



บันทึกการทวนสอบก่อนใช้งานเครื่องมือตรวจวัด

Equipment :	Air Sampling Pump (Low Flow)	Model :	M-5
Date of Calibration :	17/8/2023	Maker :	A.P Buck Inc., USA.
Certificate of Calibration No. :	MTC.No.23-66/0611	Serial No. :	M-3761B

CALIBRATION DATA

PERSONAL PUMP DATA				CALIBRATION DATA							
NO.	BRAND /MODEL	SERIAL NO.	DATE	FLOW RATE (ml/min)						VALUE FROM CALIBRATION	
				SETTING			ACTUAL (Q std.)			CURVE	
				1	1	1	1	1	1	Y	R ²
1	GILIAN LFS 113D	4613	27/5/2024	50	100	200	51	103	202	75.5x - 32.333	0.9687
2	GILIAN LFS 113D	5854	27/5/2024	50	100	200	50	101	203	76.5x - 35	0.9643
3	GILIAN LFS 113D	5825	27/5/2024	50	100	200	53	102	202	74.5x - 30	0.9624
4	GILIAN LFS 113D	6167	27/5/2024	50	100	200	50	101	200	75x - 33	0.967
5	GILIAN LFS 113D	5869	27/5/2024	50	100	200	53	102	201	74x - 29.333	0.9633
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ผู้จัดทำ

ธีระ วัฒน

(นายธีระวัฒน์ ทองแดง)

นักวิชาการสิ่งแวดล้อม

วันที่

27/5/2024

ผู้อนุมัติ

ปมณา .

(นายยมนา เศษโร)

หัวหน้ากลุ่มงานตรวจวัดมลพิษในสถานประกอบการ

วันที่

27/5/2024

สอบเทียบเครื่องมือตรวจวัด
ระดับความดันเสียง



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-670182

MTC No. EEL. BP. 40/0167

CALIBRATION CERTIFICATE

Submitted by : V Care Environment Services Co., Ltd.
Address : 1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravaeh, Bangkok, 10250.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator : (23 ± 3) °C
Manufacturer : Tannars : (50 ± 15) %
Model : TM-100 : Ambient Pressure : (101.325 ± 1.500) kPa
Serial No. : 170603266

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 123037.

2. Measuring Amplifier Brüel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tannagawa TPA-303A S/N OF 3214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.

7. Condenser Microphone B&K 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942:2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 4 Jan. 2024

Date of Calibration : 9 Jan. 2024

The results relate only to the items tested/calibrated or value assigned.

Accepting the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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PARL/MTC.002 Rev.4



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-670182

MTC No. FEL. BP. 40/0167

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0°C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit
1/2 inch Brüel&Kjaer 4180	94.43	0.43	± 0.10	IEC 60942:2003 Class 2 ± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit
1/2 inch Brüel&Kjaer 4180	997.7	-2.3	± 1.5	IEC 60942:2003 Class 2 ± 2.0%

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit
1/2 inch Brüel&Kjaer 4180	1.75	± 0.50	IEC 60942:2003 Class 2 14.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Date of Calibration : 9 Jan. 2024

2/3

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PARL/MTC.002 Rev.4



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0182

MTC No. EEL.BP. 40/0167

Nominal Output of Unit Under Test = 114 dB re 20µPa at 1000 Hz

Acoustic Output in dB re 20µPa, Corrected to Reference Conditions : 101.325 kPa, 23.0 °C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit
1/2 inch Brüel&Kjær 4180	114.47	0.47	± 0.10	IEC60942:2003 Class 2 ±0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit
1/2 inch Brüel&Kjær 4180	992.5	-7.5	± 1.5	IEC60942:2003 Class 2 ±2.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit
1/2 inch Brüel&Kjær 4180	2.06	± 0.50	IEC60942:2003 Class 2 +4.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

.....
(Mr. Weerachai Dreechanyan)

Approved by :

.....
(Mr. Weerachai Dreechanyan)

Date of Calibration : 9 Jan. 2024
Date of Issue : 11 Jan. 2024

End of Certificate

3 / 3

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TISTR MTC 002 Rev.4



Request No. 21-66/0600

MTC No. EEL BP. 36/0766

CALIBRATION CERTIFICATE

Submitted by : V Care Environment Services Co., Ltd.
Address : 1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravaeh, Bangkok, 10250.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Acoustic Calibrator
Manufacturer : Quest Technologies
Model : QC-10
Serial No. : QE6010048

Ambient Environment

Temperature : (23 ± 3) °C
Relative Humidity : (50 ± 15) %
Ambient Pressure : (101.325 ± 1.500) kPa

Standards used :

1. Digital Function Synthesizer NF Electronic DE-193A S/N 122037.
2. Measuring Amplifier Brüel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tanagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 17 Jul. 2023**Date of Calibration** : 18 Jul. 2023

1/2

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FM.BL.MTC.002 Rev.4

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Request No. 21-66/0600

MTC No. EEL BP. 36/0766

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 114 dB re 20µPa at 1000 Hz
Acoustic Output in dB re 20µPa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class I
1/2 inch Brüel&Kjaer 4180	113.98	-0.02	± 0.10	±0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class I
1/2 inch Brüel&Kjaer 4180	1006.2	6.2	± 1.5	±1.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class I
1/2 inch Brüel&Kjaer 4180	0.33	± 0.50	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr. Weerachai Deechaiyae)

Approved by :

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011266071702806001

End of Certificate

2 / 2

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0184

MTC No. EEL. BP. 71/0167

CALIBRATION CERTIFICATE

Submitted by : V Care Environment Services Co., Ltd.

Address : 1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravach, Bangkok 10250.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Integrating Sound Level Meter
Manufacturer : ACO
Model : 6236
Serial No. : 222051
Microphone : Type 7052NR No.79303
Preamplifier : -

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

Standards used :

1. Band Pass Filter Wavetek 752A S/N 90010494.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 4 Jan. 2024

Date of Calibration : 7-8 Feb. 2024

1 / 9

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0184

MTC No. EEL. BP. 71/0167

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.

10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.

11. Digital Multimeter Agilent 34401A S/N MY44005560.

12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Date of Calibration : 7-8 Feb. 2024

2 / 9

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1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.96	115.1	114.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 113.9 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
19.2	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	18.6	0.10	N/A
C-Weight	24.7	0.10	N/A
Flat	27.0	0.10	N/A

Date of Calibration : 7-8 Feb. 2024

3 / 9

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3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)		Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight			
125	-0.1	0.1	1.5	0.45	0.6
1 000	-0.7	-0.8	1.0	0.45	0.6
8 000	-4.5	-4.5	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)		Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight			
63	-0.4	0.0	2.0	0.20	0.6
125	-0.4	0.0	1.5	0.20	0.6
250	-0.3	0.0	1.5	0.20	0.6
500	-0.1	0.0	1.5	0.20	0.6
1 000	0.0	0.0	1.0	0.20	0.6
2 000	0.0	0.0	2.0	0.20	0.6
4 000	-0.3	-0.3	3.0	0.20	0.6
8 000	-0.4	-0.5	5.0	0.20	0.7

Date of Calibration : 7-8 Feb. 2024

4 / 9

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FM.BL.MTC.002 Rev.4

5. Long-term stability

Time	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.1	0.1	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
122	122.1	0.1	1.1	0.30	0.3
121	121.1	0.1	1.1	0.30	0.3
120	120.1	0.1	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	88.9	-0.1	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	78.9	-0.1	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	68.9	-0.1	1.1	0.30	0.3
64	63.8	-0.2	1.1	0.30	0.3
59	58.8	-0.2	1.1	0.30	0.3
54	53.8	-0.2	1.1	0.30	0.3
49	48.8	-0.2	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	39.3	0.3	1.1	0.30	0.3
34	34.3	0.3	1.1	0.30	0.3
33	33.6	0.6	1.1	0.30	0.3



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0184

MTC No. EEL. BP. 71/0167

7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
32	32.8	0.8	1.1	0.30	0.3
31	31.8	0.8	1.1	0.30	0.3
30	30.9	0.9	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	94.0	94.0	0.0	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	94.0	0.0	1.1	0.30	0.3
20-100	94.0	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 7-8 Feb. 2024

7/9

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Request No. 21-67/0184

MTC No. EEL. BP. 71/0167

8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	45	45.0	0.0	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	26.5	1.5	1.1	0.84	0.3
20-100	25	26.5	1.5	1.1	0.80	0.3
20-90	25	26.7	1.7	1.1	0.94	0.3
20-80	25	26.7	1.7	1.1	1.13	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	115.8	-0.2	±1.0	0.20	0.3
	2	98.8	-0.2	+1.0; -2.5	0.20	0.3
	0.25	89.6	-0.4	+1.5; -5.0	0.20	0.3
Slow	200	109.4	-0.2	±1.0	0.20	0.3
	2	89.8	-0.2	+1.0; -5.0	0.20	0.3
	200	109.9	-0.1	±1.0	0.20	0.3
SEL	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 7-8 Feb. 2024

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NSC-TISI-TIS 17025
CALIBRATION 0037

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0184

MTC No. EEL. BP. 71/0167

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.8	0.4	3.0	0.20	0.35
Positive half cycle	124.4	124.2	-0.2	2.0	0.20	0.35
Negative half cycle	124.4	124.2	-0.2	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
131.1	131.1	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	119.0	0.0	0.3	0.10	0.1
End	119.0				

Calibrated by

Pannasit Phasingsri

(Mr. Pannasit Phasingsri)

Approved by :

Prawate Klueypa

(Mr. Prawate Klueypa)

Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 7-8 Feb. 2024

Date of Issue : 20 Feb. 2024

Ref : 2011267010400027010

End of Certificate

9 / 9

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FM.BLMTC.002 Rev.4

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : SOUND LEVEL METER
MANUFACTURER : ACO CO.,LTD
MODEL / TYPE : TYPE 6236
SERIAL NO. : 222059
CLID. NO. : 252400473
JOB CONTROL NO. : 240307025005
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : V CARE ENVIRONMENT SERVICES CO., LTD.
1/29 SOI SUPHAPHONG 3 YEK 8,
NONGBON, PRAVACH, BANGKOK, 10250

DATE OF RECEIVED : 07 March 2024 DATE OF ISSUED : 11 March 2024

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

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
11 March 2024

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. Q24025005
F3-011-05/12-23

page 1 of 3



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REPORT OF CALIBRATION

FOR

NOMENCLATURE : SOUND LEVEL METER
MANUFACTURER : ACO CO.,LTD
MODEL / TYPE : TYPE 6236
SERIAL NO. : 222059
DATE OF CALIBRATION : 08 March 2024

ENVIRONMENT CONDITIONS :

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

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-34 by comparison with Multifunction Acoustic Calibrator which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Multifunction Acoustic Calibrator, B&K Model 4226 SN.3318732

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AA-2030-23, Due Date 07 November 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2,00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24025005
F3-011-05/12-23

page 2 of 3



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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. 02-578-2872 www.cali-lab.com E-mail: sale@cali-lab.com



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

ACOUSTIC CALIBRATION FREQUENCY [IEC 61672-3] @ 1 kHz RESULT

STD Applied (dB _A)	DUC Reading (dB _A)	Correction (dB _A)	Uncertainty $\pm$ (dB _A)
94.0	94.2	-0.2	0.4
114.0	114.1	-0.1	0.4

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 3 of 67

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

End of Certificate

Certificate No. Q24025005

F3-011-05/12-23

page 3 of 3



edcalibration



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0184

MTC No. EEL. BP. 80/0167

CALIBRATION CERTIFICATE

Submitted by : V Care Environment Services Co., Ltd.
Address : 1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravach, Bangkok, 10250
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre,
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :
Description : Sound Level Meter
Manufacturer : ACO
Model : 6236
Serial No. : 222063
Microphone : 7052NR No.82878
Preamplifier : -

Standards used :

1. Band Pass Filter Wavetek 752A S/N 90010494.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AI.-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 4 Jan. 2024

Date of Calibration : 6 Feb. 2024

1 / 9

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0184

MTC No. EEL. BP. 80/0167

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP 102-02 and CP 102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Date of Calibration : 6 Feb. 2024

2 / 9

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1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit class 2 (+/-dB)	Uncertainty (+/-dB)	Maximum-permitted uncertainty of measurement (+/-dB)
	Before adjust	After adjust				
113.93	115.8	113.9	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 114.5 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (+/-dB)	Maximum-permitted uncertainty of measurement (+/-dB)
22.4	0.10	N/A

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

Frequency	Measured value (dB)	Uncertainty (+/-dB)	Maximum-permitted uncertainty of measurement (+/-dB)
A-Weight	21.5	0.10	N/A
C-Weight	27.2	0.10	N/A
Flat	29.8	0.10	N/A

Date of Calibration : 6 Feb, 2024

3 / 9

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3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve (dB)		Acceptance limit class 2 (+/-dB)	Uncertainty (+/-dB)	Maximum-permitted uncertainty of measurement (+/-dB)
	A-weight	C-weight			
125	0.1	0.4	1.5	0.45	0.6
1 000	-0.4	-0.5	1.0	0.45	0.6
8 000	-1.5	-1.5	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve (dB)		Acceptance limit class 2 (+/-dB)	Uncertainty (+/-dB)	Maximum-permitted uncertainty of measurement (+/-dB)
	A-weight	C-weight			
63	-0.2	0.0	2.0	0.20	0.6
125	-0.2	0.1	1.5	0.20	0.6
250	-0.2	0.1	1.5	0.20	0.6
500	-0.2	0.1	1.5	0.20	0.6
1 000	0.0	0.0	1.0	0.20	0.6
2 000	0.0	0.0	2.0	0.20	0.6
4 000	-0.3	-0.3	3.0	0.20	0.6
8 000	-0.4	-0.5	5.0	0.20	0.7

Date of Calibration : 6 Feb, 2024

4 / 9

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5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 6 Feb. 2024

5 / 9

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7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
122	122.0	0.0	1.1	0.30	0.3
121	121.0	0.0	1.1	0.30	0.3
120	120.1	0.1	1.1	0.30	0.3
119	119.1	0.1	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	83.9	-0.1	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	68.9	-0.1	1.1	0.30	0.3
64	63.8	-0.2	1.1	0.30	0.3
59	58.8	-0.2	1.1	0.30	0.3
54	53.8	-0.2	1.1	0.30	0.3
49	48.8	-0.2	1.1	0.30	0.3
44	43.8	-0.2	1.1	0.30	0.3
39	38.9	-0.1	1.1	0.30	0.3

Date of Calibration : 6 Feb. 2024

6 / 9

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7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
34	34.1	0.1	1.1	0.30	0.3
33	33.1	0.1	1.1	0.30	0.3
32	32.3	0.3	1.1	0.30	0.3
31	31.5	0.5	1.1	0.30	0.3
30	30.6	0.6	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	94.0	94.0	0.0	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	94.0	0.0	1.1	0.30	0.3
20-100	94.0	93.9	-0.1	1.1	0.30	0.3

Date of Calibration : 6 Feb. 2024

7 / 9

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FM.BLMTC.002 Rev.4



8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	45	45.0	0.0	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	26.1	1.1	1.1	0.30	0.3
20-100	25	26.1	1.1	1.1	0.30	0.3
20-90	25	26.1	1.1	1.1	0.30	0.3
20-80	25	26.1	1.1	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	116.0	0.0	+1.0	0.20	0.3
	2	98.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	89.8	-0.2	+1.5; -5.0	0.20	0.3
Slow	200	109.4	-0.2	+1.0	0.20	0.3
	2	89.8	-0.2	+1.0; -5.0	0.20	0.3
	200	109.9	-0.1	+1.0	0.20	0.3
SEL	2	89.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	80.8	-0.2	+1.5; -5.0	0.20	0.3

Date of Calibration : 6 Feb. 2024

8 / 9

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Fax. (66) 0 2323 9165
Email : mtc@tistr.or.th

Office
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Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
Email : sumalee@tistr.or.th

FM.BLMTC.002 Rev.4

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.7	0.3	3.0	0.20	0.35
Positive half cycle	124.4	124.3	-0.1	2.0	0.20	0.35
Negative half cycle	124.4	124.3	-0.1	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle	0.0	1.5	0.20	0.25
130.9	130.9				

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by : 
.....
(Mr. Wittawat Supanich)

Approved by : 
.....
(Ms. Prapha Kluyap)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 6 Feb. 2024

Date of Issue : 6 Feb. 2024

Ref : 2011267010400027019

End of Certificate

9 / 9

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CERTIFICATE OF CALIBRATION

NO. 20240114058

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	820894
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-01-15
Due Date:	2025-01-14



Calibrated by: *Jim Lin*

- This report certifies that all calibration equipment used in the test is traceable with the internal (ISO9001) procedures and meets all specification given in the Manual(s) or respectively surpass then, and applies only to the unit identified above.
- This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

- Preliminary inspection: OK
- Type & serial No. of Microphone: AWA14425-58728
- Adjustments to indicated sound levels:
Type of Calibrator: B&K 4231 Sound Pressure Level 94.0 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.1	-14.6	0.2	1000	0.0	0.0	-0.1
20	-50.3	-6.4	-0.4	2000	1.2	-0.2	0.0
315	-39.4	-2.2	0.1	4000	1.0	-0.8	0.0
63	-26.2	-0.8	-0.1	8000	-1.2	-3.2	0.0
125	-16.3	-0.1	-0.2	12500	-5.8	-7.8	0.1
250	-8.6	0.1	0.0	16000	-11.7	-13.7	0.0
500	-3.1	0.1	0.0	20000	-23.8	-25.8	-0.2

6. Self-generated noise

Microphone replaced by electrical input signal device

6.9 dB(A)	7.0 dB(C)	15.1 dB(Z)
7. F&S Weighting		
Rate of the F weighting decrease (dB/s)		35.0
Rate of the S weighting decrease (dB/s)		4.4
Deviation of F&S		-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	LAFmax-LA	LASmax-LA	LAE-LA	LAeqT-LA
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.2	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.5	3.5	2.4	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 40 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.2	0.0
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.8	0.1
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 20 °C
Relative humidity: 50 %
Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2024-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2024-10-15	CIGISMEC
Signal generator	DS 360	33873	2024-10-15	CEPREI

Test specifications:

- All Scair's Sound Level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20240114059

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	820895
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-01-15
Due Date:	2025-01-14



Calibrated by: *Jim Lin*

- I. This report certifies that all calibration equipment used in the test is traceable with the internal (ISO9001) procedures and meets all specification given in the Manual(s) or respectively surpasses them, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK
2. Type & serial No. of Microphone: AWA1425-52652
3. Adjustments to indicated sound levels:
- Type of Calibrator: B&K 4231 Sound Pressure Level 34.0 dB
4. Measuring up limit: 140 dBA
5. Frequency weightings (Acoustic signal tests for Z weighing, other electric signal tests.)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.1	-14.6	0.2	1000	0.0	0.0	-0.1
20	-50.3	-6.4	-0.3	2000	0.2	-0.2	0.0
315	-39.4	-2.1	0.1	4000	1.0	-0.8	0.0
63	-26.1	-0.7	-0.1	8000	-1.2	-3.2	0.0
125	-16.3	-0.1	-0.1	12500	-5.8	-7.8	0.1
250	-8.6	0.1	0.0	16000	-11.7	-13.7	0.0
500	-3.1	0.1	0.1	20000	-23.8	-25.8	-0.2

6. Self-generated noise
- Microphone replaced by electrical input signal device

8.4 dB(A)	8.2 dB(C)	13.4 dB(Z)
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7. F&S Weighing

Rate of the F weighting decrease (dB/s)	35.1
Rate of the S weighting decrease (dB/s)	4.4
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	LAFmax-LA	LASmax-LA	LAE-LA	LAeqT-LA
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.2	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.5	3.5	2.4	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 40 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.2	0.0
LS	110.8	110.8	0.0
LI0	108.8	108.8	0.0
LS0	92.9	92.8	0.1
LS9	76.9	76.8	0.1
LS95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 20 °C
 Relative humidity: 50 %
 Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	BSK 4191	2929405	2024-12-15	NML
Multi function sound calibrator	BSK 4226	2288444	2024-10-15	CIGISMEC
Signal generator	DS 340	33873	2024-10-15	CEPREI

Test specifications:

1. All Scair's Sound Level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMP004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of <20%.
3. The acoustic calibration was performed using an BSK 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20240114062

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	820898
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-01-15
Due Date:	2025-01-14



Calibrated by:

Jim Lin

- This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them, and applies only to the unit identified above.
- This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

- Preliminary inspection: OK
- Type & serial No. of Microphone: AWA14425-58918
- Adjustments to indicated sound levels:
Type of Calibrator: B&K 4231 Sound Pressure Level 94.0 dB
- Measuring up limit: 140 dBA
- Frequency weightings (Acoustic signal tests for Z weighing, other electric signal tests,)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.1	-14.4	0.2	1000	0.0	0.0	-0.1
20	-50.3	-6.4	-0.3	2000	0.1	-0.2	0.0
31.5	-39.4	-2.1	0.1	4000	1.2	-0.8	0.0
63	-26.1	-0.7	-0.1	8000	1.2	-3.2	0.0
125	-16.4	-0.1	-0.1	12500	-5.2	-7.8	0.1
250	-8.6	0.1	0.0	16000	-11.5	-13.7	0.0
500	-3.1	0.1	0.1	20000	-23.4	-25.8	-0.2

6. Self-generated noise

Microphone replaced by electrical input signal device

10.8 dB(A)	10.3 dB(C)	15.8 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.1
Rate of the S weighting decrease (dB/s)	4.1
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	LAFmax-LA	LASmax-LA	LAE-LA	LAeqT-LA
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.2	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.5	3.5	2.4	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.2	0.0
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.8	0.1
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 20 °C
Relative humidity: 50 %
Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2024-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2024-10-15	CIG/ISMEC
Signal generator	DS 340	33873	2024-10-15	CEPREI

Test specifications:

- All Scartel's Sound Level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of 420%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



SCARLET | TECH



Calibration Laboratory
J419

CERTIFICATE OF CALIBRATION

NO. 20230115118

Name of Product:	Sound Level Meter
Model	ST-21D
Serial Number:	820767
Specification:	Class 2
Conclusion:	Pass
Date of calibration:	2024-01-15
Due Date:	2025-01-14

Calibrated by: Jim Lin



- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpasses them, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK
2. Type & serial No. of Microphone: AWA14421A-000434
3. Adjustments to indicated sound levels:
Type of Calibrator: 3&K 4231
Sound Pressure Level: 94.0 dB
4. Measuring up limit: 138 dBA
5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
20	-50.3	-6.3	-0.1	1000	0.0	0.0	0.0
31.5	-39.4	-2.9	-0.1	2000	1.3	-0.1	0.0
63	-26.1	-0.8	0.0	4000	1.3	-0.6	0.0
125	-16.2	-0.2	0.0	8000	-1.2	-3.1	0.0
250	-8.7	-0.1	0.0	12500	-11.0	-13.0	0.0
500	-3.2	0.0	0.0	/	/	/	/

6. Self-generated noise
Microphone replaced by electrical input signal device

24.5 dB(A)	25.6 dB(C)	33.5 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	34.4
Rate of the S weighting decrease (dB/s)	4.3
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB
Max error at 10dB steps upper reference sound level 0.1 dB
Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB
Max error at 10dB steps below reference sound level 0.1 dB
Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB		
	LAFmax-LA	LASmax-LA	LAE-LA
500	0.0	-4.0	-2.9
200	-1.0	-7.4	-6.9
2	-18.2	-26.9	-26.9
0.25	-27.1	/	-36.1

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.5	3.5	2.3	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 123.0 dB
Sweep amplitude: 40 dB
Scan cycle time: 40 S; Measurement period: 180 S

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	113.3	113.4	-0.1
L ₅	121.0	121.0	0.0
L ₁₀	119.0	119.0	0.0
L ₅₀	103.0	103.0	0.0
L ₉₀	87.1	87.0	0.1
L ₉₅	85.1	85.0	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions

Air temperature: 20 °C

Relative humidity: 50 %

Static pressure: 101.3 kPa

Test specifications:

1. All Scartel's Sound Level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMP004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±0.5%.
3. The acoustic calibration was performed using an B&K 4228 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

Scartel's Sound Level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMP004-CA-152.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	113.3	113.4	-0.1
L ₅	121.0	121.0	0.0
L ₁₀	119.0	119.0	0.0
L ₅₀	103.0	103.0	0.0
L ₉₀	87.1	87.0	0.1
L ₉₅	85.1	85.0	0.1

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	113.3	113.4	-0.1
L ₅	121.0	121.0	0.0
L ₁₀	119.0	119.0	0.0
L ₅₀	103.0	103.0	0.0
L ₉₀	87.1	87.0	0.1
L ₉₅	85.1	85.0	0.1

Scartel's Sound Level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMP004-CA-152.

The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±0.5%.

The acoustic calibration was performed using an B&K 4228 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	113.3	113.4	-0.1
L ₅	121.0	121.0	0.0
L ₁₀	119.0	119.0	0.0
L ₅₀	103.0	103.0	0.0
L ₉₀	87.1	87.0	0.1
L ₉₅	85.1	85.0	0.1

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	113.3	113.4	-0.1
L ₅	121.0	121.0	0.0
L ₁₀	119.0	119.0	0.0
L ₅₀	103.0	103.0	0.0
L ₉₀	87.1	87.0	0.1
L ₉₅	85.1	85.0	0.1

Scartel's Sound Level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMP004-CA-152.

The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±0.5%.

The acoustic calibration was performed using an B&K 4228 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20231130193

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	821300
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-01-16
Due Date:	2025-01-15

Calibrated by: 



- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

- 1. Preliminary inspection: OK
- 2. Type & serial No. of Microphone: AWA14425-50198
- 3. Adjustments to indicated sound levels: 4. Measuring up limit: 140 dBA
- 5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.):

Type of Calibrator: B&K 4231
Sound Pressure Level: 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Frequency weighting / dB		
	A	C	Z	A	C	Z
10	-71.0	-14.2	-0.5	0.1	0.0	0.0
20	-50.3	-6.0	-0.2	1.3	-0.1	0.0
31.5	-39.3	-2.9	-0.1	1.2	-0.7	0.0
63	-26.1	-0.8	-0.1	-1.0	-3.0	0.0
125	-16.1	-0.1	0.0	-6.0	-7.9	-0.1
250	-8.6	0.0	0.0	-11.7	-13.7	0.0
500	-3.1	0.1	0.0	-23.8	-25.8	-0.2

- 6. Self-generated noise
Microphone replaced by electrical input signal device

9.4 dB(A)	9.6 dB(C)	17.8 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.0
Rate of the S weighting decrease (dB/s)	4.4
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	L _{10ms-1s}	L _{10ms-1s}	L _{1s-1s}	L _{1s-1s}
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.2	-26.9	-26.9	-7.0
0.25	-27.1	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.4	2.4	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/ dB	Theoretical calculated value/ dB	Error/ dB
$L_{Aeq,T}$	103.2	103.2	0.0
L_5	110.8	110.8	0.0
L_{10}	108.8	108.8	0.0
L_{50}	92.9	92.8	0.1
L_{90}	76.9	76.8	0.1
L_{95}	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 25 °C
 Relative humidity: 60 %
 Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2025-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2025-10-15	CIGISMEC
Signal generator	DS 360	33873	2025-10-15	CEPREI

Test specifications:

1. All Scalet's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMT004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of $\pm 20\%$.
3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20231130244

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	821351
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-01-16
Due Date:	2025-01-15

Calibrated by: Jim Lin



- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manuals(s) or respectively surpass them, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlett Tech Co Ltd Taiwan.

1. Preliminary Inspection: OK
2. Type & serial No. of Microphone: AWA14425-60333
3. Adjustments to Indicated sound levels: 4. Measuring up limits: 140.dBA
5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.):

Type of Calibrator: B&K 4231

Sound Pressure Level: 94.0_dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Frequency weighting / dB		
	A	C	Z	A	C	Z
10	-70.9	-14.5	-0.9	0.1	0.0	0.0
20	-50.4	-6.2	-0.2	1.2	0.1	0.0
31.5	-39.3	-3.0	-0.2	1.1	-0.8	0.0
63	-26.1	-0.8	-0.1	-1.2	-3.2	0.0
125	-16.2	-0.1	-0.1	-6.0	-7.9	-0.1
250	-8.8	0.0	-0.1	-11.7	-13.7	0.0
500	-3.2	0.0	-0.1	-23.8	-25.8	-0.2

6. Self-generated noise

Microphone replaced by electrical input signal device

7.2 dB(A)	8.5 dB(C)	18.2 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.3
Rate of the S weighting decrease (dB/s)	4.4
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

- Reference sound level 90.0 dB
- Max error at 10dB steps upper reference sound level 0.1 dB
- Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB
- Max error at 10dB steps below reference sound level 0.1 dB
- Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	L _{upper} -L _u	L _{lower} -L _u	L _u -L _u	L _u -L _u
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.1	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.3	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

- Sweep signal maximum indicated sound level: 112.8 dB
- Sweep amplitude: 40 dB
- Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	103.2	103.2	0.0
L ₅	110.8	110.8	0.0
L ₁₀	108.8	108.8	0.0
L ₅₀	92.9	92.8	0.1
L ₉₀	76.9	76.8	0.1
L ₉₅	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 25 °C
 Relative humidity: 60 %
 Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2025-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2025-10-15	CIGISMEC
Signal generator	DS 360	33873	2025-10-15	CEPREI

Test specifications:

1. All Scaier's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMTP004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±0.5%.
3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



SCARLET TECH

CERTIFICATE OF CALIBRATION

NO. 20231123021

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	821373
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-01-16
Due Date:	2025-01-15



Calibrated by: Jim Lin

- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manuals or respectively surpass them, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspections: OK
2. Type & serial No. of Microphone: AWA14425-60239
3. Adjustments to indicated sound levels: Type of Calibrator: B&K 4231
4. Measuring up limit: 140 dBa
5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests,)

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-70.4	-14.6	-0.4	1000	0.1	0.0	0.0
20	-50.3	-6.1	-0.2	2000	1.3	-0.1	0.0
31.5	-39.5	-2.9	-0.2	4000	1.2	-0.7	0.0
63	-26.1	-0.8	-0.1	8000	-1.1	-3.0	0.0
125	-16.1	-0.2	-0.1	12500	-6.0	-7.9	-0.1
250	-8.6	0.0	0.0	16000	-11.7	-13.7	0.0
500	-3.2	0.0	0.0	20000	-23.8	-25.8	-0.2

6. Self-generated noise
- Microphone replaced by electrical input signal device

7.3 dB(A)	8.4 dB(C)	14.9 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.3
Rate of the S weighting decrease (dB/s)	4.4
Deviation of F&S	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

- Reference sound level 90.0 dB
- Max error at 10dB steps upper reference sound level 0.1 dB
- Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB
- Max error at 10dB steps below reference sound level 0.1 dB
- Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	L _{10ms} -L ₀	L _{100ms} -L ₀	L _{1s} -L ₀	L _{10s} -L ₀
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.1	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-1C(dB)	3.4	3.5	2.3	2.4	2.4	2.4

11. Overload indication: Pass

12. Statistical analysis function

- Sweep signal maximum indicated sound level: 112.8 dB
- Sweep amplitude: 40 dB
- Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	103.2	103.2	0.0
L _S	110.8	110.8	0.0
L ₁₀	108.8	108.8	0.0
L ₅₀	92.9	92.8	0.1
L ₉₀	76.9	76.8	0.1
L ₉₅	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 25 °C
 Relative humidity: 60 %
 Static pressure: 101.8 kPa

Reference equipment used in the calibration:

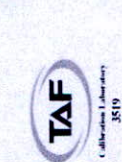
Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2025-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2025-10-15	CIGISMEC
Signal generator	DS 360	33873	2025-10-15	CEPREI

Test specifications:

1. All Scaer's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMTPO04-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20231123023

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	821387
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-01-16
Due Date:	2025-01-15



Jim Lin

Calibrated by:

- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manuals(s) or respectively surpass then, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlett Tech Co Ltd Taiwan.

- 1. Preliminary inspection: OK
- 2. Type & serial No. of Microphone: AWA14425-57234
- 3. Adjustments to Indicated sound levels: 4. Measuring up limits: 140 dBA
- 5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Type of Calibrator: B&K 4231

Sound Pressure Level: 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.0	-14.5	-0.9	1000	0.1	0.0	0.0
20	-50.2	-6.1	-0.1	2000	1.4	-0.1	0.0
31.5	-39.4	-2.8	-0.2	4000	1.2	-0.7	0.0
63	-26.1	-0.7	0.0	8000	-1.0	-3.0	0.0
125	-16.1	-0.1	0.0	12500	-6.0	-7.9	-0.1
250	-8.6	0.0	0.0	16000	-11.7	-13.7	0.0
500	-3.1	0.1	0.0	20000	-23.8	-25.8	-0.2

- 6. Self-generated noise
- Microphone replaced by electrical input signal device

8.3 dB(A)	8.1 dB(C)	15.7 dB(Z)
7. F&S Weighting		
Rate of the F weighting decrease (dB/s)		35.2
Rate of the S weighting decrease (dB/s)		4.3
Deviation of F&S		0.0

- 8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

- 9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	L _{upper} -L _a	L _{lower} -L _a	L _u -L _a	L _l -L _a
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.1	/	-36.0	-7.0

- 10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.3	2.4	2.4	2.4

- 11. Overload indication: Pass

- 12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	103.2	103.2	0.0
L ₅	110.8	110.8	0.0
L ₁₀	108.8	108.8	0.0
L ₅₀	92.9	92.8	0.1
L ₉₀	76.9	76.8	0.1
L ₉₅	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 25 °C
 Relative humidity: 60 %
 Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2025-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2025-10-15	CIGSMEC
Signal generator	DS 360	33873	2025-10-15	CEPREI

Test specifications:

1. All Scalet's Sound Level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMP004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters, Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20231130374



Name of Product:	Sound Level Meter
Model:	ST-110
Serial Number:	821474
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-02-06
Due Date:	2025-02-05

Calibrated by:

Jim Lin



- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manuals(s) or respectively surpass them, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK
2. Type & serial No. of Microphone: AWA14425-60040
4. Measuring up limit: 140.dBA
5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Type of Calibrator: B&K 4231

Sound Pressure Level: 94.0.dB

Equivalent Free-field Sound level (reference environment conditions) 93.8.dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-70.8	-14.7	-0.5	1000	0.1	0.0	-0.1
20	-50.2	-6.1	-0.3	2000	1.3	-0.1	0.0
31.5	-39.5	-3.0	-0.2	4000	1.1	-0.7	0.0
63	-26.2	-0.8	-0.1	8000	-1.1	-3.1	0.0
125	-16.1	-0.2	-0.1	12500	-6.0	-7.9	-0.1
250	-8.6	0.0	0.0	16000	-11.7	-13.7	0.0
500	-3.2	0.0	-0.1	20000	-23.8	-25.8	-0.3

6. Self-generated noise
- Microphone replaced by electrical input signal device

8.2 dB(A)	8.3 dB(C)	19.3 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.0
Rate of the S weighting decrease (dB/s)	4.4
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0.dB

Max error at 10dB steps upper reference sound level 0.1.dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0.dB

Max error at 10dB steps below reference sound level 0.1.dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1.dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	L _{lower} -L _u	L _{center} -L _u	L _u -L _u	L _{upper} -L _u
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.2	-26.9	-26.9	-7.0
0.25	-27.1	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value		Positive half		Negative half		nominal value
		LCpeak-LC(dB)	3.4	3.5	2.4	2.4	2.3	2.4

11. Overload indication: Pass
12. Statistical analysis function
- Sweep signal maximum indicated sound level: 112.8.dB
- Sweep amplitude: 40.dB
- Scan cycle time: 60.S; Measurement period: 180.S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	103.2	103.2	0.0
L ₅	110.8	110.8	0.0
L ₁₀	108.8	108.8	0.0
L ₅₀	92.9	92.8	0.1
L ₉₀	76.9	76.8	0.1
L ₉₅	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 25 °C
Relative humidity: 60 %
Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2025-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2025-10-15	CIGISMEC
Signal generator	DS 360	33873	2025-10-15	CEPREI

Test specifications:

1. All Scairlet's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMT004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20231130376

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	821476
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-02-06
Due Date:	2025-02-05



Calibrated by:

Jm Lin

- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK
2. Type & serial No. of Microphone: AWA14425-61071
4. Measuring up limit: 140 dBA
5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Type of Calibrator: B&K 4231

Sound Pressure Level: 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Frequency weighting / dB		
	A	C	Z	A	C	Z
10	-70.2	-14.3	-1.0	0.1	0.0	0.0
20	-50.2	-6.1	-0.3	1.3	-0.1	0.0
31.5	-39.4	-3.0	-0.2	1.1	-0.7	0.0
63	-26.2	-0.8	-0.1	-1.1	-3.1	0.0
125	-16.1	-0.2	-0.1	-6.0	-7.9	-0.1
250	-8.6	0.0	0.0	-11.7	-13.7	0.0
500	-3.2	0.1	0.0	-23.8	-25.8	-0.2

6. Self-generated noise

Microphone replaced by electrical input signal device

9.0 dB(A)	10.0 dB(C)	17.4 dB(Z)
-----------	------------	------------

7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.2
Rate of the S weighting decrease (dB/s)	4.4
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	L _{lower} -L _u	L _{upper} -L _u	L _u -L _u	L _u -L _u
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.1	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.3	2.4	2.3	2.4

11. Overload indications: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.2	0.0
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.8	0.1
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 25 °C
 Relative humidity: 60 %
 Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2025-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2025-10-15	CIGISMEC
Signal generator	DS 360	33873	2025-10-15	CEPREI

Test specifications:

1. All Scairlet's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMTP004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



TISTR

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0183

MTC No. EEL BP.

42/0167

CALIBRATION CERTIFICATE

Submitted by : V Care Environment Services Co., Ltd

Address : 1/29 Soi Suphaphong 3 Yek 8, Nongbon, Prawach, Bangkok, 10250.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dose Meter

Manufacturer : Soundtek

Model : ST-130

Serial No. : 200300139

Microphone : 200300139

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Date of Receipt : 4 Jan. 2024

Date of Calibration : 15 Jan. 2024

The results relate only to the items tested/calibrated or value assigned.

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TISTR

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0183

MTC No. EEL BP.

42/0167

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from various frequency curve		Uncertainty (±dB)	Tolerance limits class 2 (±dB)
	C-weighting (dB)	A-weighting (dB)		
125	0.2	0.5	0.25	2.0
1 000	0.0	0.0	0.25	1.4
4 000	0.3	0.4	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 94 dB.

3) The measured values did not include the correction of microphone of UUT.

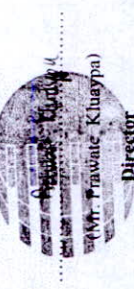
4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :

G. Sany

(Mr. Sanaey Grajang)

Approved by :



Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011267010400026002

End of Certificate

2 / 2

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TISTR

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0183

MTC No. EEL. BP.

53/0167

CALIBRATION CERTIFICATE

Submitted by : V Care Environment Services Co., Ltd.

Address : 1/29 Soi Suphaphong 3 Yek 8, Nongbon, Prayach, Bangkok, 10250.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre,

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dose Meter

Manufacturer : Soundtek

Model : ST-130

Serial No. : 220100119

Microphone : 220100119

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC

61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Date of Receipt : 4 Jan. 2024

Date of Calibration : 16 Jan. 2024

1 / 2

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TISTR

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0183

MTC No. EEL. BP.

53/0167

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from various frequency curve		Uncertainty ($\pm$ dB)	Tolerance limits class 2 ($\pm$ dB)
	C-weighting (dB)	A-weighting (dB)		
125	0.3	0.2	0.25	2.0
1 000	0.0	0.0	0.25	1.4
4 000	-0.7	-0.5	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 94 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :

G. Samy

(Mr. Sanaey Grajang)

Approved by :



Director
Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011267010400026013

End of Certificate

2 / 2

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TISTR

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0183

MTC No. EEL. BP. 54/0167

CALIBRATION CERTIFICATE

Submitted by : V Care Environment Services Co., Ltd.

Address : 1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravach, Bangkok, 10250.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dose Meter

Manufacturer : Soundtek

Model : ST-130

Serial No. : 220300226

Microphone : 220300226

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjaer 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Date of Receipt : 4 Jan. 2024

Date of Calibration : 16 Jan. 2024

1 / 2

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TISTR

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0183

MTC No. EEL. BP. 54/0167

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from various frequency curve		Uncertainty ($\pm$ dB)	Tolerance limits class 2 ($\pm$ dB)
	C-weighting (dB)	A-weighting (dB)		
125	0.4	0.5	0.25	2.0
1 000	0.0	0.0	0.25	1.4
4 000	0.0	0.0	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 94 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :

G. Samy

(Mr. Sanay Grajang)

Approved by :



Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 2011267010400026014

2 / 2

End of Certificate

The results relate only to the items tested/calibrated at value assigned.

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FM.BL.MTC.002 Rev.4

Head Office

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TISTR

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0183

MTC No. EEL. BP.

59/0167

CALIBRATION CERTIFICATE

Submitted by : V Care Environment Services Co.,Ltd.

Address : 1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravaach, Bangkok, 10250.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dose Meter

Temperature : $(23 \pm 3) ^\circ\text{C}$

Manufacturer : Soundick

Relative Humidity : $(50 \pm 15) \%$

Model : S1-130

Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

Serial No. : 220300233

Microphone : 220300233

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjaer 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC

61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Date of Receipt : 4 Jan. 2024

Date of Calibration : 16 Jan. 2024

1 / 2

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FMBL/MTC.002 Rev.4

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TISTR

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0183

MTC No. EEL. BP.

59/0167

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from various frequency curve		Uncertainty ($\pm$ dB)	Tolerance limits class 2 ($\pm$ dB)
	C-weighting (dB)	A-weighting (dB)		
125	0.7	0.7	0.25	2.0
1 000	0.0	0.0	0.25	1.4
4 000	-3.5	-3.5	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 94 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :


(Mr. Sanaey Grajang)

Approved by :


(Mr. Prayoon Chaiyaporn)

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 201267010400026019

2 / 2

End of Certificate

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FMBL/MTC.002 Rev.4

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Calibration & Test Certificate

We hereby certify that the instrument under mentioned has been certainly calibrated according to our calibration standard and the testing result in the calibration procedure has been good enough within the tolerance regulated in our specification.

Test conditions

Model name Noise Dosimeter
Model number ST-130
Serial number 230600159
Temperature 20.0° C
Humidity 77.0%/rh
Date of calibration 2024/02/22
Valid Until 2025/02/21

Test data

Test item	Range	Results
M dBA	Range: 30...130 dB	PASS
M dBC	Range: 30...130 dB	PASS
M dBZ	Range: 30...130 dB	PASS

Calibrator

Model Model number Serial number Date
Standard SOUND LEVEL METER B&K 2239 2449143 OCT/22/2025
The standard generators used for calibration procedure are proofed once a year and can be traceable to the standard authorized by public organization.



Approved by

Tim Lin
Scarlet Tech
Head of Engineering Department

**สอบเทียบเครื่องมือตรวจวัด
ระดับความเข้มแสง**



Request No. : 22-67 / 0244

MTC No. : PSL-P 0038 / 67

CERTIFICATE OF CALIBRATION

Nomenclature : Digital Lux Meter

Serial No. : T.034947

Maker : DIGICON

Model : LX-73

Customer : V CARE ENVIRONMENT SERVICES CO.,LTD.

Address : 1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravaeh, Bangkok 10250

Date of receipt : 3 January 2024

Date of calibration : 15 January 2024

Place of calibration : Photometry and Temperature Standards Laboratory, MTC. (Bangpoo)

Basis of calibration : calibration at 0 ~ 5000 lux.

Condition of calibration :- Ambient temperature : (25 ± 2) °C

- Relative humidity : (60 ± 20) %

Reference Standard : Working Standard Luminous Intensity Lamp, Serial No.: FEL003 and 3501,

can be traceable to international system of units (SI), through calibration certificate

MTC No. PSL-P 131/66 and PSL-P 132/66, date of calibration 12 May 2023.

Traceability : This certificate is traceable to SI units through the National Institute of Metrology (Thailand)

calibration certificate No. TP-1010-23, TP-1011-23 and TP-1012-23

Support Equipment : 1. Photometric bench , 3.0 meter long

2. DC power supply, Serial No.: BC - 341006035007/2

3. Digital Multimeter , Model : R 6551 , S/N : 92041186 and 92041192

Calibration Procedure : The measurement was done in accordance with WI.CP.10.

The reported uncertainty is based on a standard uncertainty multiplied by a coverage

factor $k = 2$, providing a level of confidence of approximately 95 %.

page 1 of 2

P. P.

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FM.BLMTC.002 Rev.4



Request No. : 22-67 / 0244

MTC No. : PSL-P 0058 / 67

Serial No. : T.034947

Results :

UUC Range (lux)	Standard (lux)	*UUC Reading (lux)	Uncertainty of Measurement ± (lux)
40	10	10.36	0.23
	20	20.68	0.46
	30	30.87	0.69
	39	39.99	0.89
	40	-	-
400	100	103.5	2.0
	200	205.1	4.0
	300	307.7	6.0
	390	399.5	7.8
	400	-	-
4000	1000	1039	20
	2000	2072	40
	3000	3084	60
	3800	3898	76
	3900	-	-
40000 (× 10)	4000	-	-
	409	409	80
	512	512	100

Note : 1.*UUC = Unit Under Calibration.

2. The adjustment can not to be done.

...end of certificate...

Calibrated by :

(Ms. Rattanawadee Pholprom)

Approved by :

(Mr. Kamchai Sanghapiwat)
Director

Photometry and Temperature Standards Laboratory

Ref. : 2012267010300023002

Issued date : 26 January 2024

page 2 of 2

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FM.BLMTC.002 Rev.4

**สอบเทียบเครื่องมือตรวจวัด
ระดับความร้อน**



73-TISTR

MSC-TS-175-1726
CALIBRATION 2015

Request No. 22-67 / 0245

MTC No. PSL-H 0077 / 67

Certificate of Calibration

Customer : Vcare Environment Services Company Limited
1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravech, Bangkok

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : QUESTemp[®]32

Serial Number : TPH050079

Manufacturer : QUEST Technologies

Date of Request : 3 January 2024

Date of Calibration : 15 January 2024

The certifies the above equipment was calibrated in accordance with the recognised International Standard ISO/IEC 17025:2017 and the operation according to procedure no. WI.CP.18.

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 %.

Calibrated by :

Panit T.

(Ms. Panit Thummasri)

Approved by :

(Signature)
(Mr. Kamoljai Singhapiwat)
Director

Photometry and Temperature Standards Laboratory

Ref. No. : 20122670103000240002

Issued Date : 29 January 2024

Page 1 of 4

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73-TISTR

MSC-TS-175-1726
CALIBRATION 2015

Request No. 22-67 / 0245

MTC No. PSL-H 0077 / 67

Description of Unit Under Calibration :

Customer : Vcare Environment Services Company Limited
Address : 1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravech, Bangkok

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Serial Number : TPH050079

Calibration Required : Temperature at (25, 30, 32, 34, 40) °C

Ambient Condition : Ambient temperature (23 ± 3) °C

Relative humidity : (55 ± 20) %

Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 0976/66.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WI.CP.18.

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9141-5110, S/N : 1205101

Adjustments : NONE

Page 2 of 4

P.T.

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73-TISTR
ISO-TIS-17025
CALIBRATION 8013

Request No. 22-67 / 0245

MTC No. PSL-H 0077 / 67

Results of Calibration :- (☒) Without Adjustment (☐) After Adjustment

Table : Temperature Measurement @ Wet Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
24.9	25.0	-0.1	0.50
30.0	30.1	-0.1	0.50
32.0	31.9	0.1	0.50
34.0	33.8	0.2	0.50
39.9	39.6	0.3	0.50

Table : Temperature Measurement @ Dry Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
24.9	25.0	-0.1	0.50
30.0	30.0	0.0	0.50
32.0	32.1	-0.1	0.50
34.0	34.2	-0.2	0.50
39.9	39.9	0.0	0.50

Page 3 of 4

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73-TISTR
ISO-TIS-17025
CALIBRATION 8013

Request No. 22-67 / 0245

MTC No. PSL-H 0077 / 67

Results of Calibration :-

Table : Temperature Measurement @ Globe Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
24.9	25.0	-0.1	0.50
30.0	30.0	0.0	0.50
32.1	31.8	0.3	0.50
34.0	33.7	0.3	0.50
39.9	39.5	0.4	0.50

Note :

1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

Page 4 of 4

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FM.BLMTC.002 Rev.4



Request No. 22-67 / 0245

MTC No. PSL-H 0080 / 67

Certificate of Calibration

Customer : Vcare Environment Services Company Limited
1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravech, Bangkok

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Model / Type : QUESTemp³²

Serial Number : TPF010004

Manufacturer : QUEST Technologies

Date of Request : 3 January 2024

Date of Calibration : 22 January 2024

The certifies the above equipment was calibrated in accordance with the recognised International Standard ISO/IEC 17025:2017 and the operation according to procedure no. WI.CP.18.

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 %.

Calibrated by :

Janet T.

(Ms. Panit Thummasri)

Approved by :

K. Kamon Singhapiwat

(Mr. Kamon Singhapiwat)

(Director)

Photometry and Temperature Standards Laboratory

Ref. No : 2012267010300024006

Issued Date : 29 January 2024

Page 1 of 4

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FM.BLMTC.002 Rev.4



Request No. 22-67 / 0245

MTC No. PSL-H 0080 / 67

Description of Unit Under Calibration :

Customer : Vcare Environment Services Company Limited
1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravech, Bangkok

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Serial Number : TPF010004

Calibration Required : Temperature at (25, 30, 32, 34, 40) °C

Ambient Condition : Ambient temperature (23 ± 3) °C

Relative humidity : (55 ± 20) %

Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe
No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service
Centre, Certificate No. PSL-T 0976/66.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WI.CP.18.

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9141-S110, S/N : 1205101

Adjustments : NONE

Page 2 of 4

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FM.BLMTC.002 Rev.4



TISTR

MSC-TIS-175 1925

CALIBRATION 2015

Request No. 22-67 / 0245

MTC No. PSL-H 0080 / 67

Results of Calibration :- (✓) Without Adjustment () After Adjustment

Table : Temperature Measurement @ Wet Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
24.9	25.4	-0.5	0.50
30.0	30.2	-0.2	0.50
32.0	32.1	-0.1	0.50
34.1	34.2	-0.1	0.50
40.1	40.4	-0.3	0.50

Table : Temperature Measurement @ Dry Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
24.9	25.2	-0.3	0.50
30.0	30.1	-0.1	0.50
32.0	31.9	0.1	0.50
34.1	34.2	-0.1	0.50
40.1	40.3	-0.2	0.50

Page 3 of 4

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FM.BLMTC.002 Rev.4



TISTR

MSC-TIS-175 1725

CALIBRATION 2015

Request No. 22-67 / 0245

MTC No. PSL-H 0080 / 67

Results of Calibration :-

Table : Temperature Measurement @ Globe Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
24.9	25.4	-0.5	0.50
30.0	30.1	-0.1	0.50
32.0	32.1	-0.1	0.50
34.1	34.1	0.0	0.50
40.1	40.3	-0.2	0.50

Note :

1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

Page 4 of 4

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FM.BLMTC.002 Rev.4



Request No. 22-66 / 0698

MTC No. PSL-H 0324 / 66

Certificate of Calibration

Customer : Vcare Environment Services Company Limited
1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravech, Bangkok

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : QUESTemp³²

Serial Number : TPK050013

Manufacturer : 3M, QUEST Technologies

Date of Request : 17 July 2023

Date of Calibration : 10 August 2023

The certifies the above equipment was calibrated in accordance with the recognised International Standard ISO/IEC 17025:2017 and the operation according to procedure no. WI.CP.18.

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 %.

Calibrated by :

Panit T.

(Ms. Panit Thummasri)

Approved by :

Mr. Kamchai Singhapiwat

(Mr. Kamchai Singhapiwat)

Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012266071702796001

Issued Date : 15 August 2023

Page 1 of 4

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FM.BL.MTC.002 Rev.4



Request No. 22-66 / 0698

MTC No. PSL-H 0324 / 66

Description of Unit Under Calibration :

Customer : Vcare Environment Services Company Limited
1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravech, Bangkok

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Serial Number : TPK050013

Calibration Required : Temperature at (25, 30, 32, 34, 40) °C

Ambient Condition : Ambient temperature (23 ± 3) °C
Relative humidity (55 ± 20) %

Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe
No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service
Centre, Certificate No. PSL-T 0976/66.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WI.CP.18.

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9141-5110, S/N : 1205101

Adjustments : NONE

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FM.BL.MTC.002 Rev.4



Request No. 22-66 / 0698

MTC No. PSL-H 0324 / 66

Results of Calibration :- (/) Without Adjustment () After Adjustment

Table : Temperature Measurement @ Wet Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
24.9	25.2	-0.3	0.50
30.0	30.0	0.0	0.50
32.0	31.9	0.1	0.50
34.0	34.0	0.0	0.50
40.0	39.8	0.2	0.50

Table : Temperature Measurement @ Dry Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
24.9	25.1	-0.2	0.50
30.0	30.0	0.0	0.50
32.0	31.9	0.1	0.50
34.0	34.0	0.0	0.50
40.0	39.8	0.2	0.50

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FM.BL.MTC.002 Rev.4

Request No. 22-66 / 0698

MTC No. PSL-H 0324 / 66

Results of Calibration :-

Table : Temperature Measurement @ Globe Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
24.9	25.8	-0.9	0.50
30.0	30.7	-0.7	0.50
31.9	33.1	-1.2	0.50
34.0	35.0	-1.0	0.50
40.0	40.8	-0.8	0.50

Note :

1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

The results relate only to the items tested/calibrated or value assigned. Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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FM.BL.MTC.002 Rev.4



Request No. 22-66 / 0698

MTC No. PSL-H 0325 / 66

Certificate of Calibration

Customer : Vcare Environment Services Company Limited
1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravech, Bangkok

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Model / Type : WB-300

Serial Number : WBR080010

Manufacturer : 3M

Date of Request : 17 July 2023

Date of Calibration : 8 August 2023

The certifies the above equipment was calibrated in accordance with the recognised International Standard ISO/IEC 17025:2017 and the operation according to procedure no. WI.CP.18.

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 %.

Calibrated by :

Parit T.
(Ms. Panit Thummasri)

Approved by :

Mr. Kamchai Singhapiwat
(Mr. Kamchai Singhapiwat)
Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012266071702796002

Issued Date : 15 August 2023

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FM.BLMTC.002 Rev.4

Request No. 22-66 / 0698

MTC No. PSL-H 0325 / 66

Description of Unit Under Calibration :

Customer : Vcare Environment Services Company Limited
1/29 Soi Suphaphong 3 Yek 8, Nongbon, Pravech, Bangkok

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Serial Number : WBR080010

Calibration Required : Temperature at (25, 30, 32, 34, 40) °C

Ambient Condition : Ambient temperature (23 ± 3) °C

Relative humidity (55 ± 20) %

Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 0976/66.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WI.CP.18.

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9141-5110, S/N : 1205101

Adjustments : NONE

Page 2 of 4

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Request No. 22-66 / 0698

MTC No. PSL-H 0325 / 66

Results of Calibration :- (/) Without Adjustment () After Adjustment

Table : Temperature Measurement @ Wet Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
25.0	25.2	-0.2	0.50
30.0	30.0	0.0	0.50
31.9	31.7	0.2	0.50
34.0	33.8	0.2	0.50
40.0	39.6	0.4	0.50

Table : Temperature Measurement @ Dry Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
25.0	25.2	-0.2	0.50
30.0	30.0	0.0	0.50
31.9	31.8	0.1	0.50
34.0	33.9	0.1	0.50
40.0	39.8	0.2	0.50

Page 3 of 4

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Sri 1C, Bangpoo Industrial Estate, Sukhumvit Road, Amphoe Muang, Changwat Samutprakan 10280, Thailand
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Request No. 22-66 / 0698

MTC No. PSL-H 0325 / 66

Results of Calibration :-

Table : Temperature Measurement @ Globe Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
25.0	25.1	-0.1	0.50
30.0	30.0	0.0	0.50
31.9	31.7	0.2	0.50
34.0	33.8	0.2	0.50
40.0	39.6	0.4	0.50

Note :

1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

Page 4 of 4

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