

ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



right solutions,
right partner

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal.	Freq. Calibrate (Months)
Water Lab	Flow	Flowmeter	WFL-0001	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0002	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0003	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0004	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0005	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0006	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0007	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0008	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0009	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0010	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0011	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0012	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0013	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0014	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0015	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0016	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0017	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0018	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0019	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0020	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0021	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0022	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0023	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0024	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0025	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0026	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0027	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0028	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0029	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0030	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0031	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0032	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0033	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0034	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0035	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0036	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0037	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0038	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0039	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0040	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0041	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0042	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0043	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0044	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0045	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0046	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0047	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0048	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0049	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0050	14 Jun 23	14 Jun 24	12



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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal.	Freq. Calibrate (Months)
Water Lab	Flow	Flowmeter	WFL-0051	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0052	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0053	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0054	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0055	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0056	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0057	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0058	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0059	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0060	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0061	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0062	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0063	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0064	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0065	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0066	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0067	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0068	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0069	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0070	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0071	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0072	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0073	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0074	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0075	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0076	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0077	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0078	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0079	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0080	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0081	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0082	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0083	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0084	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0085	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0086	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0087	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0088	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0089	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0090	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0091	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0092	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0093	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0094	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0095	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0096	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0097	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0098	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0099	14 Jun 23	14 Jun 24	12
Water Lab	Flow	Flowmeter	WFL-0100	14 Jun 23	14 Jun 24	12

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-34
Serial No. : 3417535
ID No. : NK1138019

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
101 PHATHANAKAN 40, PHATHANAKAN ROAD,
KHUANG PHATHANAKAN, KHUAT SUAN LUANG,
BANGKOK, 10250 THAILAND

Location :
Ambient Temperature : (23.0 ± 3.3) °C
Pressure : (101.3 ± 3.3) kPa
Relative Humidity : (50.0 ± 2.0) %

Received Date : 11 SEPTEMBER 2024
Calibration Date : 01 OCTOBER 2024
Date of Issue : 02 OCTOBER 2024

Calibrated by : Nadeem Prapaisan

Approved by : T. Petchu
(Thanakul Petchu)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory

Cert. No. : ACC24045
Job No. : VC07AC0163
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by follow on IEC 60642-3:2003 Standard.
The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511U	MY53202742	IF-9007-24	05-FEB-25
Digital Multimeter	33461A	MY5320104	IF-210207	12-APR-25
Digital Multimeter	33461A	MY53202076	111110100267	15-FEB-25
Digital Multimeter	33461A	MY60024273	IF-210207	15-FEB-25
Programmable Attenuator	MA1-1070	62100114	IF-0008-24	05-FEB-25
Constance Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-43KA1	34560595	AA-3001-24	05-FEB-25
Audio Analyzer	AVR-3360A	V7441609	IF-0009-24	09-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at:

- National Institute of Metrology (Thailand).
- Thailand Institute of Scientific and Technological Research (TISTR).

Cert. No. : ACC24045
Job No. : VC07AC0163
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	94.09	0.09	0.20	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1002.4	0.2	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
0.04	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

T. Petchu

T. Petchu

Cert. No. : ACC24123
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-43 / Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 0037914 / 169110 / 72255
ID No. : NK1138001

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
101 PHATHANAKAN 40, PHATHANAKAN ROAD,
KHUANG PHATHANAKAN, KHUAT SUAN LUANG,
BANGKOK, 10250 THAILAND

Location :
Ambient Temperature : (23.0 ± 3.3) °C
Pressure : (101.3 ± 3.3) kPa
Relative Humidity : (50.0 ± 2.0) %

Received Date : 12 APRIL 2024
Calibration Date : 02-03 MAY 2024
Date of Issue : 06 MAY 2024

Calibrated by : Nadeem Prapaisan

Approved by : T. Petchu
(Thanakul Petchu)

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Cert. No. : ACL24123
Job No. : VC87AC0079
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC 61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests in Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

If/ tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY46017076	13-0009-4	05-FEB-25
Waveform Generator	335113	MY52102742	13-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	DEL-IP-214267	13-01-05-25
Digital Multimeter	33461A	MY53220076	DEL-IP-204267	13-01-05-25
Digital Multimeter	33461A	MY68024273	DEL-IP-224267	15-01-08-25
Programmable Attenuator	MAT-1070	62100134	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-34	12-01-05-25
Measuring Amplifier	NA-425CA1	34360495	AA-1001-34	05-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Cert. No. : ACL24123
Job No. : VC87AC0079
Pages : 3 of 8

Summary of Measurement Results:

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
5.1 long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.25
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

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

Frequency Weighting	Measured value (dB)
A-weight	9.9
C-weight	16.1
Flat	21.9

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-0.3	0.3	-0.3	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-0.9	-0.8	-0.8	±5.0

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Job No. : VC87AC0079
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4. Electrical signal tests of frequency weightings

Weighting network response with reference to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	-0.1	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Log	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
138.0	138.0	0.0	±1.1
139.0	139.0	0.0	±1.1
140.0	140.0	0.0	±1.1
141.0	141.0	-0.1	±1.1
142.0	142.0	-0.1	±1.1
143.0	143.0	-0.1	±1.1
144.0	144.0	0.0	±1.1
145.0	145.0	0.0	±1.1
146.0	146.0	0.0	±1.1
147.0	147.0	0.0	±1.1
148.0	148.0	0.0	±1.1
149.0	149.0	0.0	±1.1
150.0	150.0	0.0	±1.1
151.0	151.0	0.0	±1.1
152.0	152.0	0.0	±1.1
153.0	153.0	0.0	±1.1
154.0	154.0	0.0	±1.1
155.0	155.0	0.0	±1.1
156.0	156.0	0.0	±1.1
157.0	157.0	0.0	±1.1
158.0	158.0	0.0	±1.1
159.0	159.0	0.0	±1.1
160.0	160.0	0.0	±1.1
161.0	161.0	0.0	±1.1
162.0	162.0	0.0	±1.1
163.0	163.0	0.0	±1.1
164.0	164.0	0.0	±1.1
165.0	165.0	0.0	±1.1
166.0	166.0	0.0	±1.1
167.0	167.0	0.0	±1.1
168.0	168.0	0.0	±1.1
169.0	169.0	0.0	±1.1
170.0	170.0	0.0	±1.1
171.0	171.0	0.0	±1.1
172.0	172.0	0.0	±1.1
173.0	173.0	0.0	±1.1
174.0	174.0	0.0	±1.1
175.0	175.0	0.0	±1.1
176.0	176.0	0.0	±1.1
177.0	177.0	0.0	±1.1
178.0	178.0	0.0	±1.1
179.0	179.0	0.0	±1.1
180.0	180.0	0.0	±1.1
181.0	181.0	0.0	±1.1
182.0	182.0	0.0	±1.1
183.0	183.0	0.0	±1.1
184.0	184.0	0.0	±1.1
185.0	185.0	0.0	±1.1
186.0	186.0	0.0	±1.1
187.0	187.0	0.0	±1.1
188.0	188.0	0.0	±1.1
189.0	189.0	0.0	±1.1
190.0	190.0	0.0	±1.1
191.0	191.0	0.0	±1.1
192.0	192.0	0.0	±1.1
193.0	193.0	0.0	±1.1
194.0	194.0	0.0	±1.1
195.0	195.0	0.0	±1.1
196.0	196.0	0.0	±1.1
197.0	197.0	0.0	±1.1
198.0	198.0	0.0	±1.1
199.0	199.0	0.0	±1.1
200.0	200.0	0.0	±1.1

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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Time burst response

Time Weighting	Fast	Slow	SEL	Test burst duration, T _b (ms)	Cycles	Acceptance Limits			
						Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	2	8	290	0.25	1	108.0	107.9	-0.1	1.5; -5.0
						117.0	117.0	0.0	1.0; -2.5
						124.0	124.0	0.0	±1.0
Slow	2	8	290	0.25	1	108.0	108.0	0.0	1.5; -5.0
						127.6	127.6	0.0	±1.0
						127.6	127.6	0.0	±1.0
SEL	2	8	290	0.25	1	99.0	99.9	-0.1	1.5; -5.0
						108.0	108.0	0.0	1.0; -2.5
						128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leq (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
Once	135.4	135.6	-0.8	±3.0

Number of cycle is test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.4	-0.3	±2.0
Negative half cycle	135.4	135.4	-0.3	±2.0

T. Pichan

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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.5	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$, or any value following calculation providing a level of confidence of approximately 95 %.

End of Calibration Certificate

T. PetchCert. No. : ACL24124
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : IUON
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 00371915 / 169104 / 72249
ID No. : NK1, FS0002

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PIATTHANAKAN RD, PIATTHANAKAN ROAD,
KJWANG PIATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 12 APRIL 2024
Calibration Date : 07-03 MAY 2024
Date of Issue : 08 MAY 2024



Calibrated by : Nualakorn Panyutanan

Approved by :

T. Petch
(Thanakul Petchani)

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Cert. No. : ACL24124
Job No. : VC67AC0079
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC 61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.
For tests results of each item were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	11-0009-4	05-01-25
Waveform Generator	33511B	MY53202742	11-0007-24	05-01-25
Digital Multimeter	33461A	MY53220104	11-0021-6267	13-03-25
Digital Multimeter	33461A	MY53220076	11-0021-6267	15-03-25
Digital Multimeter	34461A	MY60024273	11-0021-6267	15-03-25
Programmable Attenuator	MAT-1070	62100114	11-0008-24	08-03-25
Condenser Microphone	4180	2977900	AA-1001-24	12-03-25
Measuring Amplifier	NA-42KAT	34560495	AA-0001-24	05-03-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- National Institute of Metrology (Thailand).
- Thailand Institute of Scientific and Technological Research (TISTR).

T. PetchCert. No. : ACL24124
Job No. : VC67AC0079
Pages : 3 of 8

Summary of Measurement Results :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
1000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.5
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.2
9. Tone burst response	0.2	0.3
10. Pink C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

T. PetchCert. No. : ACL24124
Job No. : VC67AC0079
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A-weight	10.8
C-weight	17.3
Flat	23.2

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.1	0.1	±1.5
1000	-0.1	-0.1	-0.1	±1.0
2000	0.5	0.9	0.9	±5.0

T. PetchCert. No. : ACL24124
Job No. : VC67AC0079
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Imp	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2

T. Petch

Cert. No. : ACL24124
Job No. : VC67AC0079
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	38.9	-0.1	±1.1
34.0	33.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
24.0	23.9	-0.1	±1.1
19.0	18.9	-0.1	±1.1
14.0	13.9	-0.1	±1.1

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Cert. No. : ACL24124
Job No. : VC67AC0079
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 : -5.0
	2	8	117.0	117.0	0.0	1.0 : -2.5
	200	800	124.0	124.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 : -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	90.0	90.0	-0.1	1.5 : -5.0
SEL	2	8	108.0	108.0	0.0	1.0 : -2.5
	200	800	128.1	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

T. Petchum

Cert. No. : ACL24124
Job No. : VC67AC0079
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at first (dB)	SLM Display at first (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k = 2 or any value following calculation providing a level of confidence of approximately 95 %.

End of Calibration Certificate

T. Petchum

Cert. No. : ACL24125
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NI-42 / Microphone UC-52 / Pre-amplifier NI-24
Serial No. : 00371916 / 169103 / 2248
ID No. : NIKI PSU003

Condition As Found : GOOD

Customer : A/S LABORATORY GROUP (THAI) ANDI CO., LTD.
104 PIA (THANAKAN 40, PIA THANAKAN ROAD,
KIWAENG PIA THANAKAN, KHUET SUAN LUANG,
BANGKOK, 10250 THAI ANDI.

Location :
Ambient Temperature : 1 23.0 ± 3.1 °C
Pressure : 1 101.3 ± 3.3 kPa
Relative Humidity : 1 50.0 ± 2.0 %

Received Date : 12 APRIL 2024
Calibration Date : 03 MAY 2024
Date of Issue : 06 MAY 2024

Calibrated by : Nakhorn Hiruphan

Approved by :

T. Petchum
(Thasak Petchum)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 (standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Cert. No. : ACL24125
Job No. : VC67AC0079
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow an IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests in Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For test results of each items were made by observation of each instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33510A	MY54817076	IS-0009-4	05-FEB-25
Waveform Generator	33511B	MY52302742	BP-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	IEEL-AP 21-0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	IEEL-AP 20-0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	IEEL-AP 22-0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	11-0008-24	05-FEB-25
Condenser Microphone	4180	2977590	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-5001-24	05-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is unable to be international system of unit maintained at :

3.1 National Institute of Metrology (NIM)

3.2 Thailand Institute of Scientific and Technological Research (TISTR)

Cert. No. : ACL24125
Job No. : VC67AC0079
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
3150 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.3	0.25
12. High level stability	0.1	0.1

T. Petchum

T. Petchum

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CALIBRATION LABORATORY

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Cert. No. : ACL24125
Job No. : VC67AC0079
Pages : 4 of 8

Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

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

Frequency Weighting	Measured value (dB)
A-weight	10.8
C-weight	17.1
Flat	23.0

3. Acoustic signal tests of frequency weightings

Meter (see file) acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.0	0.0	±1.5
1000	-0.1	-0.1	-0.1	±1.0
2000	0.5	0.9	0.9	±5.0

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Cert. No. : ACL24125
Job No. : VC67AC0079
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative in 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Log	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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Cert. No. : ACL24125
Job No. : VC67AC0079
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	53.9	-0.1	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	38.0	-0.1	±1.1
34.0	33.9	-0.1	±1.1
29.0	29.9	+0.1	±1.1
24.0	24.8	+0.2	±1.1
20.0	20.9	+0.1	±1.1
15.0	15.9	+0.1	±1.1
10.0	10.9	+0.1	±1.1
5.0	5.9	+0.1	±1.1

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Cert. No. : ACL24125
Job No. : VC67AC0079
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T ₀ (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	809	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	809	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	809	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Exp. (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.8	-0.6	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

T. Petcham

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Cert. No. : ACL24125
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
53.6	89.6	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following national law, providing a level of confidence of approximately 95 %

End of Calibration Certificate

T. Petcham

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Cert. No. : ACL24126
Job No. : VC67AC0079
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 0071917 / 169101 / 72247
ID No. : NKL1180004

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN 40, PHATTANAKAN ROAD,
KIJWAENG PHATTANAKAN, KIJET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3.1) °C
Pressure : (101.3 ± 3.1) kPa
Relative Humidity : (50.0 ± 20.1) %

Received Date : 12 APRIL 2024
Calibration Date : 02-03 MAY 2024
Date of Issue : 06 MAY 2024

Calibrated by : Natskorn Petcham

Approved by : T. Petcham
(Thanokul Petcham)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced
other than in full, except with the prior written approval of the head of Calibration Laboratory.

Cert. No. : ACL24126
Job No. : VC67AC0079
Page : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For test results of each items were made by observation of each instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY38017076	IEF-0009-4	05-FEB-25
Waveform Generator	335111	MY53362742	IEF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	1-1-IMP-21/02/67	13-FEB-25
Digital Multimeter	33461A	MY53220076	EPL-IMP-20/02/67	15-FEB-25
Digital Multimeter	34461A	MY56024273	1-1-IMP-22/02/67	15-FEB-25
Programmable Attenuator	MAF-1070	62100114	IEF-0006-24	05-FEB-25
Condenser Microphone	A150	2971990	AA-IMP-01-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34566935	AA-IMP-01-24	05-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated from only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (NIM) (Thailand).
- 3.2 The National Institute of Scientific and Technological Research (NIST) (USA).

T. Pichan

Cert. No. : ACL24126
Job No. : VC67AC0079
Page : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

T. Pichan

Cert. No. : ACL24126
Job No. : VC67AC0079
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.99)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.1

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

Frequency Weighting	Measured Value (dB)
A-weight	11.6
C-weight	17.7
Flat	23.4

3. Acoustical signal tests of frequency weightings

Meter free field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.1	0.1	±1.5
1000	-0.1	0.0	0.0	±1.0
8000	0.8	0.9	0.9	±5.0

T. Pichan

Cert. No. : ACL24126
Job No. : VC67AC0079
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4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Imp	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

T. Pichan

Cert. No. : ACL24126
Job No. : VC67AC0079
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
26.0	26.0	0.0	±1.1
22.0	22.1	0.1	±1.1
20.0	20.1	0.1	±1.1
25.0	25.0	0.0	±1.1

T. Pichan

Cert. No. : ACL24126
Job No. : VC67AC0079
Page : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

T. Pichan

Cert. No. : ACL24127
Job No. : VC67AC0079
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.7	0.2	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calibration, assuming a level of confidence of approximately 95 %

End of Calibration Certificate

Cert. No. : ACL24127
Pages : 1 of 8

Calibration Certificate

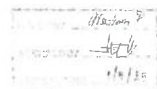
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52 / Microphone UC-52 / Pre-amplifier NI-24
Serial No. : 00371923 / 169109 / 72245
ID No. : NK1115005

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 HIATTUANAKAN 30, HIATTUANAKAN ROAD,
KIWAENG HIATTUANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 12 APRIL 2024
Calibration Date : 02-03 MAY 2024
Date of Issue : 06 MAY 2024



Calibrated by : Nattakorn Pinnapaisan

Approved by : *T. Petchurai*
(Thumkol Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Cert. No. : ACL24127
Job No. : VC67AC0079
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.
For test results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY480170056	EF-0809-4	05-FEB-25
Waveform Generator	31511B	MY52302742	1-0607-24	05-FEB-25
Digital Multimeter	3346A	MY53220104	1-11-10-21-06-07	13-FEB-25
Digital Multimeter	3346A	MY53220076	1-11-10-21-06-07	15-FEB-25
Digital Multimeter	3446A	MY60043273	FEL-02-22-02-07	15-FEB-25
Programmable Amplifier	KAT-1070	02100114	EF-0008-24	05-FEB-25
Condenser Microphone	4181	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-1001-24	05-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
3.2 Thailand Institute of Scientific and Technological Research (NSTR)

Cert. No. : ACL24127
Job No. : VC67AC0079
Pages : 3 of 8

Summary of Measurement Result.

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
5000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Time limit response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL24127
Job No. : VC67AC0079
Pages : 4 of 8

Result of Calibration.

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
11.5

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

Frequency Weighting	Measured value (dB)
A-weight	9.9
C-weight	16.3
Flat	22.2

3. Acoustical signal tests of frequency weightings

Near free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.5	0.5	±1.5
1000	-0.1	-0.1	-0.1	±1.0
5000	-2.1	-2.1	-2.1	±5.0

Cert. No. : ACL24127
Job No. : VC67AC0079
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
53	0.0	-0.1	-0.1	±2.0
125	0.0	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
5000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Imp	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

Cert. No. : ACL24127
 Job No. : VC67AC0079
 Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	132.9	-0.1	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	130.9	-0.1	± 1.1
129.0	129.0	0.0	± 1.1
128.0	128.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.1	0.1	± 1.1

g. Peth

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	± 1.1

9. Time burst response

Time Weighting	Time burst duration (s)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5; -5.0
	2	3	112.0	112.0	0.0	1.0; -2.5
	200	800	134.0	134.6	0.6	± 1.0
Slow	2	3	108.0	108.0	0.0	1.5; -5.0
	200	800	127.6	127.6	0.0	± 1.0
	0.25	1	99.0	98.9	-0.1	1.5; -5.0
SEL	2	3	108.0	108.0	0.0	1.0; -2.5
	200	800	128.0	128.0	0.0	± 1.0

10. Peak C sound level

Number of cycle in integral	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.6	0.6	± 3.0
One	136.4	136.1	-0.3	± 3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	± 2.0
Positive half cycle	135.4	135.1	-0.3	± 2.0
Negative half cycle	135.4	135.1	-0.3	± 2.0

g. Peth

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.5	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	± 0.2

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
 or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

g. Peth

CERTIFICATE OF CALIBRATION

ISSUED BY : Cirrus Research plc
 DATE OF ISSUE : 12 June 2024
 CERTIFICATE NUMBER : 216167

Cirrus Research plc
 Acoustic House
 Bridlington Road
 Hummerby
 North Yorkshire
 YO14 0PH
 United Kingdom

Page 1 of 2
 Approved signatory
 N. Smith
 Electronically signed

doseBadge Reader : IEC 60942:2003

Instrument Information

Manufacturer : Cirrus Research plc
 Model : RC 110A
 Serial number : 9546
 Class : 2

Notes:

Test summary

Date of calibration : 12 June 2024

The doseBadge reader detailed above has been calibrated to the published data as described in the operating manual and in the full-scale configuration. The procedures and techniques used are as described in IEC 60942:2003 Annex B - Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a VSP2 condenser microphone type MK 224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The doseBadge Reader has been shown to conform to the Class 2 requirements for periodic testing described in Annex B of IEC 60942:2003 for the sound pressure level and frequency only. No general statement or conclusion can be made about conformance of the doseBadge Reader to the requirements of IEC 60942:2003.

Notes:

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realized at the National Physical Laboratory or other recognized national metrology institutes. It is a certificate that may be used for legal purposes. It is not a statement of approval of the issuing laboratory. The results within the certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, giving a coverage probability of approximately 95 %.

CERTIFICATE OF CALIBRATION

Certificate Number : 216167
 Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test

Before : Pressure : 101.16 kPa Temperature : 21.8 °C Humidity : 44.6 %
 After : Pressure : 101.19 kPa Temperature : 21.9 °C Humidity : 44.6 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Kelby	2310	1003426
Acoustic Calibrator	Brüel and Kjaer	4231	2610257
Environmental Monitor	Comet	17510	21902628

Initial Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	113.52	113.53	113.51	113.52	-0.48	± 0.75	0.11 dB
Distortion (%)	< 4.00	0.43	0.43	0.43	0.43	0.43	± 4.00	0.13 %
Frequency (Hz)	1000.0	998.8	998.8	998.8	998.8	-1.2	± 200.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

Adjusted Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	114.01	114.00	113.98	114.00	0.00	± 0.75	0.11 dB
Distortion (%)	< 4.00	0.44	0.44	0.43	0.44	0.44	± 4.00	0.13 %
Frequency (Hz)	1000.0	998.8	998.8	998.8	998.8	-1.2	± 200.0	0.1 Hz

Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

End of results

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
 134/4 PRAKARADIN ROAD 501-18, SUKHUMVIT, SUKHUMVIT BANGKOK 10250
 TEL: 0 2717 3000-23 FAX: 0 2719 9484

IAC-MRA

DAC

Certificate of Calibration

Cert. No. : 24CH1295
 Page : 1 of 3

Equipment : pH Meter
 Manufacturer : Hach
 Model : HG111d
 Serial No. : 200100021163
 ID No. : BKG_EN0342
 Condition As-Received : Used item
 Received Date : 16 October 2024
 Calibration Date : 17 October 2024
 Reference : 2410-0548DSC-5
 Submitted by : ALS Laboratory Group (Thailand) Co. Ltd.
 104 Phatthanasak 40, Phatthanasak Rd.,
 Khwaeng Phatthanasak, Khet Suan Luang,
 Bangkok 10250 Thailand

Ambient Temperature : (25 ± 2.5) °C
 Relative Humidity : (50 ± 15) %
 Calibration Procedure : In-house method :
 - CP-CH5 by direct measurement with certified reference material (CRM)
 - CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lungsirakul
 Approved by : *Sathip*
 Approved Signatory

() Unnepphol Hirachai
 () Porpan Papiem
 (✓) Sathip Meangmal
 Issue Date : 21 October 2024

The Uncertainties are for a confidence probability of approximately 95 %
 This certificate may not be reproduced other than in full, except with the prior written approval of the holder of Corporate Services, J. Lungsirakul and Training Services



Certificate No. T240742

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Certificate of Calibration

Equipment : Digestion Unit
Manufacturer : SCP Science
Model : DigiPRER HT
Serial No. : HTCJ120480658
Customer Code : BKKE_EN0366
ID No. : T2635A5
Customer : A1S Laboratory Group (Thailand) Co.,Ltd.
184 Phatthanakun 40, Phatthanakun Rd., Khwaeng Phatthanakun,
Khet Suan 1 song, Bangkok 10350
Customer Location : Wet Chemistry Lab 1
Date of Receipt : 11 April 2024
Calibrated By : Sujjar Nakankred (Site Calibration Manager)
Approved By : / Boonchal Surlyawong (Site Calibration Manager)
Date of Issue : 02 MAY 2024

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

EN 45001:2018 3945:17



Certificate No. T240742

Page 2 of 5

Calibration Report

Equipment : Digestion Unit
Date of Calibration : 21 April 2024
Environment : Temperature : 23.9 - 26.3 °C
Line Voltage : 221.8 - 225.9 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

- This equipment was calibrated by insert four standard thermocouple type S into its chamber, the other one thermocouple type T use for ambient temperature measurement. The calibration was done in according to NIST 116 was based on ITS-90.
- Reference Standard Instrument :
Instrument Model Instrument No. Certificate No. Due Date
TC M26A2 (C1111-C1114) T230866 09 May 2024
DATA LOGGER 34970A T230866 09 May 2024
- This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NISC-FSI-1 IS 17025 CALIBRATION 0241)
- Condition of calibrated item : good
Equipment Description :
Time Constant : 1 Hour 6 Minute At 350 °C
Fresh Air Discharge : ☐ Open ☐ Min ☐ Medium ☐ Max
☒ Close
☒ Not Available
- Adjustment :
(X) without adjustment () after adjustment

Approved By :

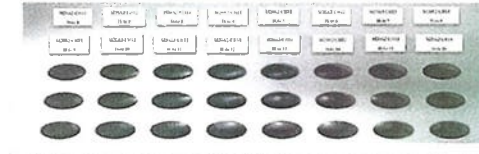
EN 45001:2018 3945:17



Certificate No. T240742

Page 3 of 5

Calibration Report



FRONT

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
				Reading	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature
300.0	300.0	319.2 - 319.5	Reading	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Max °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Min °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Average °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
				Reading	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature
300.0	300.0	319.2 - 319.5	Reading	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Max °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Min °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Average °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5

Approved By :

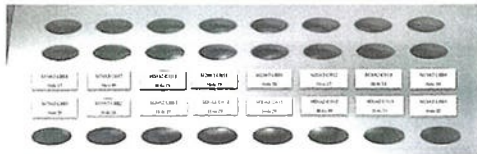
EN 45001:2018 3945:17



Certificate No. T240742

Page 4 of 5

Calibration Report



FRONT

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
				Reading	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature
300.0	300.0	319.2 - 319.5	Reading	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Max °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Min °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Average °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
				Reading	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature
300.0	300.0	319.2 - 319.5	Reading	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Max °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Min °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Average °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5

Approved By :

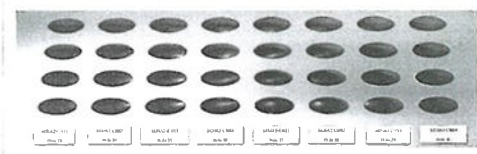
EN 45001:2018 3945:17



Certificate No. T240742

Page 5 of 5

Calibration Report



FRONT

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
				Reading	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature
300.0	300.0	319.2 - 319.5	Reading	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Max °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Min °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5
			Average °C	319.2	319.5	319.5	319.5	319.5	319.5	319.5	319.5

The expanded uncertainty of temperature measurement was ± 0.87 °C.

The calibration results apply only to the above calibrated items.

The result of test was found accurate as shown on date and place of test only.

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

Approved By :

EN 45001:2018 3945:17

Sartorius (Thailand) Co., Ltd.
120 Moo 8 Road, Bangkok, Bangkok, Bangkok 10110
Tel : +66 2 586 5109 E-mail : calibrate@scg.co.th



Certificate of Calibration
02/08/25

Model Number : M3745-100-01
Description : Analytical Balance
Serial Number : 022149555
ID No. : 001-10000
Manufacturer : Sartorius
Customer Name : A1S Laboratory Group (Thailand) Co., Ltd.
184 Phatthanakun 40, Phatthanakun Rd., Khwaeng Phatthanakun, Khet Suan 1 song, Bangkok 10350
Calibrated Place : Lab Room

Calibrated By : Boonchal Surlyawong
Calibration Date : Friday, August 02, 2024

Calibration Procedure No. : This calibration was conducted by following the calibration procedure number SC-0002, based on ISO 15:2019

Atmospheric data : Capacity : 220 g Readability : 0.0001 g Temperature : 23.8 °C ± 0.5 °C Humidity : 55.0 % RH ± 10.0 % RH Pressure : 1013.25 hPa ± 0.1 hPa

Measurement Method : UKAS Publication Ref:Lab 14

The measurement uncertainty stated in the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor k=2 in provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which are the basis of measurement according to the International System of Units (SI). Report of Uncertainty comes from the SI of Sartorius Metrological Specifications.

Traceability : Model Number : YC011-522-00 Description : Sartorius weight set (kg) 500g E20101-522-00
Serial Number : 022149555
Manufacturer : Sartorius

This certificate is valid for 12 months only. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center (Thailand) Co., Ltd.

Approved By :

EN 45001:2018 3945:17

Certificate of Calibration

Model Number: M52245-100-02
Description: Analytical Balance
Serial Number: 0027405555
ID No: BOC-140001
Manufacturer: Sartorius
Certificate No: 249301/0
Issued Date: Monday, August 05, 2024
Reference No.: 249343
Page No.: 2 of 2

Calibration Results : Without Adjustment

Repeatability				Eccentricity (Off-center loading error)			
The repeatability is the ability of a weighing instrument to display nearly identical values, despite the conditions when the same load within a measurement range is placed repeatedly on the weighing pan or the load measure. The standard deviation is used to express repeatability quantitatively.				The off-center loading error is defined by the difference between the result of the load on the left of the pan and the result of the load on the right of the pan. The standard deviation is used to express the error quantitatively.			
Nominal Value	20.0000	200.0000		Nominal value	100	g	
20 g	20.0000	199.9999		Tolerance	0.0004	g	
Tolerance	0.0001	0.0001					
200 g	200.0000	200.0000					
2000 g	2000.0000	2000.0000					
20000 g	20000.0000	20000.0000					
200000 g	200000.0000	200000.0000					
2000000 g	2000000.0000	2000000.0000					
Standard deviation	0.00001	0.00001					

SOP 18.13.10.15.2012.2022

Certificate No. T240994

Page 1 of 3

Certificate of Calibration

Equipment : Chamber (Oven)
Manufacturer : Memmert
Model : UF 450
Serial No. : D1717.0531
Customer Code : DKK_EN0273
ID No. : T8042A4
Customer : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd., Khwaeng Phatthanasak,
Khet Suan Luang, Bangkok 10250
Customer Location : Laboratory (Oven Room)
Date of Receipt : 08 May 2024
Calibrated By : Preecha Pissasathitkul (Temperature Calibration Manager)
Approved By : / Nuanfun Sunghum (Metrology Manager)
Date of Issue : 23 MAY 2024

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

FM L1411018-08-66

Certificate No. T240994

Page 2 of 3

Calibration Report

Equipment : Chamber (Oven)
Date of Calibration : 14 May 2024
Environment : Temperature : 26.5-28.1 °C
Line Voltage : 226.7-229.8 V
Relative Humidity : 51 - 57 %RH

Condition of this results of calibration :

- This equipment was calibrated by insert nine resistance thermometer detectors into its chamber, the other one resistance thermometer detector was for ambient temperature measurement. The calibration was done in accordance to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986). All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS-90.
- Reference Standard Instrument :
Instrument Model Instrument No. Certificate No. Due Date
RTD 100 ohm T231955 T231955 17 November 2024
DATA LOGGER 34970A T121 T231955 17 November 2024
- This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS-TIS 17025 CALIBRATION 0244)
- Condition of calibrated item : good
Equipment Description :
Time Constant 1 Hour 30 Minute At 104 °C
Fresh Air Dumper ☐ Open ☐ Min ☐ Medium ☐ Max
☒ Close
☒ Not Available
- Adjustment :
(X) without adjustment () after adjustment

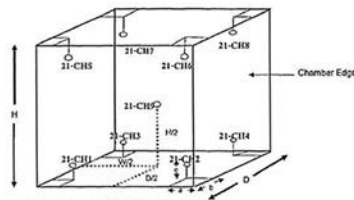
Approved By: /

FM L151018-08-66

Certificate No. T240994

Page 3 of 3

Calibration Report



Remark :

Internal Dimensions of Chamber : W (width) = 104 cm, H (height) = 72 cm, and D (depth) = 60 cm.
Size of installed Standard sensor number 21-CH16 : a = 5 cm, b = 5 cm, and c = 5 cm.
Size of installed Standard sensor number 21-CH9 : W/2 = 104 cm/2, H/2 = 72 cm/2 and D/2 = 60 cm/2

Measurement Results

Average Standard Reading at each position (°C)									
Calibration Point	21-CH1	21-CH2	21-CH3	21-CH4	21-CH5	21-CH6	21-CH7	21-CH8	21-CH9
104	103.4	103.0	103.7	103.8	103.3	104.5	103.3	104.0	103.9
150	149.2	151.4	149.2	149.5	149.6	151.3	149.8	149.9	150.2

Chamber (Oven)		Temperature Distribution					
Setting (°C)	Reading (°C)	Average (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)	Coverage Factor	
104.0	103.9, 104.1	104.0	103.55	0.14	1.27	0.44	2.00
150.0	149.9, 150.1	150.0	149.94	0.30	2.29	0.76	2.00

* The quoted uncertainty exclude "linearity"

The calibration result apply only to the above calibrated items.

The results of this report are accurate as shown on date and place of test only.

The expanded expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a probability, providing level of confidence of approximately 95 %.

End of Certificate

Approved By: /

FM L151018-08-66

Certificate of Calibration

Equipment : CONDUCTIVITY METER
Model : ORION STAR A215
Serial No. (or ID) : X56031
Manufacturer : Thermo Scientific
Electrode Serial No. : YV1-18416
Concusion : In Condition
Certificate No. : C2423092
Issued Date : 25 December 2023
Job No. : YVO-00012652
Page : 1 of 2
Model : ORION 013005M2 Brand : Thermo Scientific
Customer : ALS Laboratory Group (Thailand) Co., Ltd.
104 Sok Pattanasak 40, Pattanasak Rd.,
Suan Luang, Bangkok 10250 Thailand
Environment Condition : Temperature 21.7 °C ± 0.1 °C
Humidity 53.7 %RH ± 0.1 %RH
Calibration Place : ALS Laboratory Group (Thailand) Co., Ltd. (Wei Chemistry Lab 2)
104 Sok Pattanasak 40, Pattanasak Rd.,
Suan Luang, Bangkok 10250 Thailand
Calibration By : Mr. Sirinjan Sirjan
Calibration Date : 25 December 2023
The Method used : In house method, CAL-V0-43, based on ASTM D 1125-14 and D 5391-14
Traceability : This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 890590, 890591, 890592

Signature
(Mr. Sirinjan Sirjan)

Signature
(Mr. Sirinjan Sirjan)

This certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

Delivering Growth - In Asia and Beyond.

CAL-V0-43-01-12 Sep 2022

Calibration Results:

Before Adjustment				
Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading			
84.000 µS/cm	82.64 µS/cm	-0.640 µS/cm	2.00	0.68 µS/cm
1413.0 µS/cm	1423 µS/cm	+10.0 µS/cm	2.00	11 µS/cm
12.800 mS/cm	12.61 mS/cm	-0.070 mS/cm	2.00	0.10 mS/cm

After Adjustment : at 84.0 µS/cm, 1413 µS/cm, 12.80 mS/cm

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading			
84.000 µS/cm	84.03 µS/cm	+0.030 µS/cm	2.00	0.68 µS/cm
1413.0 µS/cm	1414 µS/cm	+1.0 µS/cm	2.00	11 µS/cm
12.800 mS/cm	12.86 mS/cm	+0.070 mS/cm	2.00	0.09 mS/cm

The End of Certificate

Delivering Growth - In Asia and Beyond.

CAL-V0-43-01-12 Sep 2022

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม



บริษัทในเครือ WO-0012682
ชนิดเครื่องวัด: CONDUCTIVITY METER รุ่น: ORION STAR A215 หมายเลขเครื่อง: JC5031

รายการ (No.)	รายการตรวจ	ผลการตรวจ (OK)	หมายเหตุ
ผ่าน	ไม่ผ่าน	ผ่าน	ไม่ผ่าน
General			
1	ความถูกต้อง (Accuracy)	OK	
2	ความละเอียด (Resolution) และช่วงการวัด (Range)	OK	
3	สวิตช์ On - Off (On/Off)	OK	
4	ปุ่ม (Buttons)	OK	
5	หน้าจอ (Display, Screen Contrast)	OK	
Specific parameters			
6	แหล่งจ่ายไฟ (Battery Backup) >= 2.5 VDC	OK	
7	ช่วงความยาวคลื่น (Wavelength Control)	OK	
8	ความยาวคลื่น (Wavelength Check)	OK	
9	เวลาการวัด (Vial < 3,000 hour)	OK	
10	เวลาการวัด (Vial < 3,000 hour)	OK	
11	ช่องใส่ตัวอย่าง (Cartridge Module)	OK	
pH Meter and Conductivity Meter			
12	อิเล็กโทรด (Electrode and Connection Cable)	OK	
13	อิเล็กโทรดแบบ Electrode (Level KCl)	OK	
14	อิเล็กโทรดแบบ Electrode (Dust Protection Hood)	OK	
15	การเชื่อมต่อ (Stand)	OK	
Turbidimeter			
16	ตัวอย่างน้ำ (The Sample)	OK	
17	การวัดความขุ่น (Turbidity) >= 2.5 NTU (3.0)	OK	
Automatic Diluter			
18	การวัดปริมาณ (Automatic Dilution)	OK	
19	Function Setting and Display	OK	
20	การสอบเทียบ (Calibration)	OK	

ผู้ตรวจสอบ: Mr. Suvaporn Sran Service Engineer

SCG Metrology Services Company Limited
33/2 Moo 3, T. Banpa, A. Kaengkhoh, Saraburi 18110, Thailand
Bangkok Tel: +66 8227 3096 Fax: +66 8247 2360
Website: www.scieco.co.th E-Mail: calibrate@scg.com

CAL 118-01-10 Jan 2022



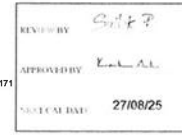
TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 19, SUKUMVIT, SUKHUMVIT BANGKOK 10250
TEL 0-2717-3000-29 FAX 0-2718-9484



Certificate of Calibration

Cert.No.: 24CG952
Page: 1 of 2

Equipment: Burette
Capacity: 50 mL
Serial No.:
ID No.: BKK_EN0171
Manufacturer: Witeg
Made In: Germany
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan Rd.,
Khuang Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Ambient Temperature: (20 ± 2.5) °C
Relative Humidity: (50 ± 10) %
Barometric Pressure: 760 mmHg
Calibration Procedure: ASTM E 642 - 01
Calibrated by: Natcha Chayyingsichew
Approved by: S. S. S.
() Unnophol Hanchai
(✓) Sinsuda Khamsa
() Sa-ngenkan Wongso
Issue Date: 27 February 2024



The Uncertainties are for a confidence probability of approximately 95 %
This certificate may not be reproduced or used in full, except with the prior written
Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services



Equipment: Burette
Received Date: 23 February 2024
Condition As Received: New Item
Calibration Date: 27 February 2024
Reference: 2402-0757-DSC-1

Cert.No.: 24CG952
Page: 2 of 2

Condition of this result of calibration

- Reference Standard Instruments:

Instruments	Model	Serial No.	ID No.	Certificate No.	Traceability	Due date
1) Balance	XP205DR	1126143764	1408C004	2388M538	TPA	15 Sep 2024
2) Thermo-Hygrometer	TH04-CE	000118140	1408C001	23841755	TPA	08 June 2024
3) Thermometer	-	0654181	1408C005	23849	TPA	10 Aug 2024
- This certificate is valid only to the item calibrated on date and place of calibration.
- True value is converted to true volume at the standard temperature of 20 °C

Calibration result:

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
50	50.0032	0.010	2.00

Remark: mL = cm³

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



Metrology
SCI ECO Services Company Limited
33/2 Moo 3, T. Banpa, A. Kaengkhoh, Saraburi 18110, Thailand
Saraburi Tel: +66 3627 3096 Fax: +66 3627 3100
Bangkok Tel: +66 8225 6851, +66 8247 2360
Website: www.scieco.co.th E-Mail: calibrate@scg.com

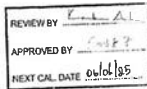


Certificate No. T232160

Page 1 of 4

Certificate of Calibration

Equipment: Chamber (Cooling Room)
Manufacturer: KOLDTECH
Model: KM 320
Serial No.: TBN-1012061/05
Customer Code: BKK_EN0167
ID No.: T2463A3
Customer: ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250
Customer Location: Laboratory
Date of Receipt: 29 November 2023
Calibrated By: Atiphong Rongrat (Technician)
Approved By: S. S. S. / Boonchai Suriyavong (Site Calibration Manager)
Date of Issue: 03 JAN 2024



The uncertainties are for a confidence probability of approximately 95 %.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

TN 5.1.1 118-13-06-66



Metrology
SCI ECO Services Company Limited
33/2 Moo 3, T. Banpa, A. Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T232160

Page 2 of 4

Calibration Report

Equipment: Chamber (Cooling Room)
Date of Calibration: 6 December 2023
Environment: Temperature: 23.4-24.9 °C
Line Voltage: 221.4-230.2 V
Relative Humidity: 55 - 65 %RH

Condition of this results of calibration:

- The equipment was calibrated by inserting 16 standard thermocouples type T into its chamber, the other one standard thermocouple type T was for ambient temperature measurement. The calibration was done in accordance with W1-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986). All data shown below were final values and the initial data from customer request. The temperature scale used was based on ITS-90.
- Reference Standard Instrument:

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T230773	10 April 2024
TC	TYPE T	TN171-TN180	T230773	10 April 2024
DATA LOGGER	34570A	T140	T230773	10 April 2024
- This certificate is traceable to:
National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244)
- Condition of calibrated item: good
Equipment Description:
Time Constant: 1 Hour 30 Minute At 3 °C
Fresh Air Draper: ☒ Open ☐ In ☐ Medium ☐ Max
☐ Close
☒ Not Available
- Adjustment: (X) without adjustment () after adjustment

Approved By: S. S. S.

FN L15 118-13-06-66



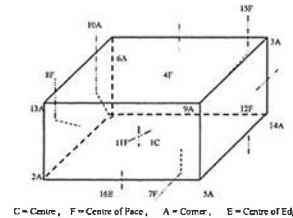
Metrology
SCI ECO Services Company Limited
33/2 Moo 3, T. Banpa, A. Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T232160

Page 3 of 4

Calibration Report



1C = TN161	12F = TN177
2A = TN162	13A = TN173
3A = TN163	14A = TN174
4F = TN164	15F = TN175
5A = TN165	16B = TN176
6A = TN166	
7F = TN167	
8F = TN168	
9A = TN169	
10A = TN170	
11F = TN171	

Approved By: S. S. S.

FN 5.1.1 118-13-06-66



Certificate No. T23160

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN171	TN172
3.0	2.83	3.34	2.95	3.46	3.45	2.76	3.25	3.46	3.38	3.58
	TN173	TN174	TN175	TN176						
	3.33	3.39	3.15	3.45						

Chamber (Cooking Room)			Temperature Distribution					
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k	
	Min	Max						
3.0	3.8	4.1	3.5	3.36	1.10	2.00	1.99	2.09

The calibration result apply only the above calibrated item.
The result of test was found accurate as shown on date and place of test only.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k, which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By:

TN-4.15 15151-06-66



Cert.No.: 23TW243
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-230V
Serial No. : 05J101147
ID No. : BKK_EN0017
Received Date : 15 November 2023
Test Date : 16 November 2023
Reference : 2311-0505DSC-4
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
In-house method : CIP-CH3
by Comparison Technique with Aulde Modification Method

Tested by : Watatani, Sirithan

Approved by :
Approved Signatory

() Sathip Meengmai
() Wanwan Lemgajakul
() Pongpan Pajipim

Issue Date : 17 November 2023

B 0326589



Cert.No.: 23TW243
Page: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :
This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan)

Instrument	Serial No.	ID No.	Certificate No.	Due Date
1) Buette	-	130BU10	23CG1172	22 Mar 2025
2) Balance	1124013302	140RC006	23MM18	20 Feb 2024

Material	Manufacturer	Lot No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No. : 16K100498

Titration Method (Aside Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.18	8.18	0.0055

This report was certified only for the instrument we tested it is allowable to use for study the system efficiency. The environmental impact control and present in organization it may concerned intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full without written approval of the laboratory.

-000-

a 1150297



Cert. No.: 23LM192
Page: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5000-230V
Serial No. : 05J101147
ID No. : BKK_EN0017
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Location : TPA Chemistry Calibration Laboratory
Received Order : 15 November 2023
Calibrated Date : 16 November 2023
Ambient Temperature : (25 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Kunchit Prompim
Approved by :
() Pongpan Pajipim
() Wanwan Lemgajakul
() Sathip Meengmai
() Pongpan Pajipim
() Sathip Meengmai
Issue Date : 17 November 2023

The uncertainties are for a confidence probability of approximately 95%
Percent uncertainty may not be reproduced other than in full compliance with the present version
Approved by the head of Corporate Services 3: Equipment Calibration and Testing Services

A 0060730



Equipment : DO Meter with Sensor
Condition As Received : Used Item
Reference : 2311-0505DSC-10
Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-
(Instrument) Serial No. Cert. No. Traceable Due Date
1) Digital Thermometer 3240076 234305 TPA 15 Mar 2024
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.
Remark : TPA: Technology Promotion Association (Thailand - Japan)
Result of Calibration :- (°C) Without Adjustment
Function : Temperature measurement.

This instrument was connected with temperature sensor, SN: 16K100498						
Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	60	19.997	19.93	-0.067	0.15	2.00

UUC: Unit Under Calibration

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

-000-

a 1150298



Certificate No.: 24T2852
Reference No.: 72409-A

PAGE: 1 OF 2

Certificate of Calibration

EQUIPMENT : COOLED INCUBATOR
MANUFACTURER : MEMBERT
MODEL : KP730
SERIAL No. : FK19-0021
ID No. : BKK_EN0104
CONDITION AS RECEIVED : UNDEFIEM
SUBMITTED BY : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN 40, PHATTANAKAN RD.,
KHWAENG PHATTANAKAN, KHEU SUAN LUANG, BANGKOK 10250, THAILAND

CALIBRATED BY : CHAKHARN CHIL
CALIBRATION DATE : 20-Mar-24

APPROVED BY :
ISSUED DATE : 21-Mar-24
RECEIVED DATE : 20-Mar-24

THIS CERTIFICATE MAY NOT BE REPRODUCED OR OTHER THAN IN FULL COMPLIANCE WITH THE PRESENT WRITTEN APPROVAL OF QUALITY CALIBRATION CO., LTD.

8-001516-1-03

FIG. 1.13. *Emydoidea blandingi*. 9

Bara Scientific Co., Ltd. 908 U Chu Liang Building Floor 7 Namut Road Sam Bangkang Bangkok Thailand 10250 Tel : 02-6374300 Fax : 02-6374366-7 www.barscientific.co.th

Certificate of Calibration

Certificate No. BSCC-LV-37424 Number of Page(s) 1 of 3

Equipment: UV/VIS Spectrophotometer Model: UV-1600 Manufacturer: Shimadzu Serial No.: A11454905333 CD ID No.: B0X_EH0018 Date of receipt: 13 September 2024 Date of calibration: 13 September 2024 Date of issue: 13 SEP 2024

Customer name: ALS Laboratory Group (Thailand) Co., Ltd. Address: 104 Soi Phatnanakan 40, Phatnanakan Road, Phatnanakan, Sam Luang, Bangkok 10250

Temperature: (25.3 ± 26.7) °C (On site) Humidity: (50.4 ± 55.9) %RH (On site)

Equipment condition: Good Operation Calibration Location: Organic Preparation Lab Calibration Procedure: In-house method: W1 UV-702-01 based on ASTM E275-01

Traceability: Wavelength Accuracy is traceable to certificate No. 106372 and 106371 Photometric Accuracy is traceable to certificate No. 106368 and 111309 Stray Light is traceable to certificate No. 106377 The above certificates are traceable to SI unit through Sigma Scientific Ltd. (UKAS accredited calibration laboratory NO. 0659)

Calibrated by: Mr Wanchana Janjany

Approved by: Mr. Sontti Tambonakul Service Manager

The above results are valid exclusively for the calibrated item(s) as mentioned in this report / certificate. Any further use of the report / Certificate and validity of the results are not valid and shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.

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Certificate of Calibration

Certificate No. BSCC-LV-37424 Number of Page(s) 2 of 3

Calibration Results:

1. Wavelength Accuracy

Calibrated Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (nm)
243.75	241.55	-0.15	0.15
334.02	333.65	-0.17	0.16
416.43	416.57	0.04	0.15
572.08	572.97	-0.32	0.18
879.41	879.12	-0.24	0.15

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (A)
235	0.0000	0.0000	0.0000	0.0075
257	0.0000	0.0000	0.0000	0.0075
313	0.0000	0.0000	0.0000	0.0075
350	0.0000	0.0000	0.0000	0.0075

*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mentioned in this report / certificate. Any further use of the report / Certificate and validity of the results are not valid and shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.

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Certificate of Calibration

Certificate No. BSCC-LV-37424 Number of Page(s) 3 of 3

Calibration Results:

2. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (A)
420.0	0.0000	0.0000	0.0000	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
460.0	0.0000	0.0000	0.0000	0.0042
480.0	0.0000	0.0000	0.0000	0.0042
500.0	0.0000	0.0000	0.0000	0.0042
520.0	0.0000	0.0000	0.0000	0.0042
540.0	0.0000	0.0000	0.0000	0.0042
560.0	0.0000	0.0000	0.0000	0.0042
580.0	0.0000	0.0000	0.0000	0.0042
600.0	0.0000	0.0000	0.0000	0.0042
620.0	0.0000	0.0000	0.0000	0.0042
640.0	0.0000	0.0000	0.0000	0.0042
660.0	0.0000	0.0000	0.0000	0.0042
680.0	0.0000	0.0000	0.0000	0.0042
700.0	0.0000	0.0000	0.0000	0.0042
720.0	0.0000	0.0000	0.0000	0.0042
740.0	0.0000	0.0000	0.0000	0.0042
760.0	0.0000	0.0000	0.0000	0.0042
780.0	0.0000	0.0000	0.0000	0.0042
800.0	0.0000	0.0000	0.0000	0.0042
820.0	0.0000	0.0000	0.0000	0.0042
840.0	0.0000	0.0000	0.0000	0.0042
860.0	0.0000	0.0000	0.0000	0.0042
880.0	0.0000	0.0000	0.0000	0.0042
900.0	0.0000	0.0000	0.0000	0.0042

*CNR = Customer not request

4. Stray Light

Standard cut-off wavelength (nm)	Wavelength (nm)	Transmission (%)	Absorbance (A)
220.85±0.1 nm	199.58	0.9520	2.0217

The stray light transmission reference is less than 1.0% and stray light absorbance reference is greater than 2.00A. Stray Light met ISO-9000 Accredited.

The above results are valid exclusively for the calibrated item(s) as mentioned in this report / certificate. Any further use of the report / Certificate and validity of the results are not valid and shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN) CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES 5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250 TEL 0-2717-3000-29 FAX 0-2718-9494

Certificate of Calibration

Cert.No.: 24CH332 Page: 1 of 3

Equipment: pH Meter Manufacturer: Mettler Toledo Model: SevenGo Go S2 Serial No.: B829137069 ID No.: NNG_F50002 Condition As-Received: Used Item Received Date: 15 March 2024 Calibration Date: 18 March 2024 Reference: 2403-05180SC-1 Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. 104 Phatnanakan 40, Phatnanakan Rd., Nwaeng Phatnanakan, Khwa Sam Luang, Bangkok 10250 Thailand

Ambient Temperature: (25 ± 2.5) °C Relative Humidity: (50 ± 15) % In-house method: CP-CHS by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM) CP-CHS by comparison with temperature standard

Calibrated by: Wanchana Janjany Approved by: Sontti Tambonakul Approved Signature

1. Penthappa Tanayakul 1. Unnaphol Harnchai 1. Sontti Tambonakul

Issue Date: 19 March 2024

The uncertainties are for a confidence probability of approximately 95%.

This certificate may not be reproduced or used in full, except with the prior written approval of the Bara Scientific Co., Ltd. Equipment Calibration and Testing Services

Certificate of Calibration

Cert.No.: 24CH332 Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Exp. Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23E0808	26 July 2024

The certification is traceable to the International System of Unit maintained through Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials

The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.996	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

Calibration Results

Function: mV Measurement

Performing standard curve by Document Process Calibrator at pH (4.7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement	Coverage factor	
pH Meter	pH	mV	mV	pH	k	
	4.00	177.48	178	4.00	0.56	2.00
	7.00	0.00	0	7.00	0.56	2.00
S/N: B829137069	10.00	-177.48	-177	10.00	0.56	2.00

Certificate of Calibration

Cert.No.: 24CH332 Page: 3 of 3

Calibration Results

Function: pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (A)	Coverage factor k
pH Electrode	4.008	4.02	183	0.0005	2.05
	6.996	6.99	7	0.0003	2.00
	9.997	10.00	-170	0.0002	2.00

Function: Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model: InLabExpert Go-ISM

- Serial No.: 3083003

Dimension of probe

- Length: 120 mm

- Diameter: 12 mm

- Immersion Depth: 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.000	24.9	-0.100	0.13	2.00
45.0	45.001	45.0	-0.001	0.13	2.00

Remark: - UUC = Unit Under Calibration

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

Agilent CrossLab Start Up Services

Agilent 5100 5110 ICP-OES
Preventive Maintenance

REVIEW BY	DATE
APPROVED BY	DATE
TEST DATE	21/01/2022

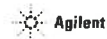
Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your system operating at their peak performance.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

Revision A.01, issued 21 Jan 2022
Document Number: 59814-0037
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Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for regular maintenance and to choose Agilent to perform the service when necessary.
- Any parts not included in the Parts List section of the document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.
- For customers using ICP applications, the instrument should be installed in its standard sample introduction system.

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Important Customer Web Links

- To access Agilent University visit <http://www.agilent.com/university> to learn about training options which include online, classroom and on-site delivery. A learning specialist can work directly with you to help determine your best options.
- To access the Agilent Resource Center web page, visit <http://www.agilent.com/resources>. The following information topics are available:
 - Sample Prep and Containment
 - Chemical Standards
 - Analysis
 - Service and Support
 - Application Workflows
- The Agilent Community is an excellent place to get answers, collaborate with others about applications and Agilent products, and find relevant documents and videos relevant to Agilent technologies. Visit <http://community.agilent.com>.
- Videos about specific preparation requirements for your instrument can be found by searching the Agilent YouTube channel at <http://www.youtube.com/user/agilent>.
- Need to place a service call? Possible to call Agilent.

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Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Service not applicable" check boxes to indicate services/tasks not performed, as applicable.
- Complete the Preventive Maintenance services in the order logically relevant to the individual system service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page.
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Completion section.
- Ask the customer to sign the Service Verification section including the customer's and your signature.

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Instrument Maintenance

System Information

- Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID	
AS Laboratory Chem. Analysis Config.	
Instrument System Site and Location	
AS Laboratory Chem. Analysis Config.	
List System Component Product Number	List the digital hardware of each component
1. AS 5100	AS 5100 5110
2. AS 5100 5110	AS 5100 5110
3. AS 5100 5110	AS 5100 5110
4. AS 5100 5110	AS 5100 5110
5. AS 5100 5110	AS 5100 5110
6. AS 5100 5110	AS 5100 5110
7. AS 5100 5110	AS 5100 5110
8. AS 5100 5110	AS 5100 5110
9. AS 5100 5110	AS 5100 5110

ICP-OES Configuration Table	Circle the type or write in the type if other
Instrument Type	Aspirator / Gravimetric / Dual View / Other
Sample Introduction	Gravimetric / Single Phase / Cyclonic / Dual Phase / Other
Pump	Aspirator / Dual View / Other
Reactor Type	One / Two / Three / Four / Five / Six / Seven / Eight / Nine / Ten / Eleven / Twelve / Thirteen / Fourteen / Fifteen / Sixteen / Seventeen / Eighteen / Nineteen / Twenty / Other
Optical Detector	2 / 4 / 6 / 8 / 10 / 12 / 14 / 16 / 18 / 20 / Other
Control Method	AS 5100 5110 / Other

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Preparation

- Discuss any specific issues with the customer before starting.
- Review the instrument logbook for needed problems and comments.
- Save instrument control settings before starting the procedure.
- Perform a general inspection of the system for cleanliness.
- Check for proper installation of parts, assemblies, sensors, etc.
- Check system for required installation of components and implementation of Service Notes.
- Check for required firmware/software updates and verify with customers if they would like them installed.
- For ICP applications systems, if a standard sample introduction system was not installed, ask the customer to install it.
- Ask the customer to remove any samples from the ICP-OES sample introduction area, auto sampler or around the ICP-OES.

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Consumed PM Parts

Part Description	Part Number	Product or Model# where used	Quantity consumed
Analysis Data Interface	66101-60014	220124, 66101-60014, 66101-60014	1
Installation Package	66101-60015	AI	1
Agilent ECO (Clear Label) Part	17941-112	Agilent ECO (Clear Label) Part	1
Purge Gas Filter	01013-60115	AI	1
Air Inlet Filter	01013-60115	AI	1
High Capacity Air Filter	01016-01015	AI	1
Replacement for 2 ports valve for AI	06416-60012	66101-60015	1
Replacement for 4 ports valve for AI	06416-60012	66101-60015	1
Replacement for 6 ports valve for AI	06416-60012	66101-60015	1
Replacement for 8 ports valve for AI	06416-60012	66101-60015	1
Replacement for 10 ports valve for AI	06416-60012	66101-60015	1
Replacement for 12 ports valve for AI	06416-60012	66101-60015	1
Replacement for 14 ports valve for AI	06416-60012	66101-60015	1
Replacement for 16 ports valve for AI	06416-60012	66101-60015	1
Replacement for 18 ports valve for AI	06416-60012	66101-60015	1
Replacement for 20 ports valve for AI	06416-60012	66101-60015	1
Replacement for 22 ports valve for AI	06416-60012	66101-60015	1
Replacement for 24 ports valve for AI	06416-60012	66101-60015	1
Replacement for 26 ports valve for AI	06416-60012	66101-60015	1
Replacement for 28 ports valve for AI	06416-60012	66101-60015	1
Replacement for 30 ports valve for AI	06416-60012	66101-60015	1
Replacement for 32 ports valve for AI	06416-60012	66101-60015	1
Replacement for 34 ports valve for AI	06416-60012	66101-60015	1
Replacement for 36 ports valve for AI	06416-60012	66101-60015	1
Replacement for 38 ports valve for AI	06416-60012	66101-60015	1
Replacement for 40 ports valve for AI	06416-60012	66101-60015	1
Replacement for 42 ports valve for AI	06416-60012	66101-60015	1
Replacement for 44 ports valve for AI	06416-60012	66101-60015	1
Replacement for 46 ports valve for AI	06416-60012	66101-60015	1
Replacement for 48 ports valve for AI	06416-60012	66101-60015	1
Replacement for 50 ports valve for AI	06416-60012	66101-60015	1
Replacement for 52 ports valve for AI	06416-60012	66101-60015	1
Replacement for 54 ports valve for AI	06416-60012	66101-60015	1
Replacement for 56 ports valve for AI	06416-60012	66101-60015	1
Replacement for 58 ports valve for AI	06416-60012	66101-60015	1
Replacement for 60 ports valve for AI	06416-60012	66101-60015	1
Replacement for 62 ports valve for AI	06416-60012	66101-60015	1
Replacement for 64 ports valve for AI	06416-60012	66101-60015	1
Replacement for 66 ports valve for AI	06416-60012	66101-60015	1
Replacement for 68 ports valve for AI	06416-60012	66101-60015	1
Replacement for 70 ports valve for AI	06416-60012	66101-60015	1
Replacement for 72 ports valve for AI	06416-60012	66101-60015	1
Replacement for 74 ports valve for AI	06416-60012	66101-60015	1
Replacement for 76 ports valve for AI	06416-60012	66101-60015	1
Replacement for 78 ports valve for AI	06416-60012	66101-60015	1
Replacement for 80 ports valve for AI	06416-60012	66101-60015	1
Replacement for 82 ports valve for AI	06416-60012	66101-60015	1
Replacement for 84 ports valve for AI	06416-60012	66101-60015	1
Replacement for 86 ports valve for AI	06416-60012	66101-60015	1
Replacement for 88 ports valve for AI	06416-60012	66101-60015	1
Replacement for 90 ports valve for AI	06416-60012	66101-60015	1
Replacement for 92 ports valve for AI	06416-60012	66101-60015	1
Replacement for 94 ports valve for AI	06416-60012	66101-60015	1
Replacement for 96 ports valve for AI	06416-60012	66101-60015	1
Replacement for 98 ports valve for AI	06416-60012	66101-60015	1
Replacement for 100 ports valve for AI	06416-60012	66101-60015	1

Consumed Parts Reference
(Purchased by customer, not included as part of PM)

Section Not Applicable

Part Description	Part Number	Product or Model# where used	Quantity consumed
------------------	-------------	------------------------------	-------------------

Revision A1, 11/18/2011, January 2012
Revision A2, 11/18/2011, January 2012
Revision A3, 11/18/2011, January 2012

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Signature Page

Service Engineer Comments (optional)

If there are any specific events you wish to note as part of performing the installed on or other items requested for the customer, please write in this box.

Service Verification

Service Engineer Name: Mr. S. S. S. S.
Service Engineer Title: Service Engineer
Customer Name: ALS Laboratory Group (Thailand) Co., Ltd.
Customer Signature: [Signature]
Total number of pages in this document: 16

Revision A1, 11/18/2011, January 2012
Revision A2, 11/18/2011, January 2012
Revision A3, 11/18/2011, January 2012

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Certificate No. T231676

Page 1 of 6

Certificate of Calibration

Equipment : HEATING BLOCK

Manufacturer : Environmental Express

Model : SC 196

Serial No. : 6974CECW3285

Customer Code : BKK_EL0054

ID No. : T5306A3

Customer : ALS Laboratory Group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phatthanakan, Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Acid Digestion Lab

Date of Receipt : 13 September 2023

Calibrated By : Saneek Musikanan (Site Calibration Manager)

Approved By : [Signature] / Sujjar Nakiakred (Site Calibration Manager)

Date of Issue : 20 SEP 2023

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its suitability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center

T231676-01-07

Certificate No. T231676

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Calibration Report

Equipment : HEATING BLOCK
Date of Calibration : 22 September 2023
Environment : Temperature : 21.8-23.1 °C
Line Voltage : 221.6-226.3 V
Relative Humidity : 55-65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by meet 20 standard thermocouples type T into its chamber, the other are standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20.

All data show below were final values and the in at data from customer request. The temperature scale used was based on ITS-90.

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN21-TN30	T230014	17 January 2024
TC	TYPE T	TN31-TN40	T230014	17 January 2024
DATA LOGGER	3499A	T151	T230014	17 January 2024

3. This certificate is in compliance to :
National Institute of Metrology (Thailand) through Metrological Center (PRT-151-TIS-TIS 1725 CALIBRATION 0241)

4. Condition of calibrated item : good

Environment Description :
Time Constant : 3 Hour 20 Minute At 95 °C
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☒ Close
☒ Not Available

5. Adjustment :
() without adjustment (X) after adjustment

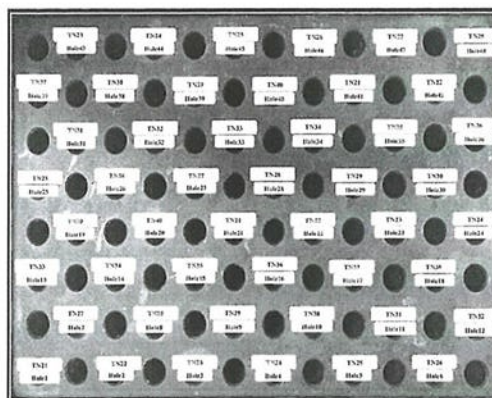
Approved By: [Signature]

T231676-01-07-02

Certificate No. T231676

Page 3 of 6

Calibration Report



FRONT CONTROL

Approved By: [Signature]

T231676-01-07-03

Certificate No. T231676

Page 4 of 6

Calibration Report

Measurement Results		Average Standard Reading at each position (°C)									
Calibration Point		TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28	TN29	TN30
R1 Hole1-Hole6	Max	95.80	94.44	95.29	95.41	94.51	95.17				
	Min	94.57	93.05	93.75	94.82	94.60	94.72				
	Average	94.79	93.74	94.52	95.11	94.56	94.95				
	Standard Deviation	0.13	0.13	0.13	0.13	0.13	0.13				
R2 Hole7-Hole12	Max	95.36	95.43	95.19	95.16	95.33	94.97				
	Min	94.84	94.95	94.72	94.71	94.90	94.57				
	Average	95.13	95.19	94.96	94.94	95.13	94.77				
	Standard Deviation	0.13	0.13	0.13	0.13	0.13	0.13				
R3 Hole13-Hole18	Max	95.37	95.10	95.22	95.21	95.33	95.31				
	Min	94.99	95.09	94.78	94.82	94.88	94.96				
	Average	95.18	95.09	95.00	95.04	95.13	95.13				
	Standard Deviation	0.13	0.13	0.13	0.13	0.13	0.13				
R4 Hole19-Hole24	Max	95.56	94.42	94.52	94.24	94.63	94.67				
	Min	95.21	94.06	94.13	93.88	94.28	94.27				
	Average	95.44	94.24	94.33	94.06	94.48	94.47				
	Standard Deviation	0.13	0.13	0.13	0.13	0.13	0.13				
R5 Hole25-Hole30	Max	95.19	95.16	95.03	95.36	95.14	95.03				
	Min	94.86	94.89	94.78	94.78	94.86	94.77				
	Average	95.01	95.02	94.92	95.02	94.96	94.92				
	Standard Deviation	0.13	0.13	0.13	0.13	0.13	0.13				
R6 Hole31-Hole36	Max	94.83	94.90	94.72	94.31	94.24	94.17				
	Min	94.54	94.55	94.44	93.95	94.02	93.96				
	Average	94.64	94.72	94.60	94.14	94.09	94.07				
	Standard Deviation	0.13	0.13	0.13	0.13	0.13	0.13				
R7 Hole37-Hole42	Max	94.70	94.44	94.04	93.83	94.39	94.35				
	Min	94.55	94.05	93.62	93.48	94.39	94.30				
	Average	94.63	94.24	93.86	93.65	94.39	94.32				
	Standard Deviation	0.13	0.13	0.13	0.13	0.13	0.13				
R8 Hole43-Hole48	Max	95.59	95.43	95.24	95.24	95.43	95.43				
	Min	95.57	95.14	94.82	94.84	94.99	94.98				
	Average	95.58	95.29	95.03	95.07	95.22	95.22				
	Standard Deviation	0.13	0.13	0.13	0.13	0.13	0.13				

Approved By: [Signature]

T231676-01-07-04

Measurement Results		Generation Report						
Calibration Point		Average Standard Reading at each position (°C)						
R1 Hote-Hold-18								
TN21	TN32	TN23	TN24	TN25	TN26	TN27	TN28	TN29
Max	105.23	104.52	103.43	103.25	104.41	103.27	104.14	103.27
CAL POINT	Min	104.04	103.95	103.15	103.64	104.11	104.11	104.06
Average	104.63	104.13	103.29	103.45	104.26	103.69	104.14	103.66
R2 Hote-Hold-18								
TN25	TN26	TN29	TN30	TN31	TN32			
Max	105.23	104.52	103.73	103.72	104.15			
Min	104.11	103.95	103.15	103.64	104.02			
Average	104.20	103.82	103.47	103.67	104.07			
R3 Hote-Hold-18								
TN23	TN34	TN35	TN36	TN37	TN38			
Max	105.37	105.63	105.02	104.40	104.59			
Min	103.17	103.37	104.31	105.30	104.10			
Average	104.27	104.50	104.68	104.89	104.60			
R4 Hote-Hold-24								
TN39	TN40	TN21	TN29	TN33	TN24			
Max	105.31	104.71	104.71	104.71	104.71			
Min	103.98	104.22	106.15	104.81	103.27			
Average	105.19	104.33	106.71	104.56	103.56			
R5 Hote-Hold-30								
TN25	TN26	TN27	TN28	TN29	TN30			
Max	104.95	103.26	103.34	103.78	103.95			
Min	104.67	105.96	103.63	103.36	103.36			
Average	104.81	106.11	103.21	103.57	103.66			
R6 Hote-Hold-36								
TN21	TN32	TN23	TN34	TN35	TN36			
Max	104.75	104.75	104.75	104.75	104.75			
Min	104.34	104.63	104.79	105.09	104.32			
Average	104.65	104.75	104.69	105.10	104.41			
R7 Hote-Hold-42								
TN27	TN38	TN39	TN40	TN21	TN22			
Max	104.39	104.90	104.83	104.63	104.88			
Min	104.69	104.72	104.66	104.49	104.43			
Average	104.47	104.81	104.75	104.56	104.66			
R8 Hote-Hold-48								
TN23	TN31	TN25	TN36	TN37	TN28			
Max	105.31	105.31	103.14	103.27	103.18			
Min	105.43	105.51	103.14	103.27	103.18			
Average	105.55	105.73	103.27	103.44	103.30			

Approved By:

F55-L13108-20-05-57



Measurement Results:

HEATING BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (°C)	Uncertainty (°C)
	Min, Max	Average		
100.0	100.3, 100.5	100.4	0.26	0.33
107.0	107.0, 107.1	107.1	0.19	0.79

* The quoted uncertainty exclude "on-forming"

The calibration result apply only the above calibrated item.

The result of test was found separate as shown on date and place of test only

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k , which for a reliability α , providing

a level of confidence of approximately 95 %.

Approved By:

FM-4.15 (28.75-05-57)

Agilent Technologies (Thailand) Limited
110/111/112/113/114/115/116/117/118/119/120/121/122/123/124/125/126/127/128/129/130/131/132/133/134/135/136/137/138/139/140/141/142/143/144/145/146/147/148/149/150/151/152/153/154/155/156/157/158/159/160/161/162/163/164/165/166/167/168/169/170/171/172/173/174/175/176/177/178/179/180/181/182/183/184/185/186/187/188/189/190/191/192/193/194/195/196/197/198/199/200/201/202/203/204/205/206/207/208/209/210/211/212/213/214/215/216/217/218/219/220/221/222/223/224/225/226/227/228/229/230/231/232/233/234/235/236/237/238/239/240/241/242/243/244/245/246/247/248/249/250/251/252/253/254/255/256/257/258/259/260/261/262/263/264/265/266/267/268/269/270/271/272/273/274/275/276/277/278/279/280/281/282/283/284/285/286/287/288/289/290/291/292/293/294/295/296/297/298/299/300/301/302/303/304/305/306/307/308/309/310/311/312/313/314/315/316/317/318/319/320/321/322/323/324/325/326/327/328/329/330/331/332/333/334/335/336/337/338/339/340/341/342/343/344/345/346/347/348/349/350/351/352/353/354/355/356/357/358/359/360/361/362/363/364/365/366/367/368/369/370/371/372/373/374/375/376/377/378/379/380/381/382/383/384/385/386/387/388/389/390/391/392/393/394/395/396/397/398/399/400/401/402/403/404/405/406/407/408/409/410/411/412/413/414/415/416/417/418/419/420/421/422/423/424/425/426/427/428/429/430/431/432/433/434/435/436/437/438/439/440/441/442/443/444/445/446/447/448/449/450/451/452/453/454/455/456/457/458/459/460/461/462/463/464/465/466/467/468/469/470/471/472/473/474/475/476/477/478/479/480/481/482/483/484/485/486/487/488/489/490/491/492/493/494/495/496/497/498/499/500/501/502/503/504/505/506/507/508/509/510/511/512/513/514/515/516/517/518/519/520/521/522/523/524/525/526/527/528/529/530/531/532/533/534/535/536/537/538/539/540/541/542/543/544/545/546/547/548/549/550/551/552/553/554/555/556/557/558/559/560/561/562/563/564/565/566/567/568/569/570/571/572/573/574/575/576/577/578/579/580/581/582/583/584/585/586/587/588/589/590/591/592/593/594/595/596/597/598/599/600/601/602/603/604/605/606/607/608/609/610/611/612/613/614/615/616/617/618/619/620/621/622/623/624/625/626/627/628/629/630/631/632/633/634/635/636/637/638/639/640/641/642/643/644/645/646/647/648/649/650/651/652/653/654/655/656/657/658/659/660/661/662/663/664/665/666/667/668/669/670/671/672/673/674/675/676/677/678/679/680/681/682/683/684/685/686/687/688/689/690/691/692/693/694/695/696/697/698/699/700/701/702/703/704/705/706/707/708/709/710/711/712/713/714/715/716/717/718/719/720/721/722/723/724/725/726/727/728/729/730/731/732/733/734/735/736/737/738/739/740/741/742/743/744/745/746/747/748/749/750/751/752/753/754/755/756/757/758/759/760/761/762/763/764/765/766/767/768/769/770/771/772/773/774/775/776/777/778/779/780/781/782/783/784/785/786/787/788/789/790/791/792/793/794/795/796/797/798/799/800/801/802/803/804/805/806/807/808/809/810/811/812/813/814/815/816/817/818/819/820/821/822/823/824/825/826/827/828/829/830/831/832/833/834/835/836/837/838/839/840/841/842/843/844/845/846/847/848/849/850/851/852/853/854/855/856/857/858/859/860/861/862/863/864/865/866/867/868/869/870/871/872/873/874/875/876/877/878/879/880/881/882/883/884/885/886/887/888/889/890/891/892/893/894/895/896/897/898/899/900/901/902/903/904/905/906/907/908/909/910/911/912/913/914/915/916/917/918/919/920/921/922/923/924/925/926/927/928/929/930/931/932/933/934/935/936/937/938/939/940/941/942/943/944/945/946/947/948/949/950/951/952/953/954/955/956/957/958/959/960/961/962/963/964/965/966/967/968/969/970/971/972/973/974/975/976/977/978/979/980/981/982/983/984/985/986/987/988/989/990/991/992/993/994/995/996/997/998/999/1000/1001/1002/1003/1004/1005/1006/1007/1008/1009/1010/1011/1012/1013/1014/1015/1016/1017/1018/1019/1020/1021/1022/1023/1024/1025/1026/1027/1028/1029/1030/1031/1032/1033/1034/1035/1036/1037/1038/1039/1040/1041/1042/1043/1044/1045/1046/1047/1048/1049/1050/1051/1052/1053/1054/1055/1056/1057/1058/1059/1060/1061/1062/1063/1064/1065/1066/1067/1068/1069/1070/1071/1072/1073/1074/1075/1076/1077/1078/1079/1080/1081/1082/1083/1084/1085/1086/1087/1088/1089/1090/1091/1092/1093/1094/1095/1096/1097/1098/1099/1100/1101/1102/1103/1104

SERVICE REPORT

Customer Contact:
 AFS Laboratory Group (Thailand) Co.
 Ltd.
 Head Office
 104 Matthanakan 16 Matthanakan Ru
 Praseang Phatthanakan Khut Sun
 TAX ID: 612554300619
 bounced.linhom.dianatogain@outglobal.com
 277151610619

Customer Purchase Order Number:	Customer Number:
Service Request:	Service Request Date:
Service Order:	Service Confirmation:

Amulco Tax
 AS Laboratory Group (Thailand) Co.
 Ltd.
 Road Office
 104 Phatthanakarn 40 Phatthanakarn R.
 Bangkok Phatthanakarn Kiet Suan

REVIEW BY: *[Signature]*
APPROVED BY: *[Signature]*
NOTED BY: *[Signature]*

Delivery Sites:
 A/S Laboratory Group (Thailand) Co.
 Ltd.
 Head Office:
 104 Phatthanasak 43 Phatthanasak B
 Phrasa, Khatthanakhat, Khat, Sun.

Direct Inquiries to:
Contact Name: Customer Contact Center
Contact E-mail: cc@m3gility.com
Contact Telephone: +662 637 4383
Contact Fax: +662 632 4334

Location:
Room
Bldg
Lab
Dept

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Subhagwari, Vardhola Chikara Group 18119 Phatana
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Page 1 of 3

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Email: jee.rajagilsoft.com
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 Road, Rong Mueang, Bangkok 10110, Thailand
 FAX ID 010550004455
 clinalab@igamvichempharm@aiglobal.com
 027158763

SERVICE REPORT	
Customer Purchase Order Number:	Customer Number: 79571013
Service Request:	Service Request Date:
Service Unit: 68000-1000	Service Confirmation: 68000-1000

Invoice To:
AT&T Laboratory Group (Dallas) / C-
Tel: Herd Office

Direct inquiries to:
Contact Name: Customer Contact Center
Contact E-mail: ccc_email@lagard.com
Contact Telephone: +662 637 6253
Contact Fax: +662 632 2734

Delivery Site:
ALS Laboratory Group (Thailand) Co
Ltd Head Office
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Khuang Phatthanasak Road Suan

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Room:
Study:
Lab:
Dept:

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Tel: 011-26102002
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Email: jns@iitd.ac.in
Srinivasan G. 41/43/2 Kanakkilass, Palayamkottai, P.O. 625 002
Tamil Nadu

Agencia InterPol (Interpol) Central Head Office
15, rue de la Loi, 1205, Luxembourg
144, rue de la Loi, 1050, Brussels
London, United Kingdom

Page 1 of 3

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-IM-7000	ICP-MS 7000 System			
G1616A	SPE 4 Autosampler	A015430722	ICP-MS 7000	SYS-IM-7000
G1417A	ESI 3 for Agilent	JP15310227	ICP-MS 7000	SYS-IM-7000
G2202A	PSC 41001 Chiller	2215A1948	ICP-MS 7000	SYS-IM-7000
G1833A	Agilent 7000 ICP-MS	JP15428165	ICP-MS 7000	SYS-IM-7000

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	EQD	Enterprise Operational Qualification	1.00	Agreement Entitlement: 100 % covered	04.10.2024	04.10.2024
1010	S105-S100	ICP-MS Checkout Solutions	1.00	Agreement Entitlement: 100 % covered		

Additional Information:

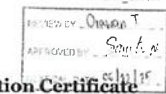
Service Confirmation Number: 0305355443
Service Confirmation Date: 03.10.2024

Service Information:

Problem Description: *VVO EQD IM-7000 S081210455		
Service Provided: Perform OQ Hardware. Test EGS Iogen, auto sampler, Auto tune, BG and 20 Min stability. I calibrate the instrument No BKK_EL0043 test at pass.		
Service Overview Code: Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
Reported Hours: 7.5	Travel Hours: 2.5	
Customer Field Service Representative Name: Pantep Kunsanabala	Customer Field Service Representative Signature: 	Date: 08 Oct 2024
Customer Name: Supabvorn Akha	Customer Signature: 	Date: 08 Oct 2024
Additional Comments:		



BKK_EL0129

Performance Verification Certificate
for Mercury Analyzer

PRODUCT ID Quicktrace M-8000 , Tedydne Leaman Labs
Equipment ID BKK_EL0128 Mercury Analyzer
S/N: US22133002
BKK_EL0129 Autosampler
S/N: 052222A560
Customer Name ALS Laboratory Group (Thailand) Co., Ltd.
Address 104 Soi Pattana 40, Pattana Rd. Sam Lung, Sam Lung Bangkok 10250 Thailand

Date of Qualified December 6, 2024
Next Due date December 6, 2025

This certifies for products which was performed in acceptable criteria specifications

Autosampler & Sample Introduction	PASSED
Analyzer	PASSED
Gas Liquid Separator & Dryer	PASSED
CVA/PS Detector	PASSED
Electronics/Mechanics	PASSED
Data station/PC	PASSED
Analytical test	PASSED

Provided by
Scientist Instrument Co., Ltd.
113 Soi Ekkachai 44, Ekkachai Road
Khlong Ueng Thani, Bangkok
Bangkok 10150 Thailand

Certified by 
Thanraphol Sakdeyong
Service Engineer

BKK_EL0026

Agilent Technologies

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Website: www.agilent.com/thailand

Location:



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Website: www.agilent.com/thailand

SERVICE REPORT

Customer Purchase Order Number: 0271010
Service Request: Service Request Code: 0271010
Service Order: Service Order Code: 0271010

REVIEW BY: 
APPROVED BY: 
TEST CAL DATE: 12/01/2025

Direct Inquiries to:

Customer Service Center
Tel: +662 604 8078
Fax: +662 604 8078
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Tel: +662 604 8078
Fax: +662 604 8078
Email: sales@agilent.com
Website: www.agilent.com/thailand

Service Confirmation Number: 0305355443
Service Confirmation Date: 03.10.2024

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
G1616A	ICP-MS 7700 System Enhanced		ICP-MS 7700 (PPLC)	
G1616A	1200 Thermochemical Column	01A0012200	ICP-MS 7700 (PPLC)	SYS-IM-7700 E
G1616A	1200 Thermochemical Column	01A0012200	ICP-MS 7700 (PPLC)	SYS-IM-7700 E
G1616A	1200 Thermochemical Column	01A0012200	ICP-MS 7700 (PPLC)	SYS-IM-7700 E
G1616A	1200 Thermochemical Column	01A0012200	ICP-MS 7700 (PPLC)	SYS-IM-7700 E
G1616A	1200 Thermochemical Column	01A0012200	ICP-MS 7700 (PPLC)	SYS-IM-7700 E
G1616A	1200 Thermochemical Column	01A0012200	ICP-MS 7700 (PPLC)	SYS-IM-7700 E
G1616A	1200 Thermochemical Column	01A0012200	ICP-MS 7700 (PPLC)	SYS-IM-7700 E
G1616A	1200 Thermochemical Column	01A0012200	ICP-MS 7700 (PPLC)	SYS-IM-7700 E


Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	EQD	Enterprise Operational Qualification	1.00	Agreement Entitlement: 100 % covered	12.12.2023	12.12.2023
1010	S105-S100	ICP-MS Checkout Solutions	1.00	Agreement Entitlement: 100 % covered		

Additional Information:

Service Confirmation Number: 0305355443
Service Confirmation Date: 12.12.2023Service Confirmation Number: 0305355443
Service Confirmation Date: 12.12.2023

Service Information:

Problem Description: VVO EQD BA/PPLC-7700 6001143313		
Service Provided: Perform OQ Hardware control test EGS Iogen, Autosampler, IIS, Auto tune, BG and Stability. After done the instrument BKK_EL0026 calibrated pass all.		
Service Overview Code: Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
Reported Hours: 6.0	Travel Hours: 1.0	
Customer Field Service Representative Name: Pantep Kunsanabala	Customer Field Service Representative Signature: 	Date: 12 Dec 2023
Customer Name: Supabvorn Akha	Customer Signature: 	Date: 12 Dec 2023
Additional Comments:		



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
FOR THE SERVICE OF EQUIPMENT CALIBRATION AND TESTING SERVICES
SUPPORTING THE INDUSTRIAL SECTOR AND THE GOVERNMENT



Cert. No.: 23TM1406
Page: 1 of 4

Certificate of Calibration

Equipment: Autoclave

Manufacturer: TOMY

Model: SX-700

Serial No.: 48124190

ID No.: BKK ML0041

Submitted by: ALS Laboratory Group (Thailand) Co. Ltd.
104 Phatthanakan Rd., Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Location: Media Preparation Room

Received Order: 03 October 2023

Calibration Date: 04 October 2023

Ambient Temperature: (20 ± 10) °C

Relative Humidity: (50 ± 30) %

Calibrated by: Kh. Rutanasapachai

Approved by: 
Approved Signatory

() Pongpan Panyim
() Pongpan Panyim
() Suwit Imjai

Issue Date: 11 October 2023

The Uncertainties are for a confidence probability of approximately 95 %

Uncertainty may be determined by the following formula: $U = \pm \sqrt{u^2 + v^2}$

Uncertainty may be determined by the following formula: $U = \pm \sqrt{u^2 + v^2}$

A 0053272



Equipment: Autoclave
Condition As-Received: Used Item
Reference: 2310-0000C-6
Procedure Used: CP-OT03

Cert. No.: 23TM1408
Page: 2 of 4

Calibration was conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T

The temperature scale used was based on ITS-90

Condition of this result of calibration

1. Reference standard instrument:

Instrument: Serial No. Cert. No. Traceable Due Date
1) Data Acquisition: MY5701043 231408 TPA 25 Mar 2024

2. This certificate is valid only to the item calibrated on date and place of calibration
3. This certificate is traceable to the International System of Unit
4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**
(** = Categorization of pathogens according to hazard and virulence of containment, second edition, 1990)

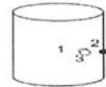
It does not cover autoclaves for use with material infected with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle

Remark: TPA: Technology Promotion Association (Thailand - Japan)

Result of Calibration: () Without Adjustment

Function of UUC: Temperature Source



Position	Description	Ref. Std. ID No.	Environmental		
			(°C)	(%RH)	(%O ₂)
Beginning of Calibration			20	04	221
Finished of Calibration			27	07	222

Position	Description	Ref. Std. ID No.
1 =	Center of chamber	19-171C-06
2 =	Temperature sensor	19-171C-09
3 =	Exhaust port	19-171C-10

a 1184533



Equipment: Autoclave
Condition As-Received: Used Item
Reference: 2310-0000C-6
Result of Calibration: () Without Adjustment
Function of UUC: Temperature Source

Cert. No.: 23TM1406
Page: 3 of 4

Operating parameter Set: Temperature = 108 °C Sterilization period = 10 minute							
UUC [*] Setting (°C)	UUC [*] Reading (°C)	Position	Average [*] Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor
108	108	1	108.203	0.12	0.04	0.00	2
		2	108.203				
		3	108.140				

Operating parameter Set: Temperature = 115 °C Sterilization period = 20 minute							
UUC [*] Setting (°C)	UUC [*] Reading (°C)	Position	Average [*] Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor
115	115	1	115.318	0.13	0.00	0.00	2
		2	115.267				
		3	115.157				

Operating parameter Set: Temperature = 118 °C Sterilization period = 10 minute							
UUC [*] Setting (°C)	UUC [*] Reading (°C)	Position	Average [*] Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor
118	118	1	118.063	0.11	0.00	0.00	2
		2	118.037				
		3	117.954				

Average^{*}: The average of 30 values in each position
Stability^{*}: One-half of the greatest maximum difference of measured temperature at any one probe
UUC^{*}: Unit Under Calibration
Note: The reported uncertainty of measurement was isolated stability and excluded uniformity

a 1184532



Equipment: Autoclave
Condition As-Received: Used Item
Reference: 2310-0000C-6
Result of Calibration: () Without Adjustment
Function of UUC: Temperature Source

Cert. No.: 23TM1406
Page: 4 of 4

Operating parameter Set: Temperature = 121 °C Sterilization period = 30 minute							
UUC [*] Setting (°C)	UUC [*] Reading (°C)	Position	Average [*] Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor
121	121	1	121.186	0.17	0.11	0.01	2
		2	121.092				
		3	120.990				

Average^{*}: The average of 30 values in each position
Stability^{*}: One-half of the greatest maximum difference of measured temperature at any one probe
UUC^{*}: Unit Under Calibration
Note: The reported uncertainty of measurement was isolated stability

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
FOR THE SERVICE OF EQUIPMENT CALIBRATION AND TESTING SERVICES
SUPPORTING THE INDUSTRIAL SECTOR AND THE GOVERNMENT



Cert. No.: 23TM1406
Page: 1 of 3

Certificate of Calibration

Equipment: Incubator

Manufacturer: SHEL-LAB

Model: 1015A

Serial No.: 0200599

ID No.: BKK ML0010

Submitted by: ALS Laboratory Group (Thailand) Co. Ltd.
104 Phatthanakan Rd., Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Location: Incubation & Micrological Reading

Received Order: 17 July 2023

Calibration Date: 17 July 2023

Ambient Temperature: (20 ± 10) °C

Relative Humidity: (50 ± 30) %

Calibrated by: Nan Peltanpongpaiboon

Approved by: 
Approved Signatory

() Pongpan Panyim
() Malee Sukrua
() Suwit Imjai

Issue Date: 24 July 2023

The Uncertainties are for a confidence probability of approximately 95 %

Uncertainty may be determined by the following formula: $U = \pm \sqrt{u^2 + v^2}$

Uncertainty may be determined by the following formula: $U = \pm \sqrt{u^2 + v^2}$

A 0056469



Equipment: Incubator
Condition As-Received: Used Item
Reference: 2307-02850C-1
Procedure Used: CP-OT02

Cert. No.: 23TM1406
Page: 2 of 3

Calibration was conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD)

The temperature scale used was based on ITS-90

Condition of this result of calibration

1. Reference standard instrument:

Instrument: Serial No. Cert. No. Traceable Due Date
1) Data Acquisition: MY49001151 231407 TPA 25 Feb 2024

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

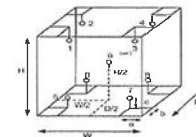
3. This certificate is traceable to the International System of Unit

Remark: TPA: Technology Promotion Association (Thailand - Japan)

Result of Calibration: () Without Adjustment

Function of UUC: Temperature Source

Fresh air setting: Close



Environment during calibration			
	Beginning	Finished	
Temp. (°C)	24	24	
REL Humid. (%)	54	56	
RG Supply (Vol.)	221	223	

Position	Ref. Std. ID No.
1	19KTD-21
2	19KTD-22
3	19KTD-23
4	19KTD-24
5	19KTD-25
6	19KTD-26
7	19KTD-27
8	19KTD-28
9	19KTD-29

Probe Installation Details: Dimension of Chamber:
a = 10 cm D = 0.50 m
b = 10 cm W = 0.75 m
c = 10 cm H = 1.2 m
Capacity = 0.45 m³

a 1172189



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2307-0285GOC-1
Result of Calibration : () Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No. : 24TM1148
Page : 3 of 3

Calibration Point	UUC Setting	UUC Reading	Temperature stability	Temperature uniformity	Overall Variation	Coverage Factor
(°C)	(°C)	(°C)	(± °C)	(°C)	(°C)	
35.0	35.0	35.0	0.056	0.39	0.44	2

Measured Temperature (°C)									Uncertainty
Calibration Point	Position								
(°C)	1	2	3	4	5	6	7	8 (ref.)	
35.0	34.898	34.933	34.815	34.813	35.054	35.019	35.158	35.141	

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.
UUC* : Unit Under Calibration.

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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a 1172159



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATHANAKARN ROAD SOI 18, SUKHUMVIT, SUKHUMVIT BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2710-8484



Certificate of Calibration

Cert. No. : 24TM567
Page : 1 of 3

Equipment : Hot Air Oven
Manufacturer : Binder
Model : ED 240/E2
Serial No. : 00-15533
ID No. : BKC_MLD013

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Media Preparation Room

Location :
Received Order : 23 April 2024
Calibration Date : 23 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Tinwattul Panu

Approved by :
Approved Signatory

() Ponpan Palpan
(✓) Suwit Imjai
() Kanchai Promprut

Issue Date : 28 April 2024

The Uncertainty is for a confidence probability of approximately 95%.

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



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0439OC-8
Procedure Used :>

Cert. No. : 24TM867
Page : 2 of 3

Calibration was conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument : Serial No. : Cert. No. : Traceable : Due Date :
1) Data Acquisition : MY49001451 : 24LM44 : TPA : 17 Mar 2025

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

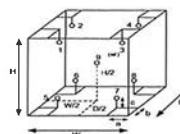
3. This certificate is traceable to the International System of Units.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :> () Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details : Dimension of Chamber :
a = 10 cm D = 0.50 m
b = 10 cm W = 0.80 m
c = 10 cm H = 0.60 m
Capacity = 0.24 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	23
REL Humid. (%)	65	65
AC Supply (Volt)	223	222

Position	Ref. Std. ID No.:
1	24-19TC-01
2	24-19TC-02
3	24-19TC-03
4	24-19TC-04
5	24-19TC-05
6	24-19TC-06
7	24-19TC-07
8	24-19TC-08
9 (ref.)	24-19TC-09



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0439OC-8
Result of Calibration : () Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No. : 24TM567
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor
180	180	180	0.64	2.7	3.7	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
180	181.009	181.511	180.922	181.359	181.217	183.659	181.664	181.986	181.474	

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.
UUC* : Unit Under Calibration.

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATHANAKARN ROAD SOI 18, SUKHUMVIT, SUKHUMVIT BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2710-8484



Certificate of Calibration

Cert. No. : 24TM569
Page : 1 of 3

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 4S
Serial No. : L712.0426
ID No. : BKC_MLD006

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Incubation & Microbiological Reading

Location :
Received Order : 01 March 2024
Calibration Date : 01 March 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Kresida Maloo

Approved by :
Approved Signatory

() Penitappa Tanayakul
() Uwepphol Hansachai
(✓) Suwit Imjai

Issue Date : 4 March 2024

The Uncertainty is for a confidence probability of approximately 95%.

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



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2403-0001OC-1
Procedure Used :>

Cert. No. : 24TM569
Page : 2 of 3

Calibration was conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (PRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument : Serial No. : Cert. No. : Traceable : Due Date :
1) Data Acquisition : MY57013711 : 23LM115 : TPA : 11 Jul 2024

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

3. This certificate is traceable to the International System of Units.

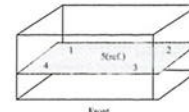
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :> () Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%RH)	(Volt)
Beginning of Calibration	24	55	221
Finished of Calibration	23	56	220



Position	Ref. Std. ID No.:
1	48003999-001
2	48003999-002
3	48003999-003
4	48003999-004
5 (ref.)	48003999-005



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2403-0001OC-1
Result of Calibration : () Without Adjustment
Function of UUC : Temperature Source

Cert. No.: 24TM469
Page: 3 of 3

Calibration point (°C)	UUC Setting (°C)	UUC Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			1	2	3	4	5 (ref.)	
44.5	44.5	44.5	44.469	44.462	44.462	44.510	44.616	0.15
45.0	45.0	45.0	44.975	44.974	45.007	45.023	44.969	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor
44.5	0.007	0.029	2
45.0	0.009	0.031	2

Average* : The average of 30 values in each position.
Uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location, which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Stability : One-half of the greatest maximum difference of measured temperature at any one probe.
UUC : Unit Under Calibration
Note : The reported uncertainty of measurement was included stability and excluded uniformity.
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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Scientist
Instrument

Performance Verification Certificate for Mercury Analyzer

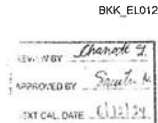
PRODUCT ID : Quicktrace M-8000 , Teledyne Leeman Labs
Equipment ID : BKK_ELO128 Mercury Analyzer
S/N: US22133002
BKK_ELO129 Autosampler
S/N: 052222A360
Customer Name : ALS Laboratory Group (Thailand) Co., Ltd.
Address : 104 Soi Pattana 40, Pattana Rd, Suan Luang, Suan Luang Bangkok 10250 Thailand

Date of Qualified : December 6, 2023
Next Due date : December 6, 2024

This certifies for products which was performed in acceptable criteria specifications
Autosampler & Sample Introduction : PASSED
Analyzer : PASSED
Gas Liquid Separator & Dryer : PASSED
CVAFS Detector : PASSED
Electronics/Mechanical : PASSED
Data station/PC : PASSED
Analytical test : PASSED

Provided by
Scientist Instrument Co., Ltd.
113/54 Jirakul 41, Ratcha Road
Klong Bang Phon, Bangkok
Bangkok 10150 Thailand

Certified by :
Thunaphol Sakdayas
Service Engineer



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND) JAPAN
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANA ROAD SOI 16, SUAN LUANG, SUAN LUANG BANGKOK 1109
TEL: 0 2713 386 24 FAX: 0 2713 3484



Cert.No.: 23CHO662
Page: 1 of 3

Certificate of Calibration

Equipment : Spectrophotometer
Manufacturer : HACH
Model : DR3900
Serial No. : 2021550
ID No. : BKK_EN0350
Condition As-Received : Used Item
Received Date : 09 November 2023
Calibration Date : 09 November 2023
Reference : 2311-0054OC-1
Submitted by : ALS Laboratory Group (Thailand) Co. Ltd.
164 Phatthanakan 40, Phatthanakan Rd,
Khwaeng Phatthanakan, Khel Suan Luang,
Bangkok 10250 Thailand
Calibration Place : Vet Chemistry Lab 2
Ambient Temperature : (22.7 - 22.5) °C (On-Site)
Relative Humidity : (63.7 - 62.6) % (On-Site)
Calibration Procedure : In-house method :
CPOCHI based on ASTM E 275-01

Calibrated by : Kanchai Prampit
Approved by :
Approved Signatory

() Saliap Meangmal
() Wirakorn Lenggrakul
() Porjan Palpin

Issue Date : 15 November 2023
The Uncertainties are for a confidence probability of approximately 95 %
This certificate may not be reproduced without the written consent of the calibration service.
Approval of the head of Calibration Services & Equipment Calibration and Testing Services

A 0060698



Cert. No.: 23CHO662
Page: 2 of 3

Condition of calibration result

1. Reference Standard Material :

Material	Serial No.	Certificate No.	Due date
1. Absorbance Standard set	8331	105939	28 Sep 2024
2. Wavelength Standard set	36730	98330	19 Jan 2024
3. Wavelength Standard set	36730	98331	19 Jan 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certificate is issuable to the International System of Unit maintained through :
- Sigma Scientific Ltd.

4. Spectral Bandwidth : 5 nm
Scan Speed : - nm/min

Calibration Results : without adjustment

Wavelength Accuracy

Certified Values of Reference Material (nm)	UUC Reading (nm)	Uncertainty of Measurement (±nm)	Coverage Factor
416.40	418	0.59	2.00
470.88	480	0.59	2.00
513.75	513	0.59	2.00
537.00	536	0.59	2.00
636.00	636	0.59	2.00
747.81	748	0.59	2.00
807.04	807	0.59	2.00



Cert. No.: 23CHO662
Page: 3 of 3

Calibration Results : without adjustment

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (±Abs)	Coverage Factor
420.0	Zero	0.000	0.0028	2.00
	0.5712	0.572	0.0031	2.00
	0.7510	0.752	0.0031	2.00
	1.0893	1.090	0.0033	2.00
440.0	Zero	0.000	0.0028	2.00
	0.5807	0.581	0.0030	2.00
	0.7338	0.733	0.0030	2.00
	1.0638	1.063	0.0030	2.00
465.0	Zero	0.000	0.0028	2.00
	0.5111	0.514	0.0029	2.00
	0.6768	0.679	0.0029	2.00
	0.9802	0.984	0.0029	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5224	0.524	0.0028	2.00
	0.6950	0.686	0.0028	2.00
	0.9937	0.985	0.0028	2.00
590.0	Zero	0.000	0.0028	2.00
	0.5542	0.554	0.0028	2.00
	0.7155	0.714	0.0029	2.00
	1.0366	1.035	0.0028	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5397	0.539	0.0029	2.00
	0.8832	0.882	0.0028	2.00
	0.9886	0.988	0.0028	2.00

Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer

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

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2global.com

Figure 10 is a scatter plot showing the relationship between the shear modulus G (in MPa) on the y-axis and the shear strain γ (in mm/mm) on the x-axis. The y-axis ranges from 0.0 to 65.4, and the x-axis ranges from 0.0 to 2.0. Four data points are plotted, and a linear regression line is fitted to them. The equation of the line is $y = 31.36x + 2.2468$.

FORM NO. 106-071 EDITION NO. 2 ISSUE DATE 28/11/22



Figure 1 is a line graph showing the relationship between reduced viscosity (η_{sp}/C) and concentration (C). The y-axis is labeled η_{sp}/C (Pa) and ranges from 0.0 to 0.5. The x-axis is labeled C (mol/m³) and ranges from 0.0 to 1.5. A series of data points are plotted, showing a linear increase. A line of best fit is drawn through the points, with the equation $\eta_{sp}/C = 0.324C + 2.47$ displayed on the graph.

FORM NO. E-6.074, REVISION No. 2, ISSUE DATE: 2011



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ISSN No. 0969-0774, EISSN No. 2, POST DATE: 20/11/22



Figure 1 is a line graph showing the relationship between the intensity of the first harmonic $I(1^{st})$ (y-axis) and the normalized frequency $\Omega_n(\pi/2)/\pi$ (x-axis). The y-axis has major ticks at 0.0 and 0.5. The x-axis has major ticks at 0.0, 0.5, 1.0, and 1.5. A solid line represents the theoretical calculation, and a dashed line represents the experimental data. The experimental data points are marked with dots. The equation $y = 0.31105x + 0.0314$ is displayed on the graph.

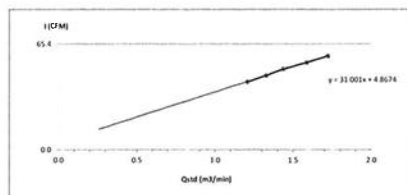
FORM NO. F16.074 REVISION No. 2 ISSUE DATE 20/11



High Volume Air Sampler Calibration Worksheet

Project Site: Kaew Phol Sugar Co., Ltd. Barometric Pressure (mm Hg): 763
 Calibrate Location: Santham Khamrai Temperature (°C): 29
 Calibrate Date: 22-Jan-24 High Volume ID: NKH P50050
 Calibration Sheet No.: C-220124-NKH P50050 TI: 11700
 Calibrator ID: NKH P50044 High Volume S/N: 5055
 Calibrator Model: TI-020NA Calibrator Slope: 1.61252
 Calibrator S/N: 1611 Calibrator Intercept: -0.02014

Test No.	Delta H ₂ O (inch)	Q _{ave} (m³/min)	1:1 Chart (CFM)	Linear Regression
1	3.8	1.2042	42	Slope: 31.0019
2	4.6	1.4272	46	Intercept: 4.0578
3	5.4	1.4362	50	Correlation Coefficient: 0.9993
4	6.6	1.5616	54	
5	7.6	1.7219	58	



Calibrated by: [Signature] Approved by: [Signature]
 (Mr. Nattapong Khamrai) (Mr. Nattapong Khamrai)
 Field Scientist (2) Division Field Coordinator Scientist (1)

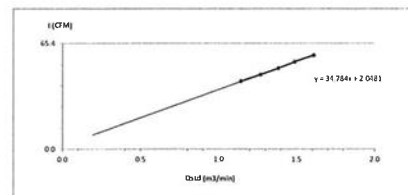
FORM NO. F-06-073 REVISION NO. 2 ISSUE DATE: 20/11/22



High Volume Air Sampler Calibration Worksheet

Project Site: Kaew Phol Sugar Co., Ltd. Barometric Pressure (mm Hg): 763
 Calibrate Location: Santham Khamrai Temperature (°C): 29
 Calibrate Date: 22-Jan-24 High Volume ID: NKH P50051
 Calibration Sheet No.: C-220124-NKH P50051 TI: 11700
 Calibrator ID: NKH P50044 High Volume S/N: 5054
 Calibrator Model: TI-502NA Calibrator Slope: 1.61252
 Calibrator S/N: 1611 Calibrator Intercept: -0.02014

Test No.	Delta H ₂ O (inch)	Q _{ave} (m³/min)	1:1 Chart (CFM)	Linear Regression
1	3.4	1.1440	42	Slope: 34.7042
2	4.2	1.2693	46	Intercept: 2.0441
3	5.0	1.3828	50	Correlation Coefficient: 0.9996
4	5.8	1.4777	54	
5	6.8	1.6072	58	



Calibrated by: [Signature] Approved by: [Signature]
 (Mr. Nattapong Khamrai) (Mr. Nattapong Khamrai)
 Field Scientist (2) Division Field Coordinator Scientist (1)

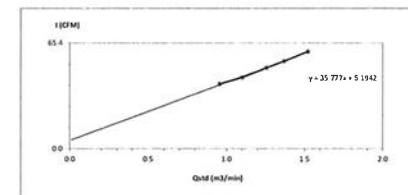
FORM NO. F-06-073 REVISION NO. 2 ISSUE DATE: 20/11/22



High Volume Air Sampler Calibration Worksheet

Project Site: Kaew Phol Sugar Co., Ltd. Barometric Pressure (mm Hg): 760.5
 Calibrate Location: Santham Khamrai Temperature (°C): 24.5
 Calibrate Date: 24-May-24 High Volume ID: NKH P50052
 Calibration Sheet No.: C-240524-NKH P50052 TI: 11700
 Calibrator ID: NKH P50044 High Volume S/N: 5055
 Calibrator Model: TI-502NA Calibrator Slope: 1.61979
 Calibrator S/N: 3-41 Calibrator Intercept: -0.02176

Test No.	Delta H ₂ O (inch)	Q _{ave} (m³/min)	1:1 Chart (CFM)	Linear Regression
1	2.4	0.9571	40	Slope: 35.7746
2	3.2	1.1009	44	Intercept: 5.1142
3	4.2	1.2572	50	Correlation Coefficient: 0.9993
4	5.0	1.3692	54	
5	6.2	1.5215	60	



Calibrated by: [Signature] Approved by: [Signature]
 (Mr. Nattapong Khamrai) (Mr. Nattapong Khamrai)
 Field Scientist (2) Division Field Coordinator Scientist (1)

FORM NO. F-06-073 REVISION NO. 2 ISSUE DATE: 20/11/22



PLAY SOLUTION TECHNOLOGY COMPANY LIMITED
 176/175 Srinakharinwirot Road, Bangna, Bangkok 10710
 Tel: +66 2 081 0156, Fax: +66 2 081 7720
 www.playstec.com



CERTIFICATE OF CALIBRATION

Result of Calibration: Certification No. PS-0130-23
 Page No. 1 of 3

3. Description: Test load is used 1/3 of the maximum capacity, typically placed between 1/2 and 1/3 of the distance from the center of the load receptor to the edge.



Test Load	Indication (kg)
1	99.9999
2	100.0000
3	99.9999
4	100.0000
5	99.9999
Max Deviation	0.0001

Test Load	Indication (kg)
1	
2	
3	
4	
5	
Max Deviation	

Standard method: The calibration was performed by using calibration laboratory's in-house calibration method (1) (2) (3) (4) (5) based on "NIST Handbook 44: Calibration of weighing machines" revision 6 (October 2010).

Reference standards:

Instrument	QMS No.	Lot	Certificate No.	Due Date
Standard Weight Set	17	416731963	22-126725	November 30, 2024
Standard Weight Set				
Standard Weight Set				

Measurement uncertainty: The given measurement uncertainty is the standard of the measurement multiplied by an expansion factor which corresponds to a confidence level of about 95% for a normal distribution. The standard uncertainty was calculated according to NIST 44.

Traceability: The measurement is traceable to national standard, which realize the physical unit of measurement (SI). Through the reference calibration laboratory of Asia Material and Agricultural Laboratory and Research Center Co., Ltd.

END OF REPORT

F-035

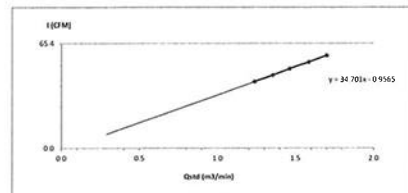
REV 02 LUG/05



High Volume Air Sampler Calibration Worksheet

Project Site: Kaew Phol Sugar Co., Ltd. Barometric Pressure (mm Hg): 713
 Calibrate Location: Santham Khamrai Temperature (°C): 29
 Calibrate Date: 22-Jan-24 High Volume ID: NKH P50052
 Calibration Sheet No.: C-220124-NKH P50052 TI: 11700
 Calibrator ID: NKH P50044 High Volume S/N: 5055
 Calibrator Model: TI-502NA Calibrator Slope: 1.61272
 Calibrator S/N: 1611 Calibrator Intercept: -0.02081

Test No.	Delta H ₂ O (inch)	Q _{ave} (m³/min)	1:1 Chart (CFM)	Linear Regression
1	4.0	1.2790	42	Slope: 34.7013
2	4.8	1.3553	46	Intercept: -0.9145
3	5.6	1.4622	50	Correlation Coefficient: 0.9990
4	6.4	1.5116	54	
5	7.6	1.7000	58	



Calibrated by: [Signature] Approved by: [Signature]
 (Mr. Nattapong Khamrai) (Mr. Nattapong Khamrai)
 Field Scientist (2) Division Field Coordinator Scientist (1)

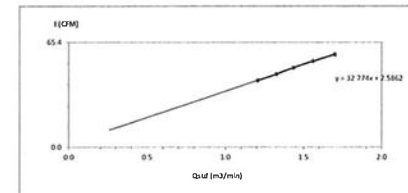
FORM NO. F-06-073 REVISION NO. 2 ISSUE DATE: 02/11/22



High Volume Air Sampler Calibration Worksheet

Project Site: Kaew Phol Sugar Co., Ltd. Barometric Pressure (mm Hg): 763
 Calibrate Location: Santham Khamrai Temperature (°C): 29
 Calibrate Date: 22-Jan-24 High Volume ID: NKH P50049
 Calibration Sheet No.: C-220124-NKH P50049 TI: 11700
 Calibrator ID: NKH P50044 High Volume S/N: 5055
 Calibrator Model: TI-020NA Calibrator Slope: 1.61252
 Calibrator S/N: 1611 Calibrator Intercept: -0.02081

Test No.	Delta H ₂ O (inch)	Q _{ave} (m³/min)	1:1 Chart (CFM)	Linear Regression
1	3.8	1.2042	42	Slope: 32.7744
2	4.6	1.4272	46	Intercept: 2.5862
3	5.4	1.4362	50	Correlation Coefficient: 0.9993
4	6.6	1.5616	54	
5	7.6	1.7000	58	



Calibrated by: [Signature] Approved by: [Signature]
 (Mr. Nattapong Khamrai) (Mr. Nattapong Khamrai)
 Field Scientist (2) Division Field Coordinator Scientist (1)

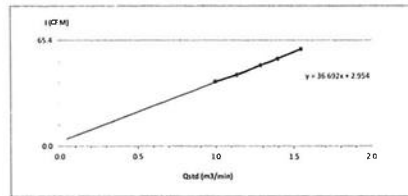
FORM NO. F-06-073 REVISION NO. 2 ISSUE DATE: 20/11/22



High Volume Air Sampler Calibration Worksheet

Project Site: Kavet Phol Sugar Co Ltd Barometric Pressure (mm Hg): 740.5
 Calibrate Location: Tanwut Temperature (°C): 34.5
 Calibrate Date: 24-May-24 High Volume ID: NKH FS0049
 Calibration Sheet No: C-240524-NKH FS0049 High Volume Model: TI-5170D
 Calibrator ID: NKH FS0044 High Volume S/N: 5452
 Calibrator Model: TE-5028A Calibrator Slope: 1.61979
 Calibrator S/N: 3601 Calibrator Intercept: -0.02778

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	Flow Chart (CFM)	Linear Regression
1	2.6	0.953	48	Slope: <u>34.623</u> Intercept: <u>2.9540</u> Correlation Coefficient: <u>0.9985</u>
2	3.4	1.1279	44	
3	4.4	1.2663	50	
4	5.2	1.3558	54	
5	6.4	1.5454	60	



Calibrated by: Sungtaew N. Approved by: [Signature]
 (Mr. Sungtaew Nattakul) (Mr. Nongkorn Jitmanont)
 Field Scientist (2) Enviro Field Coordinator Scientist (3)

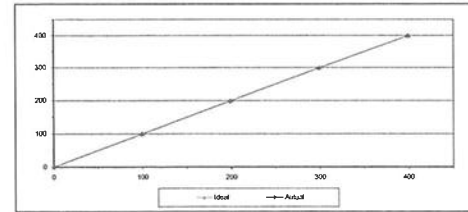
FORM NO. F-06-073 REVISION NO. 2 ISSUE DATE: 20/11/23



MULTIPOINT CALIBRATION REPORT

Calibration Date: 5-Jan-24 Equipment Name: SO2 Analyzer
 Manufacturer: HORIBA Model: APSA-370
 Serial No.: JVU4R448 Equipment ID: NKH FS0081
 Calibrator Manufacturer: Teledyne API Model: 700
 Serial No.: 947
 Std. Gas Concentration (PPM): 86.3 Cylinder No.: GN0027222
 Cylinder Pressure (psi): 1800 Certified By: Alrgas Inc.
 Certified Date: 9-Feb-22 Expired Date: 9-Feb-30

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80
2	200.00	198.60	-1.40	-0.70
3	300.00	298.40	-1.60	-0.53
4	400.00	398.70	-1.30	-0.33
AVERAGE (%)				-0.48



Calibrated By: [Signature] Approved By: [Signature]
 (Mr. Jirawat Sakam) (Mr. Samyuth Jitmanont)
 Field Environmental Scientist (3) Assistant General Manager

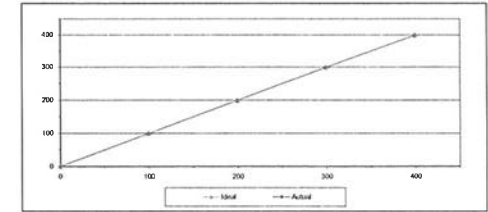
ALS Laboratory Group
 FORM NO. F-06-056 REVISION NO. 1 ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date: 5-Jan-24 Equipment Name: SO2 Analyzer
 Manufacturer: HORIBA Model: APSA-370
 Serial No.: YK0E3MP Equipment ID: NKH FS0085
 Calibrator Manufacturer: Teledyne API Model: 700
 Serial No.: 947
 Std. Gas Concentration (PPM): 86.3 Cylinder No.: GN0027222
 Cylinder Pressure (psi): 1800 Certified By: Alrgas Inc.
 Certified Date: 9-Feb-22 Expired Date: 9-Feb-30

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.80	-1.20	-1.20
2	200.00	198.90	-1.10	-0.55
3	300.00	298.30	-1.70	-0.57
4	400.00	398.70	-1.30	-0.33
AVERAGE (%)				-0.51



Calibrated By: [Signature] Approved By: [Signature]
 (Mr. Jirawat Sakam) (Mr. Samyuth Jitmanont)
 Field Environmental Scientist (3) Assistant General Manager

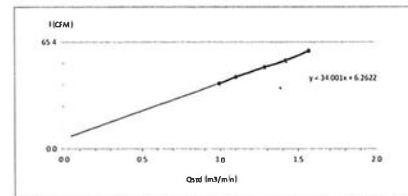
ALS Laboratory Group
 FORM NO. F-06-056 REVISION NO. 1 ISSUE DATE: 02/04/12



High Volume Air Sampler Calibration Worksheet

Project Site: Kavet Phol Sugar Co Ltd Barometric Pressure (mm Hg): 740.5
 Calibrate Location: Tanwut Temperature (°C): 34.5
 Calibrate Date: 24-May-24 High Volume ID: NKH FS0050
 Calibration Sheet No: C-240524-NKH FS0050 High Volume Model: TI-5170D
 Calibrator ID: NKH FS0044 High Volume S/N: 5453
 Calibrator Model: TE-5028A Calibrator Slope: 1.61979
 Calibrator S/N: 3601 Calibrator Intercept: -0.02778

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	Flow Chart (CFM)	Linear Regression
1	2.6	0.953	48	Slope: <u>34.611</u> Intercept: <u>6.2622</u> Correlation Coefficient: <u>0.9988</u>
2	3.2	1.1009	44	
3	4.4	1.2563	50	
4	5.4	1.4218	54	
5	6.4	1.5569	60	



Calibrated by: Sungtaew N. Approved by: [Signature]
 (Mr. Sungtaew Nattakul) (Mr. Nongkorn Jitmanont)
 Field Scientist (2) Enviro Field Coordinator Scientist (3)

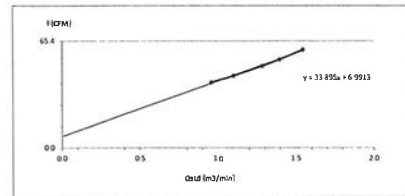
FORM NO. F-06-073 REVISION NO. 2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site: Kavet Phol Sugar Co Ltd Barometric Pressure (mm Hg): 740.5
 Calibrate Location: Tanwut Temperature (°C): 34.5
 Calibrate Date: 24-May-24 High Volume ID: NKH FS0051
 Calibration Sheet No: C-240524-NKH FS0051 High Volume Model: TI-5170D
 Calibrator ID: NKH FS0044 High Volume S/N: 5454
 Calibrator Model: TE-5028A Calibrator Slope: 1.61979
 Calibrator S/N: 3601 Calibrator Intercept: -0.02778

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	Flow Chart (CFM)	Linear Regression
1	2.4	0.9571	48	Slope: <u>33.950</u> Intercept: <u>6.9913</u> Correlation Coefficient: <u>0.9973</u>
2	3.2	1.1009	44	
3	4.4	1.2563	50	
4	5.2	1.3558	54	
5	6.4	1.5454	60	



Calibrated by: Sungtaew N. Approved by: [Signature]
 (Mr. Sungtaew Nattakul) (Mr. Nongkorn Jitmanont)
 Field Scientist (2) Enviro Field Coordinator Scientist (3)

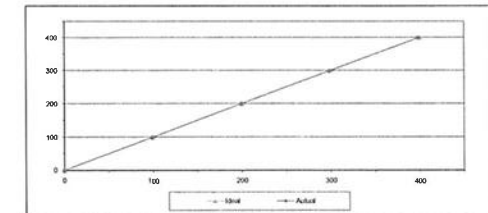
FORM NO. F-06-073 REVISION NO. 2 ISSUE DATE: 20/11/23



MULTIPOINT CALIBRATION REPORT

Calibration Date: 5-Jan-24 Equipment Name: SO2 Analyzer
 Manufacturer: HORIBA Model: APSA-370
 Serial No.: C6GMRLURP Equipment ID: NKH FS0078
 Calibrator Manufacturer: Teledyne API Model: 700
 Serial No.: 947
 Std. Gas Concentration (PPM): 86.3 Cylinder No.: GN0027222
 Cylinder Pressure (psi): 1800 Certified By: Alrgas Inc.
 Certified Date: 9-Feb-22 Expired Date: 9-Feb-30

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.50	-1.50	-1.50
2	200.00	198.70	-1.30	-0.65
3	300.00	298.00	-2.00	-0.67
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.62



Calibrated By: [Signature] Approved By: [Signature]
 (Mr. Jirawat Sakam) (Mr. Samyuth Jitmanont)
 Field Environmental Scientist (3) Assistant General Manager

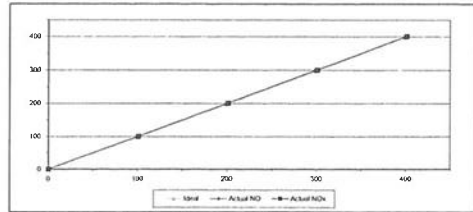
ALS Laboratory Group
 FORM NO. F-06-056 REVISION NO. 1 ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-24 Equipment Name NOx Analyzer
 Manufacturer HORIBA Model APNA-370
 Serial No. RCWXYMB8 Equipment ID NKH_FS0080
 Calibrator Manufacturer Teledyne API Model 700
 Serial No. 947
 Std. Gas Concentration (PPM) 55.88 Cylinder No. GN0027222
 Cylinder Pressure (psi) 1800 Certified By Algas Inc.
 Certified Date 9-Feb-22 Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.20	-0.70	-0.70	101.00	1.00	1.00
2	200.00	198.50	-1.50	-0.75	201.30	1.30	0.65
3	300.00	298.50	-1.50	-0.50	301.20	1.20	0.40
4	400.00	398.10	-1.90	-0.30	401.50	1.50	0.38
AVERAGE (%)				-0.43			0.51



Calibrated By

(Mr. Jirawat Sakam)
Field Environmental Scientist (3)

Approved By

(Mr. Sanayuth Jitnanont)
Assistant General Manager

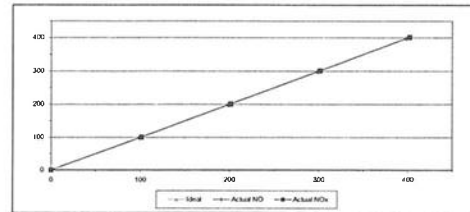
ALS Laboratory Group
FORM NO. F-06-056 REVISION NO. - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-24 Equipment Name NOx Analyzer
 Manufacturer HORIBA Model APNA-370
 Serial No. GEG32AB Equipment ID NKH_FS0084
 Calibrator Manufacturer Teledyne API Model 700
 Serial No. 947
 Std. Gas Concentration (PPM) 55.88 Cylinder No. GN0027222
 Cylinder Pressure (psi) 1800 Certified By Algas Inc.
 Certified Date 9-Feb-22 Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80	101.30	1.30	1.30
2	200.00	198.50	-1.50	-0.75	201.10	1.10	0.55
3	300.00	298.50	-1.50	-0.50	301.40	1.40	0.47
4	400.00	398.20	-1.80	-0.45	402.10	2.10	0.53
AVERAGE (%)				-0.48			0.59



Calibrated By

(Mr. Jirawat Sakam)
Field Environmental Scientist (3)

Approved By

(Mr. Sanayuth Jitnanont)
Assistant General Manager

ALS Laboratory Group
FORM NO. F-06-056 REVISION NO. - ISSUE DATE: 02/04/12



Accredited calibration laboratory
 MUKH JIRAJIT
 NO. 10/10/1005
 CHAMNONGKOT

Approved measurement laboratory
 Calibration services department

Calibration Number
 12345678

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM
 MANUFACTURER
 MODEL/TYPE

SERIAL NUMBER

REMARKS

CONDITIONS RECEIVED

CUSTOMER

RECEIVED DATE

MEASUREMENT DATE

DATE DATE

ENVIRONMENTAL CONDITIONS

Temperature

Relative Humidity

Atmospheric Pressure

PLACE OF CALIBRATION

CALIBRATION CONDITIONS

Preparation/Condition

Calibration of Results

Calibrated by

Approved by

Remarks

Notes

Comments

Signature

Date

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CERTIFICATE OF CALIBRATION

Page 1 of 3 Pages

MEASUREMENTS:
MANUFACTURER:
MODEL/TYPE:
SERIAL NUMBER:
DATE OF CALIBRATION:
BY:
CHECKED BY:
APPROVED BY:

RECEIVED DATE:
MEASUREMENT DATE:
ISSUE DATE:

ENVIRONMENTAL CONDITIONS:
Ambient temperature:
Relative humidity:

PLACE OF CALIBRATION:
Jirana Tee Associates Co., Ltd.

CALIBRATION CONDITION:
What liquid was used (if any):
Volume of liquid used (if any):
Diameter of liquid (if any):
Diameter of container (if any):

REMARKS:
Measurement Condition:

STABILITY OF RESULTS:
The table below gives the results of the stability test.

Calibrated by:
Checked by:
Approved by:

Remarks:
This certificate is valid for the period of 12 months from the date of calibration.
This certificate is valid for the period of 12 months from the date of calibration.

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE PERMISSION OF THE ISSUING ORGANIZATION.

CERTIFICATE OF CALIBRATION

Calibration No.: JAC-17-0002
Page 1 of 1 Pages

MEASUREMENTS:
MANUFACTURER:
MODEL/TYPE:
SERIAL NUMBER:
DATE OF CALIBRATION:
BY:
CHECKED BY:
APPROVED BY:

ENVIRONMENTAL CONDITIONS:
Ambient temperature:
Relative humidity:

REMARKS:
Measurement Condition:

STABILITY OF RESULTS:
The table below gives the results of the stability test.

Calibrated by:
Checked by:
Approved by:

Remarks:
This certificate is valid for the period of 12 months from the date of calibration.

Diameter (mm)	Standard Deviation (mm)	Uncertainty (mm)
50	0.004	0.004
80	0.004	0.004
100	0.004	0.004

Calibrated by:
Checked by:
Approved by:

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Calibration No.: JAC-17-0002
Page 2 of 2

Result of Calibration:
Calibration Range:

ENVIRONMENTAL CONDITIONS:
Ambient temperature:
Relative humidity:

Immersion Depth (mm)	Standard Deviation (mm)	Uncertainty (mm)
50	0.004	0.004
80	0.004	0.004
100	0.004	0.004

REMARKS:
Measurement Condition:

Calibrated by:
Checked by:
Approved by:

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE PERMISSION OF THE ISSUING ORGANIZATION.

Page 1 of 3 Pages

MEASUREMENTS:
MANUFACTURER:
MODEL/TYPE:
SERIAL NUMBER:
DATE OF CALIBRATION:
BY:
CHECKED BY:
APPROVED BY:

Wind Speed (m/s)	Temperature (°C)	Relative Humidity (%)
0.5	23.0	65
1.0	23.0	65
1.5	23.0	65
2.0	23.0	65
2.5	23.0	65
3.0	23.0	65
3.5	23.0	65
4.0	23.0	65
4.5	23.0	65
5.0	23.0	65
5.5	23.0	65
6.0	23.0	65
6.5	23.0	65
7.0	23.0	65
7.5	23.0	65
8.0	23.0	65
8.5	23.0	65
9.0	23.0	65
9.5	23.0	65
10.0	23.0	65
10.5	23.0	65
11.0	23.0	65
11.5	23.0	65
12.0	23.0	65
12.5	23.0	65
13.0	23.0	65
13.5	23.0	65
14.0	23.0	65
14.5	23.0	65
15.0	23.0	65
15.5	23.0	65
16.0	23.0	65

REMARKS:
Measurement Condition:

Calibrated by:
Checked by:
Approved by:



THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE PERMISSION OF THE ISSUING ORGANIZATION.

Page 2 of 3 Pages

MEASUREMENTS:
MANUFACTURER:
MODEL/TYPE:
SERIAL NUMBER:
DATE OF CALIBRATION:
BY:
CHECKED BY:
APPROVED BY:

Wind Speed (m/s)	Temperature (°C)	Relative Humidity (%)
0.5	23.0	65
1.0	23.0	65
1.5	23.0	65
2.0	23.0	65
2.5	23.0	65
3.0	23.0	65
3.5	23.0	65
4.0	23.0	65
4.5	23.0	65
5.0	23.0	65
5.5	23.0	65
6.0	23.0	65
6.5	23.0	65
7.0	23.0	65
7.5	23.0	65
8.0	23.0	65
8.5	23.0	65
9.0	23.0	65
9.5	23.0	65
10.0	23.0	65
10.5	23.0	65
11.0	23.0	65
11.5	23.0	65
12.0	23.0	65
12.5	23.0	65
13.0	23.0	65
13.5	23.0	65
14.0	23.0	65
14.5	23.0	65
15.0	23.0	65
15.5	23.0	65
16.0	23.0	65

REMARKS:
Measurement Condition:

Calibrated by:
Checked by:
Approved by:

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE PERMISSION OF THE ISSUING ORGANIZATION.

Calibration No.: JAC-17-0002
Page 3 of 3

CERTIFICATE OF CALIBRATION

MEASUREMENTS:
MANUFACTURER:
MODEL/TYPE:
SERIAL NUMBER:
DATE OF CALIBRATION:
BY:
CHECKED BY:
APPROVED BY:

ENVIRONMENTAL CONDITIONS:
Ambient temperature:
Relative humidity:

REMARKS:
Measurement Condition:

Calibrated by:
Checked by:
Approved by:

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE PERMISSION OF THE ISSUING ORGANIZATION.

Continuation of Calibration Certificate

Cert. No. : ACL23284
Job No. : VCM6AC0098
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
5000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.1	0.1
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Passed or deviation for each parameter,
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QE-1512-04-04-02664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23284
Job No. : VCM6AC0098
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
5000	0.0	0.0	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Imp	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SIM Display at initial (dB)	SIM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23284
Job No. : VCM6AC0098
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	100.0	107.9	-0.1	1.5 : 3.0
	2	8	117.0	117.0	0.0	1.0 : 2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 : 3.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 : 3.0
SEL	2	8	108.0	108.0	0.0	1.0 : 2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leqpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QE-1512-04-04-02664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23284
Job No. : VCM6AC0098
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC 61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For test results of each items were made by observation of each instrument's display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments:

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	17-0009-23	07-01-24
Waveform Generator	33511B	MY52302742	17-0010-23	07-01-24
Digital Multimeter	33461A	MY53220184	17-1107-23	13-01-24
Digital Multimeter	33461A	MY53220076	17-1107-23	13-01-24
Digital Multimeter	33461A	MY60024273	17-1107-23	14-01-24
Programmable Attenuator	MAT-1070	62169114	17-0111-23	06-01-24
Condenser Microphone	4189	2977900	AA-1001-23	14-01-24
Measuring Amplifier	NA-425X1	34504095	AA-3002-23	14-01-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibration item only.

3. This certificate is traceable to the international system of unit (SI) as follows:

2.1 National Institute of Metrology (Thailand).

2.2 Thailand Institute of Scientific and Technological Research (TISTR).

QE-1512-04-04-02664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23284
Job No. : VCM6AC0098
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
20.1

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

Frequency Weighting	Measured value (dB)
A-weight	15.1
C-weight	21.3
Flat	26.8

3. Acoustical signal tests of frequency weightings

Meter free field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.1	0.1	±1.5
1000	-0.1	-0.1	-0.1	±1.0
5000	1.4	1.5	1.5	±5.0

QE-1512-04-04-02664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23284
Job No. : VCM6AC0098
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
127.0	127.0	0.0	±1.1
126.0	126.0	0.0	±1.1
125.0	125.0	0.0	±1.1
124.0	124.0	0.0	±1.1
123.0	122.9	-0.1	±1.1
122.0	121.9	-0.1	±1.1
121.0	120.9	-0.1	±1.1
120.0	120.0	0.0	±1.1
119.0	119.0	0.0	±1.1
118.0	118.0	0.0	±1.1
117.0	117.0	0.0	±1.1
116.0	116.0	0.0	±1.1
115.0	115.0	0.0	±1.1
114.0	114.0	0.0	±1.1
113.0	113.0	0.0	±1.1
112.0	112.0	0.0	±1.1
111.0	111.0	0.0	±1.1
110.0	110.0	0.0	±1.1
109.0	109.0	0.0	±1.1
108.0	108.0	0.0	±1.1
107.0	107.0	0.0	±1.1
106.0	106.0	0.0	±1.1
105.0	105.0	0.0	±1.1
104.0	104.0	0.0	±1.1
103.0	103.0	0.0	±1.1
102.0	102.0	0.0	±1.1
101.0	101.0	0.0	±1.1
100.0	100.0	0.0	±1.1
99.0	99.0	0.0	±1.1
98.0	98.0	0.0	±1.1
97.0	97.0	0.0	±1.1
96.0	96.0	0.0	±1.1
95.0	95.0	0.0	±1.1
94.0	94.0	0.0	±1.1
93.0	93.0	0.0	±1.1
92.0	92.0	0.0	±1.1
91.0	91.0	0.0	±1.1
90.0	90.0	0.0	±1.1
89.0	89.0	0.0	±1.1
88.0	88.0	0.0	±1.1
87.0	87.0	0.0	±1.1
86.0	86.0	0.0	±1.1
85.0	85.0	0.0	±1.1
84.0	84.0	0.0	±1.1
83.0	83.0	0.0	±1.1
82.0	82.0	0.0	±1.1
81.0	81.0	0.0	±1.1
80.0	80.0	0.0	±1.1
79.0	79.0	0.0	±1.1
78.0	78.0	0.0	±1.1
77.0	77.0	0.0	±1.1
76.0	76.0	0.0	±1.1
75.0	75.0	0.0	±1.1

QE-1512-04-04-02664

T. Petch



Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : JUCM
Model : NL-42A/ Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 0322342 / 195375 / 15274
ID No. : NKU150115

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATHANAKAN 40, PHATHANAKAN ROAD,
KIWAENG PHATHANAKAN, KHUET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 20 OCTOBER 2023
Calibration Date : 01-02 NOVEMBER 2023
Date of Issue : 03 NOVEMBER 2023

Calibrated by : Nithakorn Pichatunai

Approved by : *T. Pichatunai*
(Thanakul Pichatunai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the local of Calibration Laboratory.

QI-TS12-04-01-02064

Continuation of Calibration Certificate

Cert. No. : ACL23330
Job No. : VC67AC0013
Pages : 3 of 8

Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Test burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QI-TS12-04-01-02064

T. Pichatunai

Continuation of Calibration Certificate

Cert. No. : ACL23330
Job No. : VC67AC0013
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
50	0.0	0.1	0.0	±2.0
125	0.0	0.0	0.1	±1.5
250	0.0	0.0	0.1	±1.5
500	0.0	0.0	0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Leq	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QI-TS12-04-01-02064

T. Pichatunai

Continuation of Calibration Certificate

Cert. No. : ACL23330
Job No. : VC67AC0013
Pages : 6 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.0	±1.5
89.6	89.9	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation providing a level of confidence of approximately 95%.

End of Calibration Certificate

QI-TS12-04-01-02064

T. Pichatunai

Continuation of Calibration Certificate

Cert. No. : ACL23330
Job No. : VC67AC0013
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For tests results of each item were made by observation of each instrument's display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33310A	MY548017075	ET-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	ET-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220164	ELU-109-20-0266	13-FEB-24
Digital Multimeter	33461A	MY53220876	ELU-109-20-0266	13-FEB-24
Digital Multimeter	33461A	MY60024273	ELU-109-21-0266	14-FEB-24
Programmable Attenuator	MAT-107D	62100114	IF-4011-23	08-FEB-24
Condenser Microphone	4130	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	24560495	AA-1002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :

- National Institute of Metrology (Thailand).
- Thailand Institute of Scientific and Technological Research (TISTR).

QI-TS12-04-01-02064

T. Pichatunai

Continuation of Calibration Certificate

Cert. No. : ACL23330
Job No. : VC67AC0013
Pages : 4 of 8

Result of calibration 1.

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A-weight	10.8
C-weight	16.9
Flat	22.6

3. Acoustical signal tests of frequency weightings

Mean free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	±1.5
1000	0.0	0.0	0.0	±1.0
3000	1.2	1.2	1.2	±5.0

QI-TS12-04-01-02064

T. Pichatunai

Continuation of Calibration Certificate

Cert. No. : ACL23370
Job No. : VC67AC0013
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 : -5.0
	2	8	117.0	117.0	0.0	1.0 : -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 : -5.0
	200	300	127.6	127.6	0.0	±1.0
	0.25	1	95.0	95.0	-0.1	1.5 : -5.0
SEL	2	8	108.0	108.0	0.0	1.0 : -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QH-TS12-04-04-02064

Continuation of Calibration Certificate

Cert. No. : ACL23330
Job No. : VC67AC0013
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.1	0.1	±1.1
136.0	136.1	0.1	±1.1
135.0	135.1	0.1	±1.1
134.0	134.1	0.1	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.1	0.1	±1.1
128.0	128.0	0.0	±1.1
119.0	119.1	0.1	±1.1
118.0	118.1	0.1	±1.1
109.0	109.1	0.1	±1.1
108.0	108.1	0.1	±1.1
99.0	99.1	0.1	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1
4.0	4.0	0.0	±1.1

QH-TS12-04-04-02064

455-03171 Solichon Rd, Bangkhuang, Bangkok 10700 THAILAND
Tel: 0-2433-8020 Fax: 0-2433-1079 e-mail: cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL23154
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : KION
Model : NI-422 Microphone UC-32 / Preamplifier NI-34
Serial No. : 00371916 / 169100 / 72348
ID No. : NKH JS0003

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PIATTHANAKAN RD, PIATTHANAKAN ROAD,
KIWAENG PIATTHANAKAN, KHUET SUAN I UANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %
Received Date : 05 MAY 2023
Calibration Date : 10-16 MAY 2023
Date of Issue : 17 MAY 2023

REVIEW BY : *[Signature]*
APPROVED BY : *[Signature]*
NEXT CAL DATE : 10/6/24

Calibrated by : Nattakorn Pongpulan

Approved by : *[Signature]*
(Thanakul Petchum)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QH-TS12-04-04-02064

Continuation of Calibration Certificate

Cert. No. : ACL23330
Job No. : VC67AC0013
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (JB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.5	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	127.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k = 2 or any value (following calculation) providing a level of confidence of approximately 95 %

End of Calibration Certificate

QH-TS12-04-04-02064

Continuation of Calibration Certificate

Cert. No. : ACL23154
Job No. : VC66AC0052
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

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Continuation of Calibration Certificate

Cert. No. : ACL23154
Job No. : VC66AC0052
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC 61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests in Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments. For test results of each item were made by observation of each instrument display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	IS-0009-23	07-FEB-24
Waveform Generator	33511B	MY52202742	IEF-0010-23	07-FEB-24
Digital Multimeter	31461A	MY5320104	EEL-IMP 30-0266	13-FEB-24
Digital Multimeter	32461A	MY53220076	EEL-IMP 20-0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-IMP 51-0266	14-FEB-24
Programmable Attenuator	MA1-1070	62100114	IS-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	24506495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Cert. No. : ACL23154
Job No. : VC66AC0052
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Eq	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QH-TS12-04-04-020664

T. P. A.

Cert. No. : ACL23154
Job No. : VC66AC0052
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Time burst response

Time Weighting	Burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5, -5.0
	2	8	117.0	116.9	-0.1	1.0, -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5, -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5, -5.0
NPL	2	8	108.0	108.0	0.0	1.0, -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	126.4	126.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QH-TS12-04-04-020664

T. P. A.

451-451/15 Soonthorn Rd., Bangphayung, Bangkok 10700 THAILAND
Tel: 0-2435-4300 Fax: 0-2433-1679 e-mail: cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL23153
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 Microphone UC-52 Pre-amplifier NH-24
Serial No. : 00371915 / 169114 / 72240
ID No. : NRH-FS0002

Condition As Found : GOOD

Customer : A.S. LABORATORY GROUP (THAILAND) CO., LTD.
101 PIATTHANAKAN 40, PIATTHANAKAN ROAD,
KHUANG PIATTHANAKAN, KHUET SUAN LUANG
BANGKOK, 10250 THAILANDLocation :
Ambient Temperature : (23.0 ± 3.1) °C
Pressure : (101.3 ± 3.3) kPa
Relative Humidity : (50.0 ± 20) %
Received Date : 05 MAY 2023
Calibration Date : 10-16 MAY 2023
Date of Issue : 17 MAY 2023REVIEW BY : *Thanaul Peichandi*
APPROVED BY : *T. P. A.*
NEXT CAL DATE : 10/16/24

Calibrated by : Thanaul Peichandi

Approved by : *T. P. A.*
(Thanaul Peichandi)This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced
other than in full, except with the prior written approval of the head of Calibration Laboratory.

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Cert. No. : ACL23154
Job No. : VC66AC0052
Pages : 4 of 8

Result of Calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A-weight	11.6
C-weight	17.4
Flat	23.1

3. Acoustical signal tests of frequency weightings

Meter free-field response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	±1.5
1000	0.2	0.2	0.2	±1.0
8000	1.2	1.3	1.3	±3.0

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T. P. A.

Cert. No. : ACL23154
Job No. : VC66AC0052
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.1	0.1	±1.1
136.0	136.1	0.1	±1.1
135.0	135.1	0.1	±1.1
134.0	134.1	0.1	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.1	0.1	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.1	0.1	±1.1
104.0	104.1	0.1	±1.1
99.0	99.1	0.1	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	29.9	-0.1	±1.1
29.0	29.0	0.0	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.9	-0.1	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

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Job No. : VC66AC0052
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.0	±4.5
89.6	89.6		

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	127.0	127.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QH-TS12-04-04-020664

T. P. A.

CALIBRATION LABORATORY
Continuation of Calibration CertificateCert. No. : ACL23153
Job No. : VC66AC0052
Pages : 3 of 8

Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 10 kHz	✓	-	0.3	0.6
For > 10 kHz to 20 kHz	✓	-	0.3	0.7
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum permitted uncertainty of measurement.

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~ P.T.A.

CALIBRATION LABORATORY
Continuation of Calibration CertificateCert. No. : ACL23153
Job No. : VC66AC0052
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4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
1 sec	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SI-M Display at initial (dB)	SI-M Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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CALIBRATION LABORATORY
Continuation of Calibration CertificateCert. No. : ACL23153
Job No. : VC66AC0052
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Th (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 : -0.0
	2	8	117.0	117.0	0.0	1.0 : -2.5
	200	300	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.2 : -5.0
	200	300	127.6	127.6	0.0	±1.0
	0.25	1	99.0	99.9	-0.1	1.2 : -5.0
SEL	2	8	108.0	108.0	0.0	1.0 : -2.5
	200	300	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.1	135.1	-0.3	±2.0
Negative half cycle	135.1	135.1	-0.3	±2.0

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~ P.T.A.

CALIBRATION LABORATORY
Continuation of Calibration CertificateCert. No. : ACL23153
Job No. : VC66AC0052
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Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC 61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference
Standard Instruments.

For test results of each item were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instruments	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	IE-0009-23	07-FEB-24
Waveform Generator	33511J	MY53220742	IE-0010-23	07-12B-24
Digital Multimeter	33461A	MY53220104	IE1-1JP-300266	13-12B-24
Digital Multimeter	33461A	MY53220076	IE1-1JP-290266	13-12B-24
Digital Multimeter	34461A	MY60024273	IE1-1JP-310266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	IE-0011-23	08-FEB-24
Condenser Microphone	4180	29779001	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the International system of units maintained at :

1. National Institute of Metrology (Thailand).
2. Thailand Institute of Scientific and Technological Research (TISTR).

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CALIBRATION LABORATORY
Continuation of Calibration CertificateCert. No. : ACL23153
Job No. : VC66AC0052
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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.0 (93.5dB)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.4

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

Frequency Weighting	Measured value (dB)
A-weight	16.8
C-weight	17.1
Flat	22.8

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	±1.5
1000	0.0	0.0	0.0	±1.0
3000	0.0	0.0	0.0	±5.0

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Job No. : VC66AC0052
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	29.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

QH-TS12-04-04-020664

~ P.T.A.

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

451-451/1 Srinakharin Rd, Banghuan, Bangkok 10700 THAILAND
Tel: 0-2435 8800 Fax: 0-2435 1679 e-mail: center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL23283
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-427 Microphone 1K / 2 Pre-amplifier N1 24
Serial No. : 06472124 / 172104 / 72458
ID No. : NK11 TS0008

Condition As Found : GOOD

Customer : AISI LABORATORY GROUP (THAI) CO., LTD.
104 PHATHANAKAN 50, PHATHANAKAN ROAD,
KHUANG PHATHANAKAN, KHET SUAN LUANG
BANGKOK, 10250 THAILAND

Location : -
Ambient Temperature : 1 23.0 ± 3.3 °C
Pressure : 1 101.3 ± 3.3 kPa
Relative Humidity : 1 50.0 ± 2.0 %

Received Date : 28 AUGUST 2023
Calibration Date : 05 SEPTEMBER 2023
Date of Issue : 13 SEPTEMBER 2023

Calibrated by : Nakhorn Pongpan

Approved by : T. Petcha
(Thanakul Petcha)

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QI-TS12-04-04-02064

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23283
Job No. : VC66AC0098
Pages : 3 of 8

Summary of Measurement Results

Parameter	Pass	Fail	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz				
Fast - term stability	✓	-	0.2	0.2
Long - term stability	✓	-	0.1	0.1
6. Level linearity on the reference level range	✓	-	0.2	0.3
7. Level linearity including the level range control	✓	-	0.2	0.3
8. True burst response	✓	-	0.2	0.3
9. Peak C-weight level	✓	-	0.2	0.35
10. Overload indication	✓	-	0.2	0.25
11. Overload recovery	✓	-	0.1	0.1
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum permitted uncertainty of measurement.

QI-TS12-04-04-02064

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23283
Job No. : VC66AC0098
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.1	0.1	±1.5
250	0.1	0.1	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Long	94.0	94.0	0.0	±0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.1	0.1	±0.3

QI-TS12-04-04-02064

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23283
Job No. : VC66AC0082
Pages : 8 of 8

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	89.8	0.3
Negative one-half cycle	89.8	0.3

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QI-TS12-04-04-02064

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23283
Job No. : VC66AC0098
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC 61672-3 (2013) standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with A-weight chamber and Reference Standard Instruments.

For test results of each item were made by observation of each instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY48017076	11-0009-23	07 FEB-24
Waveform Generator	33511B	MY5202742	03-0010-23	07 FEB-24
Digital Multimeter	33461A	MY5320104	EET-10P 3010266	13 FEB-24
Digital Multimeter	33461A	MY5320075	EET-10P 29 0266	13 FEB-24
Digital Multimeter	33461A	MY6002423	EET-10P 31 0266	14 FEB-24
Programmable Attenuator	MAF-1070	62100114	FP-0011-23	08 FEB-24
Condenser Microphone	4180	2977909	AA-1001-23	14 FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14 FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the International system of unit maintained at :

3.1 National Institute of Metrology (NIM) of Thailand.

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23283
Job No. : VC66AC0098
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A-weight	11.3
C-weight	17.6
Flat	21.4

3. Acoustical signal tests of frequency weightings

Meter free field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	±1.5
1000	-0.1	-0.1	-0.1	±1.0
8000	-0.4	-0.3	-0.3	±5.0

QI-TS12-04-04-02064

Continuation of Calibration Certificate

Cert. No. : ACL23283
Job No. : VC66AC0098
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.0

9. Tone burst response

Time Weighting	Time burst duration, 10 (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	±1.5 / ±5.0
	2	8	117.0	117.0	0.0	±1.0 / ±2.5
	200	300	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	±1.5 / ±5.0
	200	300	127.6	127.6	0.0	±1.0
	0.25	1	99.0	99.9	0.1	±1.5 / ±5.0
SFL	2	8	108.0	108.0	0.0	±1.0 / ±2.5
	200	300	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	130.4	135.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

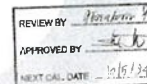
QF-TS12-04-04-020664

451-451/1 Sithiporn Rd, Bangbunmi, Bangkok 10700 THAILAND
Tel:0-2435-8800 Fax:0-2433-1879 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL23152
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NR-42 / Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 00771914 / 169100 / 7225
ID No. : NRH P50001

Condition As Found : GOOD

Customer : AIS LABORATORY GROUP (THAILAND) CO., LTD
104 PHATHANAKAN 40, PHATHANAKAN ROAD,
KHWABANG PHATHANAKAN, KHEET SUAN 1 DANG,
BANGKOK, 10250 THAILAND.Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %Received Date : 05 MAY 2023
Calibration Date : 10-16 MAY 2023
Date of Issue : 17 MAY 2023

Calibrated by : Pongsakorn Pongpisan

Approved by : T. Petchai
(Thanakul Petchai)This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced
other than in full, except with the prior written approval of the head of Calibration Laboratory.

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23152
Job No. : VC66AC0098
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.3	N/A
2. Self-generated noise	✓	-	0.3	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.7
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum permitted uncertainty of measurement.

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23283
Job No. : VC66AC0098
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
157.0	157.0	0.0	±1.1
156.0	156.0	0.0	±1.1
155.0	155.0	0.0	±1.1
154.0	154.0	0.0	±1.1
153.0	153.0	0.0	±1.1
152.0	152.0	0.0	±1.1
151.0	151.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.1	0.1	±1.1
27.0	27.0	0.0	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23283
Job No. : VC66AC0098
Pages : 8 of 8

11. Overload Indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	89.6	0.1
89.5	89.6	0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k = 2
or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23152
Job No. : VC66AC0098
Pages : 3 of 8

Calibration Procedure : UT-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weightings with Acoustic chamber and Reference Standard Instruments.
For tests results of each item were made by observation of each instrument display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY48017076	13-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	13-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	13-1107-23	13-FEB-24
Digital Multimeter	33461A	MY53220076	13-1107-23	13-FEB-24
Digital Multimeter	34461A	MY60034273	13-1107-23	14-FEB-24
Programmable Attenuator	NAT-1070	62100114	EF-0011-23	06-FEB-24
Condenser Microphone	4138	2977980	AA-1001-23	14-FEB-24
Noising Amplifier	NA-423AE	34560405	AA-3053-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23152
Job No. : VC66AC0852
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Leq	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SIM Display at initial (dB)	SIM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QH-1512-04-04-020604

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23152
Job No. : VC66AC0852
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Th (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5, -5.0
	2	8	117.0	117.0	0.0	1.0, -2.5
	200	800	134.0	134.0	0.0	±0.0
Slow	2	8	108.0	108.0	0.0	1.5, -5.0
	200	800	127.6	127.6	0.0	±0.0
	0.25	1	99.0	98.9	-0.1	1.5, -5.0
SEL	2	8	108.0	108.0	0.0	1.0, -2.5
	200	800	128.0	128.1	0.1	±0.0

10. Peak C-weight level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leq (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QH-1512-04-04-020604

T. R. R.

401/402/10th Floor, 10th Floor, 10th Floor, 10th Floor, 10th Floor
Tel : 02-7333 8338 Email : sithiporn@thai.comCert. No. : ACL24123
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Piezophila NH-24
Serial No. : 00371914 / 169110 / 72255
ID No. : NKL F30001

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAI) AND CO., LTD.
104 PHATHANAKAN-RD, PHATHANAKAN ROAD,
KHWAENG PHATHANAKAN, KITEJ SUAN LUANG,
BANGKOK, 10250 THAILANDLocation :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 2.0) %Received Date : 12 APRIL 2024
Calibration Date : 02-03 MAY 2024
Date of Issue : 06 MAY 2024

Calibrated by : Naitheem Pongpanan

Approved by : T. R. R.
(Thanaikul Pongpanan)This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard. may not be reproduced
other than in full, except with the prior written approval of the head of Calibration Laboratory.

Continuation of Calibration Certificate

Cert. No. : ACL23152
Job No. : VC66AC0852
Pages : 4 of 8

Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.9dB)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

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

Frequency Weighting (dB)	Measured value (dB)
A-weight	9.9
C-weight	16.1
Flat	21.9

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-0.3	-0.3	-0.4	±1.5
1000	0.0	0.0	0.0	±1.0
2000	-0.3	-0.7	-0.7	±5.0

QH-1512-04-04-020604

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23152
Job No. : VC66AC0852
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.1	0.1	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
29.0	29.0	0.0	±1.1
24.0	24.1	0.1	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1
4.0	4.0	0.0	±1.1

QH-1512-04-04-020604

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23152
Job No. : VC66AC0852
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.1	±1.5

12. High level stability

Frequency Weighting	SIM Display at initial (dB)	SIM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QH-1512-04-04-020604

T. R. R.



Summary of Measurement Result:

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
5000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For >4 kHz to 10 MHz	0.3	0.7
For >10 MHz to 20 MHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Fast burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High-level stability	0.1	0.1

T. Petch



4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	-0.1	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Leq	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

T. Petch



8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	106.0	107.0	-0.1	1.5 : -5.0
	2	8	117.0	117.0	0.0	1.0 : -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	106.0	106.0	0.0	1.5 : -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	99.0	-0.1	1.5 : -5.0
SEL	2	8	106.0	106.0	0.0	1.0 : -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.6	-0.8	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

T. Petch



Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For tests result of each item were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	LI-0809-4	05-11-25
Waveform Generator	33511B	MY52307342	ET-08-07-24	05-11-25
Display Multimeter	33461A	MY53220104	EEL_HP_21-02-07	15-10-25
Display Multimeter	33461A	MY53220076	EEL_HP_20-02-07	15-10-25
Display Multimeter	33461A	MY60024232	EEL_HP_22-02-07	15-11-25
Programmable Attenuator	MAV-1070	02100114	LI-0608-24	05-07-25
Condenser Microphone	4180	2977900	AA-1901-24	12-11-25
Measuring Amplifier	NA-42KAI	34560495	AA-2001-24	05-11-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand),
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

T. Petch



Result of Calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.9)	93.9	0.0	±0.1

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

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

Frequency Weighting	Measured value (dB)
A-weight	9.9
C-weight	16.1
Flat	21.9

3. Acoustical signal tests of frequency weightings

Make free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-0.9	-0.8	-0.8	±5.0

T. Petch



7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.6	135.6	0.0	±1.1
135.0	135.0	0.0	±1.1
133.0	132.9	-0.1	±1.1
132.0	131.9	-0.1	±1.1
131.6	130.9	-0.7	±1.1
129.0	128.9	-0.1	±1.1
125.6	125.9	0.3	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
105.0	104.0	-1.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.1	0.1	±1.1
30.0	30.2	0.2	±1.1
29.0	29.2	0.2	±1.1
25.0	25.3	0.3	±1.1
22.0	22.4	0.4	±1.1
20.0	20.4	0.4	±1.1
25.0	25.5	0.5	±1.1

T. Petch

Cert. No. : ACL24124
Job No. : VC67AC0079
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
Fast	0.25	1	108.0	107.9	-0.1	1.5, -5.0
	2	8	117.0	117.0	0.0	1.0, -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5, -5.0
	200	800	127.6	127.6	0.0	±1.0
SRL	0.25	1	99.0	99.9	+0.1	1.5, -5.0
	2	8	108.0	108.0	0.0	1.0, -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, 1 cycle (dB)	Deviated Value (dB)	Acceptance Limits
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

T. Petch

Cert. No. : ACL24125
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NI-42 / Microphone UC-52 / Pre-amplifier NI-124
Serial No. : 00371916 / 169103-72248
ID No. : NK1 JS0603

Condition As Found : GOOD

Customer : AI S I LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN 40, PHATTANAKAN ROAD,
KHUANG PHATTANAKAN, KHET SUAN LUANG,
HANGKOK, 10259 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 12 APRIL 2024
Calibration Date : 02-03 MAY 2024
Date of Issue : 06 MAY 2024

Calibrated by : Nubhorn Prapaisan

Approved by :
T. Petch
(Thanaol Petchai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

End of Calibration Certificate

Cert. No. : ACL24125
Job No. : VC67AC0079
Pages : 3 of 8

Summary of Measurement Results:

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.1	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

T. Petch

Cert. No. : ACL24124
Job No. : VC67AC0079
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	33.9	-0.1	±1.1
29.0	29.9	+0.1	±1.1
24.0	23.9	-0.1	±1.1
19.0	18.9	-0.1	±1.1
14.0	13.9	-0.1	±1.1
9.0	8.9	-0.1	±1.1
4.0	3.9	-0.1	±1.1

T. Petch

Cert. No. : ACL24124
Job No. : VC67AC0079
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation providing a level of confidence of approximately 95 %

Cert. No. : ACL24125
Job No. : VC67AC0079
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on JIS C-6167-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For tests results of each item were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017676	UF-0008-4	05-FEB-25
Waveform Generator	33511B	MY52102742	ED-0007-21	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEI-HP 2140267	15-FEB-25
Digital Multimeter	33461A	MY53220076	EEI-HP 2040267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEI-HP 2240267	15-FEB-25
Programmable Attenuator	MAX-1070	62100114	UF-0008-24	05-FEB-25
Condenser Microphone	4180	24779600	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

2. This result of calibration was found accurate as shown on site and place of calibration for this calibrated item only.

3. This certificate is acceptable to the international system of unit maintained at:

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
9000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Eq	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

T. Rattan

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	106.0	107.9	-0.1	1.5; -5.0
	2	8	112.0	117.0	0.0	1.0; -2.5
	200	300	134.0	134.0	0.0	±1.0
Slow	0.25	1	106.0	108.0	0.0	1.5; -5.0
	2	8	106.0	108.0	0.0	1.5; -5.0
	200	300	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5; -5.0
	2	8	105.0	105.0	0.0	1.0; -2.5
	200	300	128.0	128.0	0.0	±1.0

10. Peak Channel level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, 1 cycle (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
Dir	136.4	135.8	-0.6	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

T. Rattan

Certificate of Calibration

Customer : A15 (Sanyo Group) Ltd Co., Ltd.
Name : A15 (Sanyo Group) Ltd Co., Ltd.
Address : 104/104 Pongkarn Road, Bangkok 10250
Certificate No. : 24/12/2024
Request No. : POC2024024

Unit Under Calibration Details

Measurement : Sound Level Meter
Manufacturer : K006
Model : 94-42
Serial Number : 0000007
ID : N90, 150004
Resolution : 0.1 dB
Instrument Status : Good

Calibration Environment and Details

Temperature : 23.0 ± 0.2 °C
Humidity : 55% RH ± 2.0% RH
Pressure : 1013 hPa ± 0.1 hPa
Received Date : 20 December 2023
Calibrated Date : 20 January 2024
Calibration Facility : Sanyo Group (P.O. Box 104) based on IEC 61672-1, 2003 Electroacoustics - Sound level meters - Part 1: Precision instruments
Traceability of Calibration : Full Automatic

Instrument	Brand	Model	S/N	Recalibration	Stability
Standard Microphone	GRAS	40BN	10073	21 August 2023	±0.05%
Reference Frequency Calibrator	Sony	GC-60	87-00000000	25 July 2023	±0.1
Audio Calibrator	Sony	SC-600	314	19 October 2023	±0.1/1 year

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

Calibrated by : JRM
Mr. Suphachai Loochai
Senior Calibration Engineer

Approved by : JRM
Mr. Pongkarn Ratanaporn
Calibration Manager
Issue Date : 20 January 2024

The validity period of this certificate is 12 months from the date of issue. This certificate is valid only for the purpose stated and is not valid for any other purpose without the written approval of the issuing laboratory.

Result of Calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

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

Frequency Weighting	Measured value (dB)
A-weight	10.0
C-weight	17.1
Flat	23.0

3. Acoustical signal tests of frequency weightings

Free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.0	0.0	±1.5
1000	-0.1	-0.1	-0.1	±1.0
2000	0.0	0.0	0.0	±5.0

T. Rattan

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	53.9	-0.1	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	38.9	-0.1	±1.1
34.0	33.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
24.0	23.8	-0.2	±1.1
19.0	18.9	-0.1	±1.1
14.0	13.9	-0.1	±1.1
9.0	8.9	-0.1	±1.1
4.0	3.9	-0.1	±1.1

T. Rattan

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k = 2, or any value following calibration providing a level of confidence of approximately 95%.

End of Calibration Certificate

T. Rattan

Certificate No : 24/SLM421
 Request No : Req2023-2674

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

EUC Setting	Deviation from reference frequency	UNCERTAINTY	Acceptance
EAST / A / 30-130	Weighting Response curve	(± 0.01)	Limit
STD Setting	A (dB)	(± 0.01)	(± 0.01)
125 Hz	0.0	0.0	1.5
250 Hz	0.0	0.0	1.5
500 Hz	0.0	0.0	1.5
1000 Hz	0.0	0.0	1.5
2000 Hz	0.0	0.0	2.0
4000 Hz	0.0	0.0	2.0
8000 Hz	0.1	0.1	3.0
16000 Hz	-1.5	-1.4	4.5

EUC Setting	210	Measured	UNCERTAINTY	Acceptance
EAST / 30-130	UUC	UUC	(± 0.01)	Limit
EUC Weighting	(dB)	(dB)	(± 0.01)	(± 0.01)
A	110.0	110.0	0.0	0.20
C	110.0	110.0	0.0	0.20
Z	110.0	110.0	0.0	0.20

EUC Setting	STD	Measured	UNCERTAINTY	Acceptance
30-130 / A	REF	UUC	(± 0.01)	Limit
EUC Time Response	(dB)	(dB)	(± 0.01)	(± 0.01)
Fast	110.0	110.0	0.0	0.20
Slow	110.0	110.0	0.0	0.20
Eq	110.0	110.0	0.0	0.20

The results listed only are for reference. The certificate shall not be reproduced except in full, without written approval of the Issuing Body in writing.
 PUSAT KUALITI DAN KALIBRASI BERKUALITI ISO 9001:2015

Certificate No : 24/SLM421
 Request No : Req2023-2674

9. Level linearity including the level range control

EUC Setting	STD	Measured	UNCERTAINTY	Acceptance
EAST / A	REF	UUC	(± 0.01)	Limit
EUC Range	(dB)	(dB)	(± 0.01)	(± 0.01)
20-120	20.0	20.0	0.0	1.5
	110	110.0	0.0	1.5

10. Time burst response

EUC Setting	STD	Measured	UNCERTAINTY	Acceptance
A / 30-130	(dB)	UUC	(± 0.01)	Limit
EUC Time Response	(dB)	(dB)	(± 0.01)	(± 0.01)
Fast	20.0	20.0	0.0	1.5
Slow	20.0	20.0	0.0	1.5
Eq	20.0	20.0	0.0	1.5

11. Peak C signal level

EUC Setting	STD	Measured	UNCERTAINTY	Acceptance
EAST / A / 30-130	REF	UUC	(± 0.01)	Limit
STD Setting	(dB)	(dB)	(± 0.01)	(± 0.01)
Complete cycle	110.0	110.0	0.0	0.20
Positive half cycle	110.0	110.0	0.0	0.20
Negative half cycle	110.0	110.0	0.0	0.20

The results listed only are for reference. The certificate shall not be reproduced except in full, without written approval of the Issuing Body in writing.
 PUSAT KUALITI DAN KALIBRASI BERKUALITI ISO 9001:2015

Cert. No.: ACL23285
 Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
 Manufacturer : RION
 Model : NI-42 Microphone UC-52 Pre-amplifier NH-24
 Serial No : 0173614 / 122176 / 14026
 ID No: NK01 J89027

Condition As Found : GOOD

Customer : AIS LABORATORY GROUP (THAI) AND CO., LTD.
 104 PHATHANAKAN ROAD, PHATHANAKAN ROAD,
 KHAOW PHATHANAKAN KHU THUAN LUANG,
 BANGKOK, 10250 THAILAND

Location :
 Ambient Temperature : (23.0 \pm 3.3) °C
 Pressure : (101.3 \pm 3.3) kPa
 Relative Humidity : (58.0 \pm 2.0) %

Received Date : 28 AUGUST 2023
 Calibration Date : 06 SEPTEMBER 2023
 Date of Issue : 13 SEPTEMBER 2023

Calibrated by : Natchanon Panchanavan

Approved by : T. Petch
 (Thanukul Petchurai)

This certificate is issued in accordance with the requirement of ISO/IEC 17025 standard, may not be reproduced
 other than in full, except with the prior written approval of the head of Calibration Laboratory.

Q8-S12-04-02-001

Certificate No : 24/SLM421
 Request No : Req2023-2674

1. Indication at the calibration check frequency

EUC Setting	Measured	Before Adjust	After Adjust	UNCERTAINTY	Acceptance
EAST / A / 30-130	Level	UUC	UUC	(± 0.01)	Limit
Calibration Setting	(dB)	(dB)	(dB)	(± 0.01)	(± 0.01)
1000 Hz 110.0	110.75	110.7	110.8	0.02	0.20

Note : A/Diode as a safety is explained by the use of Sound Calibrator Model 9418A, Model SV 54, Model 9407

2. Self-generated noise, Microphone installed

EUC Setting	Measured	UNCERTAINTY
EAST / 30-130	UUC	(± 0.01)
EUC Weighting	(dB)	(± 0.01)
A	10.9	0.10

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

EUC Setting	Measured	UNCERTAINTY
EAST / 30-130	UUC	(± 0.01)
EUC Weighting	(dB)	(± 0.01)
A	11.1	0.10
C	11.0	0.10
Z	11.0	0.10

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

EUC Setting	Deviation from reference frequency	UNCERTAINTY	Acceptance
EAST / A / 30-130	Weighting Response curve	(± 0.01)	Limit
STD Setting	A (dB)	(± 0.01)	(± 0.01)
125 Hz	0.0	0.0	1.5
250 Hz	0.0	0.0	1.5
500 Hz	0.0	0.0	1.5
1000 Hz	0.0	0.0	1.5
2000 Hz	0.0	0.0	2.0
4000 Hz	0.0	0.0	2.0
8000 Hz	0.1	0.1	3.0
16000 Hz	-1.5	-1.4	4.5

The results listed only are for reference. The certificate shall not be reproduced except in full, without written approval of the Issuing Body in writing.
 PUSAT KUALITI DAN KALIBRASI BERKUALITI ISO 9001:2015

Certificate No : 24/SLM421
 Request No : Req2023-2674

2. Using Term Stability

EUC Setting	Measured	UNCERTAINTY	Acceptance
EAST / A / 30-130	UUC	(± 0.01)	Limit
STD Setting	(dB)	(± 0.01)	(± 0.01)
Fast	110.0	0.0	0.20
Slow	110.0	0.0	0.20
Eq	110.0	0.0	0.20

8. Level linearity on the reference level range

EUC Setting	STD	Measured	UNCERTAINTY	Acceptance
EAST / A / 30-130	REF	UUC	(± 0.01)	Limit
STD Setting	(dB)	(dB)	(± 0.01)	(± 0.01)
20-120	20.0	20.0	0.0	1.5
110	110.0	110.0	0.0	1.5
125 Hz	0.0	0.0	0.0	1.5
250 Hz	0.0	0.0	0.0	1.5
500 Hz	0.0	0.0	0.0	1.5
1000 Hz	0.0	0.0	0.0	1.5
2000 Hz	0.0	0.0	0.0	2.0
4000 Hz	0.0	0.0	0.0	2.0
8000 Hz	0.1	0.1	0.1	3.0
16000 Hz	-1.5	-1.4	-1.4	4.5

The results listed only are for reference. The certificate shall not be reproduced except in full, without written approval of the Issuing Body in writing.
 PUSAT KUALITI DAN KALIBRASI BERKUALITI ISO 9001:2015

Certificate No : 24/SLM421
 Request No : Req2023-2674

12. Overload indication

EUC Setting	Measured	UNCERTAINTY	Acceptance
EAST / A / 30-130	UUC	(± 0.01)	Limit
STD Setting	(dB)	(± 0.01)	(± 0.01)
Fast	110.0	0.0	0.20
Slow	110.0	0.0	0.20
Eq	110.0	0.0	0.20

13. High Level Stability

EUC Setting	Measured	UNCERTAINTY	Acceptance
EAST / A / 30-130	UUC	(± 0.01)	Limit
STD Setting	(dB)	(± 0.01)	(± 0.01)
Fast	110.0	0.0	0.20
Slow	110.0	0.0	0.20
Eq	110.0	0.0	0.20

Function	Maximum-permitted Uncertainty of normal control
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings in 30-130 Hz	0.05 dB
5. Acoustic signal test of frequency weightings in 10-130 Hz	0.20 dB
6. Acoustic signal test of frequency weightings in 10-130 Hz	0.20 dB
7. Level linearity on the reference level range	0.20 dB
8. Frequency and time weightings at 1 kHz	0.20 dB
9. Time burst response	0.20 dB
10. Level linearity on the reference level range	0.20 dB
11. Peak C signal level	0.20 dB
12. Overload indication	0.20 dB
13. High Level Stability	0.20 dB

Acceptance limit and Maximum-permitted uncertainty are in accordance with ISO/IEC 17025:2017

End of Certificate

The results listed only are for reference. The certificate shall not be reproduced except in full, without written approval of the Issuing Body in writing.
 PUSAT KUALITI DAN KALIBRASI BERKUALITI ISO 9001:2015

Continuation of Calibration Certificate

Cert. No. : ACL23285
Job No. : VC66AC0098
Pages : 3 of 8

Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
500 Hz	✓	-	0.3	0.6
800 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity via the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Time band response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.25
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	

Note : Pass / Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum permitted uncertainty of measurement.

QI-TS12-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23285
Job No. : VC66AC0098
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2500	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
10000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Leq	94.0	94.0	0.0	±0.1

5. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23285
Job No. : VC66AC0098
Pages : 6 of 8

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	99.6	0.0
Negative one-half cycle	99.6	0.0

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QI-TS12-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23285
Job No. : VC66AC0098
Pages : 3 of 8

Calibration Procedure : CPAC-01

Calibration Method :

This equipment was calibrated by based on ISO-61672-2 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For test results of each item were made by observation of each instrument display and also with SLM display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY6007076	11-0009-23	07-11-24
Waveform Generator	33511B	MY5230747	11-0010-23	07-11-24
Digital Multimeter	12461A	MY5322104	11-1110-20266	13-11-24
Digital Multimeter	73461A	MY5322076	11-1110-20266	11-11-24
Digital Multimeter	33401A	MY6002423	11-1110-21266	14-11-24
Programmable Attenuator	MAX11070	62100114	11-0011-23	06-11-24
Condenser Microphone	4180	2977000	AA-1101-23	14-11-24
Measuring Amplifier	NA-421A1	3450495	AA-3002-23	14-11-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is inescapable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QI-TS12-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23285
Job No. : VC66AC0098
Pages : 4 of 8

Result of Calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.1

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

Frequency Weighting	Measured value (dB)
A-weight	12.0
C-weight	18.1
Flat	24.0

3. Acoustical signal tests of frequency weightings

Meter free field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.0	0.0	±1.5
1000	-0.1	-0.1	-0.1	±1.0
10000	0.3	0.4	0.4	±5.0

QI-TS12-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23285
Job No. : VC66AC0098
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±1.1

9. Time band response

Time Weighting	Time band duration, Th (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 : -5.0
	2	8	117.0	117.0	0.0	1.0 : -2.5
	200	800	134.0	134.1	0.1	±0.6
Slow	2	8	108.0	108.0	0.0	1.5 : -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 : -5.0
SEL	2	8	108.0	108.0	0.0	1.0 : -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	135.0	135.0	0.0	±2.0
One cycle	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	135.0	135.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QI-TS12-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23282
Job No. : VC66AC0098
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests on Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.
For each results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Use Date
Waveform Generator	33210A	MY48017076	ET-0009-23	07-11-24
Waveform Generator	33511B	MY52502742	ET-0010-23	07-11-24
Digital Multimeter	33461A	MY53220108	EEL-09-20-0266	13-11-24
Digital Multimeter	33461A	MY53220976	EEL-09-20-0266	13-11-24
Digital Multimeter	34461A	MY60624223	EEL-09-21-0266	14-11-24
Programmable Attenuator	MA1-1070	62100114	ET-0011-23	08-11-24
Condenser Microphone	4180	2077900	AA-1003-23	14-11-24
Measuring Amplifier	NA-42KAI	34560495	AA-1002-22	14-11-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of units maintained at:

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QH-TS12-04-04-0266-1

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23282
Job No. : VC66AC0098
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.4

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

Frequency Weighting	Measured value (dB)
A-weight	13.8
C-weight	20.1
Flat	25.7

3. Acoustical signal tests of frequency weightings

Mean free field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.1	0.0	±1.5
1000	-0.1	-0.1	-0.1	±1.0
3000	0.1	0.2	0.2	±5.0

QH-TS12-04-04-0266-1

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23282
Job No. : VC66AC0098
Pages : 5 of 8

3. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	53.9	-0.1	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	38.9	-0.1	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.1	0.1	±1.1
26.0	26.0	0.0	±1.1
25.0	25.0	0.0	±1.1

QH-TS12-04-04-0266-1

T. Petch

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-4518 Sukhumvit Rd, Bangkok, Bangkok 10260 THAILAND
Tel: 0-2413-6730 Fax: 0-2413-1629 e-mail: center@sithiporn.com, info@www.sithiporn.comCert. No. : ACL23282
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NI-42 Microphone UK-52 Amplifier NI-24
Serial No. : 00472121 / 142862 / 22541
ID No. : NK11 P80007

Condition As Found : GOOD

Customer : AT S1 LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATHANAKAN 40, PHATHANAKAN ROAD,
KHUWAENG PHATHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND

Location :
Ambient Temperature : $\pm 23.0 \pm 3.3$ °C
Pressure : $\pm 101.3 \pm 2.3$ kPa
Relative Humidity : $\pm 50.0 \pm 20.3$ %

Received Date : 28 AUGUST 2023
Calibration Date : 06 SEPTEMBER 2023
Date of Issue : 13 SEPTEMBER 2023

Calibrated by : Nadekun Pitsupisarn

Approved by : T. Petch
(Thanakul Petchumai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced
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QH-TS12-04-04-0266-1

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23282
Job No. : VC66AC0098
Pages : 3 of 8

Summary of Measurement Results :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
3000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C-weight level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High-level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum permitted uncertainty of measurement.

QH-TS12-04-04-0266-1

T. Petch

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23282
Job No. : VC66AC0098
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Freq	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QH-TS12-04-04-0266-1

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23302
Job No. : VC66AC0098
Pages : 8 of 8

11. Overload indication

Measured value (dB)	Deviation Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	-0.1	+0.2
Negative one-half cycle	-0.1	+0.2

12. High level stability

Frequency (Hz)	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	+0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QI-TS12-04-01-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23331
Job No. : VC67AC0013
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on (IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with anechoic chamber and Reference Standard Instruments.

For test results of each item were made by observation of each instruments display and also with SLMs display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EP-0909-23	07-FEB-24
Waveform Generator	33511B	MY53202742	EP-0910-23	07-FEB-24
Digital Multimeter	33461A	MY53220101	DELJIT 300256	12-FEB-24
Digital Multimeter	33461A	MY53220076	DELJIT 280256	12-FEB-24
Digital Multimeter	33461A	MY60024273	DELJIT 310256	14-FEB-24
Programmable Attenuator	MA1-1070	62100114	EP-0911-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QI-TS12-04-01-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23331
Job No. : VC67AC0013
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.9)	93.9	0.0	+0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

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

Frequency (Hz)	Measured value (dB)
A-weight	9.9
C-weight	16.4
Flat	22.3

3. Acoustical signal tests of frequency weightings

Meter free field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limit
125	0.1	0.1	0.1	+1.5
1000	0.0	0.0	0.0	+1.0
3200	0.5	0.5	0.9	+5.0

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23302
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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	+1.1

9. Time burst response

Time	Tone burst duration, 1/2 cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Weighting	0.25	1	106.0	107.9	-0.1 1.5 -5.0
	2	8	117.0	117.0	0.0 1.0 -2.5
	200	800	125.0	124.0	0.0 +0.6
Slow	2	8	108.0	108.0	0.0 1.5 -5.0
	200	800	127.6	127.6	0.0 +0.0
	0.25	1	99.0	98.9	-0.1 1.5 -5.0
SI	2	8	108.0	108.0	0.0 1.0 -2.5
	200	800	125.0	125.0	0.0 +0.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	+0.0
One	136.4	136.2	-0.2	+0.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	+0.0
Positive half cycle	135.4	135.2	-0.2	+0.0
Negative half cycle	135.4	135.2	-0.2	+0.0

QI-TS12-04-01-02064

T. Petch

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Cert. No. : ACL23331
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NR-42A Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 0022553 / 195665 / 15385
ID No. : RKH-TS9116

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHUANG PHATTHANAKAN, KHUET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3.1) °C
Pressure : (101.3 ± 3.3) kPa
Relative Humidity : (59.0 ± 2.0) %

Received Date : 20 OCTOBER 2023
Calibration Date : 01-02 NOVEMBER 2023
Date of Issue : 03 NOVEMBER 2023

Calibrated by : Natchanon Petchumai

Approved by : T. Petch
(Thanakul Petchumai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory

QI-TS12-04-01-02064

Continuation of Calibration Certificate

Cert. No. : ACL23331
Job No. : VC67AC0013
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
3000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Time burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QI-TS12-04-01-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23331
Job No. : VC07AC0013
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	+1.1
136.0	136.0	0.0	+1.1
135.0	135.0	0.0	+1.1
134.0	134.0	0.0	+1.1
133.0	133.0	0.0	+1.1
132.0	132.0	0.0	+1.1
131.0	131.0	0.0	+1.1
129.0	129.0	0.0	+1.1
128.0	128.0	0.0	+1.1
119.0	119.0	0.0	+1.1
114.0	114.0	0.0	+1.1
109.0	109.0	0.0	+1.1
104.0	104.0	0.0	+1.1
99.0	99.0	0.0	+1.1
94.0	94.0	0.0	+1.1
89.0	89.0	0.0	+1.1
84.0	84.0	0.0	+1.1
79.0	79.0	0.0	+1.1
74.0	74.0	0.0	+1.1
69.0	69.0	0.0	+1.1
64.0	64.0	0.0	+1.1
59.0	59.0	0.0	+1.1
54.0	54.0	0.0	+1.1
49.0	49.0	0.0	+1.1
44.0	44.0	0.0	+1.1
39.0	39.0	0.0	+1.1
34.0	34.0	0.0	+1.1
29.0	29.0	0.0	+1.1
24.0	24.0	0.0	+1.1
19.0	19.0	0.0	+1.1
14.0	14.0	0.0	+1.1
9.0	9.0	0.0	+1.1
4.0	4.0	0.0	+1.1
-1.0	-1.0	0.0	+1.1
-6.0	-6.0	0.0	+1.1
-11.0	-11.0	0.0	+1.1
-16.0	-16.0	0.0	+1.1
-21.0	-21.0	0.0	+1.1
-26.0	-26.0	0.0	+1.1
-31.0	-31.0	0.0	+1.1
-36.0	-36.0	0.0	+1.1
-41.0	-41.0	0.0	+1.1
-46.0	-46.0	0.0	+1.1
-51.0	-51.0	0.0	+1.1
-56.0	-56.0	0.0	+1.1
-61.0	-61.0	0.0	+1.1
-66.0	-66.0	0.0	+1.1
-71.0	-71.0	0.0	+1.1
-76.0	-76.0	0.0	+1.1
-81.0	-81.0	0.0	+1.1
-86.0	-86.0	0.0	+1.1
-91.0	-91.0	0.0	+1.1
-96.0	-96.0	0.0	+1.1
-101.0	-101.0	0.0	+1.1
-106.0	-106.0	0.0	+1.1
-111.0	-111.0	0.0	+1.1
-116.0	-116.0	0.0	+1.1
-121.0	-121.0	0.0	+1.1
-126.0	-126.0	0.0	+1.1
-131.0	-131.0	0.0	+1.1
-136.0	-136.0	0.0	+1.1
-141.0	-141.0	0.0	+1.1
-146.0	-146.0	0.0	+1.1
-151.0	-151.0	0.0	+1.1
-156.0	-156.0	0.0	+1.1
-161.0	-161.0	0.0	+1.1
-166.0	-166.0	0.0	+1.1
-171.0	-171.0	0.0	+1.1
-176.0	-176.0	0.0	+1.1
-181.0	-181.0	0.0	+1.1
-186.0	-186.0	0.0	+1.1
-191.0	-191.0	0.0	+1.1
-196.0	-196.0	0.0	+1.1
-201.0	-201.0	0.0	+1.1
-206.0	-206.0	0.0	+1.1
-211.0	-211.0	0.0	+1.1
-216.0	-216.0	0.0	+1.1
-221.0	-221.0	0.0	+1.1
-226.0	-226.0	0.0	+1.1
-231.0	-231.0	0.0	+1.1
-236.0	-236.0	0.0	+1.1
-241.0	-241.0	0.0	+1.1
-246.0	-246.0	0.0	+1.1
-251.0	-251.0	0.0	+1.1
-256.0	-256.0	0.0	+1.1
-261.0	-261.0	0.0	+1.1
-266.0	-266.0	0.0	+1.1
-271.0	-271.0	0.0	+1.1
-276.0	-276.0	0.0	+1.1
-281.0	-281.0	0.0	+1.1
-286.0	-286.0	0.0	+1.1
-291.0	-291.0	0.0	+1.1
-296.0	-296.0	0.0	+1.1
-301.0	-301.0	0.0	+1.1
-306.0	-306.0	0.0	+1.1
-311.0	-311.0	0.0	+1.1
-316.0	-316.0	0.0	+1.1
-321.0	-321.0	0.0	+1.1
-326.0	-326.0	0.0	+1.1
-331.0	-331.0	0.0	+1.1
-336.0	-336.0	0.0	+1.1
-341.0	-341.0	0.0	+1.1
-346.0	-346.0	0.0	+1.1
-351.0	-351.0	0.0	+1.1
-356.0	-356.0	0.0	+1.1
-361.0	-361.0	0.0	+1.1
-366.0	-366.0	0.0	+1.1
-371.0	-371.0	0.0	+1.1
-376.0	-376.0	0.0	+1.1
-381.0	-381.0	0.0	+1.1
-386.0	-386.0	0.0	+1.1
-391.0	-391.0	0.0	+1.1
-396.0	-396.0	0.0	+1.1
-401.0	-401.0	0.0	+1.1
-406.0	-406.0	0.0	+1.1
-411.0	-411.0	0.0	+1.1
-416.0	-416.0	0.0	+1.1
-421.0	-421.0	0.0	+1.1
-426.0	-426.0	0.0	+1.1
-431.0	-431.0	0.0	+1.1
-436.0	-436.0	0.0	+1.1
-441.0	-441.0	0.0	+1.1
-446.0	-446.0	0.0	+1.1
-451.0	-451.0	0.0	+1.1
-456.0	-456.0	0.0	+1.1
-461.0	-461.0	0.0	+1.1
-466.0	-466.0	0.0	+1.1
-471.0	-471.0	0.0	+1.1
-476.0	-476.0	0.0	+1.1
-481.0	-481.0	0.0	+1.1
-486.0	-486.0	0.0	+1.1
-491.0	-491.0	0.0	+1.1
-496.0	-496.0	0.0	+1.1
-501.0	-501.0	0.0	+1.1
-506.0	-506.0	0.0	+1.1
-511.0	-511.0	0.0	+1.1
-516.0	-516.0	0.0	+1.1
-521.0	-521.0	0.0	+1.1
-526.0	-526.0	0.0	+1.1
-531.0	-531.0	0.0	+1.1
-536.0	-536.0	0.0	+1.1
-541.0	-541.0	0.0	+1.1
-546.0	-546.0	0.0	+1.1
-551.0	-551.0	0.0	+1.1
-556.0	-556.0	0.0	+1.1
-561.0	-561.0	0.0	+1.1
-566.0	-566.0	0.0	+1.1
-571.0	-571.0	0.0	+1.1
-576.0	-576.0	0.0	+1.1
-581.0	-581.0	0.0	+1.1
-586.0	-586.0	0.0	+1.1
-591.0	-591.0	0.0	+1.1
-596.0	-596.0	0.0	+1.1
-601.0	-601.0	0.0	+1.1
-606.0	-606.0	0.0	+1.1
-611.0	-611.0	0.0	+1.1
-616.0	-616.0	0.0	+1.1
-621.0	-621.0	0.0	+1.1
-626.0	-626.0	0.0	+1.1
-631.0	-631.0	0.0	+1.1
-636.0	-636.0	0.0	+1.1
-641.0	-641.0	0.0	+1.1
-646.0	-646.0	0.0	+1.1
-651.0	-651.0	0.0	+1.1
-656.0	-656.0	0.0	+1.1
-661.0	-661.0	0.0	+1.1
-666.0	-666.0	0.0	+1.1
-671.0	-671.0	0.0	+1.1
-676.0	-676.0	0.0	+1.1
-681.0	-681.0	0.0	+1.1
-686.0	-686.0	0.0	+1.1
-691.0	-691.0	0.0	+1.1
-696.0	-696.0	0.0	+1.1
-701.0	-701.0	0.0	+1.1
-706.0	-706.0	0.0	+1.1
-711.0	-711.0	0.0	+1.1
-716.0	-716.0	0.0	+1.1
-721.0	-721.0	0.0	+1.1
-726.0	-726.0	0.0	+1.1
-731.0	-731.0	0.0	+1.1
-736.0	-736.0	0.0	+1.1
-741.0	-741.0	0.0	+1.1
-746.0	-746.0	0.0	+1.1
-751.0	-751.0	0.0	+1.1
-756.0	-756.0	0.0	+1.1
-761.0	-761.0	0.0	+1.1
-766.0	-766.0	0.0	+1.1
-771.0	-771.0	0.0	+1.1
-776.0	-776.0	0.0	+1.1
-781.0	-781.0	0.0	+1.1
-786.0	-786.0	0.0	+1.1
-791.0	-791.0	0.0	+1.1
-796.0	-796.0	0.0	+1.1
-801.0	-801.0	0.0	+1.1
-806.0	-806.0	0.0	+1.1
-811.0	-811.0	0.0	+1.1
-816.0	-816.0	0.0	+1.1
-821.0	-821.0	0.0	+1.1
-826.0	-826.0	0.0	+1.1
-831.0	-831.0	0.0	+1.1
-836.0	-836.0	0.0	+1.1
-841.0	-841.0	0.0	+1.1
-846.0	-846.0	0.0	+1.1
-851.0	-851.0	0.0	+1.1
-856.0	-856.0	0.0	+1.1
-861.0	-861.0	0.0	+1.1
-866.0	-866.0	0.0	+1.1
-871.0	-871.0	0.0	+1.1
-876.0	-876.0	0.0	+1.1
-881.0	-881.0	0.0	+1.1
-886.0	-886.0	0.0	+1.1
-891.0	-891.0	0.0	+1.1
-896.0	-896.0	0.0	+1.1
-901.0	-901.0	0.0	+1.1
-906.0	-906.0	0.0	+1.1
-911.0	-911.0	0.0	+1.1
-916.0	-916.0	0.0	+1.1
-921.0	-921.0	0.0	+1.1
-926.0	-926.0	0.0	+1.1
-931.0	-931.0	0.0	+1.1
-936.0	-936.0	0.0	+1.1
-941.0	-941.0	0.0	+1.1
-946.0	-946.0	0.0	+1.1
-951.0	-951.0	0.0	+1.1
-956.0	-956.0	0.0	+1.1
-961.0	-961.0	0.0	+1.1
-966.0	-966.0	0.0	+1.1
-971.0	-971.0	0.0	+1.1
-976.0	-976.0	0.0	+1.1
-981.0	-981.0	0.0	+1.1
-986.0	-986.0	0.0	+1.1
-991.0	-991.0	0.0	+1.1
-996.0	-996.0	0.0	+1.1
-1001.0	-1001.0	0.0	+1.1
-1006.0	-1006.0	0.0	+1.1
-1011.0	-1011.0	0.0	+1.1
-1016.0	-1016.0	0.0	+1.1
-1021.0	-1021.0	0.0	+1.1
-1026.0	-1026.0	0.0	+1.1
-1031.0	-1031.0	0.0	+1.1
-1036.0	-1036.0	0.0	+1.1
-1041.0	-1041.0	0.0	+1.1
-1046.0	-1046.0	0.0	+1.1
-1051.0	-1051.0	0.0	+1.1
-1056.0	-1056.0	0.0	+1.1
-1061.0	-1061.0	0.0	+1.1
-1066.0	-1066.0	0.0	+1.1
-1071.0	-1071.0	0.0	+1.1
-1076.0	-1076.0	0.0	+1.1
-1081.0	-1081.0	0.0	+1.1
-1086.0	-1086.0	0.0	+1.1
-1091.0	-1091.0	0.0	+1.1
-1096.0	-1096.0	0.0	+1.1
-1101.0	-1101.0	0.0	+1.1
-1106.0	-1106.0	0.0	+1.1
-1111.0	-1111.0	0.0	+1.1
-1116.0	-1116.0	0.0	+1.1
-1121.0	-1121.0	0.0	+1.1
-1126.0	-1126.0	0.0	+1.1
-1131.0	-1131.0	0.0	+1.1
-1136.0	-1136.0	0.0	+1.1
-1141.0	-1141.0	0.0	+1.1
-1146.0	-1146.0	0.0	+1.1
-1151.0	-1151.0	0.0	+1.1
-1156.0	-1156.0	0.0	+1.1
-1161.0	-1161.0	0.0	+1.1
-1166.0	-1166.0	0.0	+1.1
-1171.0	-1171.0	0.0	+1.1
-1176.0	-1176.0	0.0	+1.1
-1181.0	-1181.0	0.0	+1.1
-1186.0	-1186.0	0.0	+1.1
-1191.0	-1191.0	0.0	+1.1
-1196.0	-1196.0	0.0	+1.1
-1201.0	-1201.0	0.0	+1.1
-1206.0	-1206.0	0.0	+1.1
-1211.0	-1211.0	0.0	+1.1
-1216.0	-1216.0	0.0	+1.1
-1221.0	-1221.0	0.0	+1.1
-1226.0	-1226.0	0.0	+1.1
-1231.0	-1231.0	0.0	+1.1
-1236.0	-1236.0	0.0	+1.1
-1241.0	-1241.0	0.0	+1.1
-1246.0	-1246.0	0.0	+1.1
-1251.0	-1251.0	0.0	+1.1
-1256.0	-1256.0	0.0	+1.1
-1261.0	-1261.0	0.0	+1.1
-1266.0	-1266.0	0.0	+1.1
-1271.0	-1271.0	0.0	+1.1
-1276.0	-1276.0	0.0	+1.1
-1281.0	-1281.0	0.0	+1.1
-1286.0	-1286.0	0.0	+1.1
-1291.0	-1291.0	0.0	+1.1
-1296.0	-1296.0	0.0	+1.1
-1301.0	-1301.0	0.0	+1.1
-1306.0	-1306.0	0.0	+1.1
-1311.0	-1311.0	0.0	+1.1
-1316.0	-1316.0	0.0	+1.1
-1321.0	-1321.0	0.0	+1.1
-1326.0	-1326.0	0.0	+1.1
-1331.0	-1331.0	0.0	+1.1
-1336.0	-1336.0	0.0	+1.1
-1341.0	-1341.0	0.0	+1.1

Continuation of Calibration Certificate

Cert. No. : ACL23281
Job No. : VC66AC0098
Pages : 4 of 8

Result of Calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.1

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

Frequency Weighting	Measured value (dB)
A-weight	12.0
C-weight	17.9
Flat	23.7

3. Acoustical signal tests of frequency weightings

Meter free field anechoic response at a level of 84 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.0	0.0	±1.5
1000	-0.1	-0.1	-0.1	±1.0
1000	0.4	0.5	0.5	±5.0

QT-1512-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23281
Job No. : VC66AC0098
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	63.9	-0.1	±1.1
59.0	59.0	0.0	±1.1
54.0	53.9	-0.1	±1.1
49.0	49.0	0.0	±1.1
44.0	43.9	-0.1	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
29.0	29.0	0.0	±1.1
24.0	24.1	0.1	±1.1
19.0	19.1	0.1	±1.1
14.0	14.3	0.3	±1.1
9.0	9.2	0.2	±1.1

QT-1512-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23281
Job No. : VC66AC0098
Pages : 8 of 8

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	89.5	0.2
Negative one-half cycle	89.5	±1.5

12. High level stability

Frequency Weighting	S.M Display at initial (dB)	S.M Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following calculation providing a level of confidence of approximately 95 %.

End of Calibration Certificate

QT-1512-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23281
Job No. : VC66AC0098
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C-weight level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum permitted uncertainty of measurement.

QT-1512-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23281
Job No. : VC66AC0098
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Leq	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	S.M Display at initial (dB)	S.M Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QT-1512-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23281
Job No. : VC66AC0098
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, 1/8 (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5, -3.0
	2	8	117.0	117.0	0.0	1.0, -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	0.25	1	108.0	108.0	0.0	1.5, -5.0
	2	8	127.6	127.6	0.0	±1.0
	0.25	1	99.0	99.9	-0.1	1.5, -5.0
SPL	2	8	108.0	108.0	0.0	1.0, -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C-weight level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±1.0
One	136.4	135.1	-1.3	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QT-1512-04-04-02064

T. Petch

Continuation of Calibration Certificate

Calibration Procedure : CP-AC-01

Cert. No. : ACL23229
Job No. : VC67AC0013
Pages : 2 of 8

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM final tests in Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For test results of each item were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY48017076	CF-0009-23	07-FEB-24
Waveform Generator	33511H	MY5202742	CF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY5320104	FEL-007302066	13-FEB-24
Digital Multimeter	33461A	MY5320076	U3-007290266	13-FEB-24
Digital Multimeter	34451A	MY6002423	FEL-007310266	14-FEB-24
Programmable Attenuator	MAF-1070	62400114	IS-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34590495	AA-1002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Q01-1512-04-04-02064

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23229
Job No. : VC67AC0013
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.8

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

Frequency Weighting	Measured value (dB)
A-weight	10.8
C-weight	17.2
Flat	23.0

3. Acoustical signal tests of frequency weightings

Mean free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	±1.5
1000	0.0	0.0	0.0	±1.0
8000	0.8	0.9	0.9	±5.0

Q01-1512-04-04-02064

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23229
Job No. : VC67AC0013
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
19.0	19.1	0.1	±1.1
14.0	14.1	0.1	±1.1
9.0	9.2	0.2	±1.1

Q01-1512-04-04-02064

T. Petchum

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORYS1-451/8 Sirthiporn Rd, Bangna Suburb, Bangkok 10700 THAILAND
Tel: 2415-8800 Fax: 2433-1679 e-mail: cal@sithiporn.com http://www.sithiporn.comCert. No. : ACL23229
Page : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-43A Microphone UC-52 / Preamplifier NH-24
Serial No. : 00222528 / 193774 / 15360
ID No. : NKJ1 F50114

Condition As Found : GOOD

Customer : AT S LABORATORY GROUP (THAILAND) CO., LTD.
104 PIATTHANAKAN 40, PIATTHANAKAN ROAD,
KUNWANG PIATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 2.0) %

Received Date : 20 OCTOBER 2022
Calibration Date : 01-02 NOVEMBER 2023
Date of Issue : 03 NOVEMBER 2023

Calibrated by : Nuthakorn Pongpaitan

Approved by : T. Petchum
(Thanakul Petchum)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced
when then is not, except with the prior written approval of the head of Calibration Laboratory.

Q01-1512-04-04-02064

SITHIPORN SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23229
Job No. : VC67AC0013
Pages : 3 of 8

Summary of Measurement Results

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For >4 kHz to 10 kHz	✓	-	0.3	0.7
For >10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Test burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

Q01-1512-04-04-02064

T. Petchum

SITHIPORN SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23229
Job No. : VC67AC0013
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.1	0.1	0.1	±1.5
250	0.1	0.0	0.0	±1.5
500	0.1	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.1	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Log	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.1	0.1	±0.2

Q01-1512-04-04-02064

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23329
Job No. : VC67AC0013
Pages : 8 of 8

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one half cycle	-0.2	+1.5
Negative one half cycle	-0.2	+1.5

12. High level stability

Frequency Weighting (dB)	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	127.0	127.0	0.0	+0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QP-TS12-04-04-020644

T. Petchur

451-4515 (1st Floor) 451-4516 (2nd Floor) 451-4517 (3rd Floor)
104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 ThailandCert. No. : ACL24126
Job No. : VC67AC0079
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC 61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests in Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For tests results of each item were made by observation of each instrument's display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY6017076	IEF-009-4	05-FEB-25
Waveform Generator	33511U	MY5230742	IEF-007-24	05-FEB-25
Digital Multimeter	33461A	MY5320104	IEEL-BP 210267	13-FEB-25
Digital Multimeter	33461A	MY5320076	IEEL-BP 200267	15-FEB-25
Digital Multimeter	33461A	MY6032473	IEEL-BP 220267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	IEF-008-24	05-FEB-25
Condenser Microphone	41SD	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibration is only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (NIM),

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL23329
Job No. : VC67AC0013
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	+1.5

9. Time burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5; -5.0
	2	8	117.0	116.9	-0.1	1.0; -2.5
	200	890	134.0	134.0	0.0	+1.0
Slow	0.25	1	108.0	107.9	-0.1	1.5; -5.0
	200	890	127.6	127.5	-0.1	+1.0
	0.25	1	99.0	99.3	+0.3	1.5; -5.0
SEL	2	8	108.0	107.9	-0.1	1.0; -2.5
	200	890	128.0	128.0	0.0	+1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	+3.0
One	136.4	135.8	-0.6	+3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	+2.0
Positive half cycle	135.4	135.1	-0.3	+2.0
Negative half cycle	135.4	135.1	-0.3	+2.0

QP-TS12-04-04-020644

T. Petchur

451-4515 (1st Floor) 451-4516 (2nd Floor) 451-4517 (3rd Floor)
104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 ThailandCert. No. : ACL24126
Job No. : VC67AC0079
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 00371917 / 169101 / 72247
ID No. : NK11_30044

Condition As Found :

GOOD

Customer :

ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATHANAKAN 40, PHATHANAKAN ROAD,
KHWAENG PHATHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :

Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 12 APRIL 2024
Calibration Date : 02-03 MAY 2024
Date of Issue : 06 MAY 2024

Calibrated by :

Nahakorn Petchur

Approved by :

T. Petchur
(Thanukul Petchurai)

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451-4515 (1st Floor) 451-4516 (2nd Floor) 451-4517 (3rd Floor)
104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 ThailandCert. No. : ACL24126
Job No. : VC67AC0079
Pages : 4 of 8

Result of Calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.0)	93.9	0.0	+0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.1

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

Frequency Weighting (dB)	Measured value (dB)
A-weight	11.6
C-weight	17.7
Flat	23.4

3. Acoustical signal tests of frequency weightings

Metric free-field acoustic response at a level of 88 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.1	0.1	+1.5
1000	-0.1	0.0	0.0	+1.0
3000	0.8	0.9	0.9	+5.0

T. Petchur

451-4515 (1st Floor) 451-4516 (2nd Floor) 451-4517 (3rd Floor)
104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 ThailandCert. No. : ACL24126
Job No. : VC67AC0079
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
3000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long-term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

T. Petchur



Cert. No. : ACL24126
Job No. : VC67AC0079
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1
4.0	4.0	0.0	±1.1

T. Petch



Cert. No. : ACL24126
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11. Overlaid indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	
89.5	89.7	0.2 ±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

T. Petch

Cert. No. : ACL23215
Job No. : VC66AC0071
Pages : 3 of 8

Calibration Procedure : (P-AC-01)

Calibration Method :

This equipment was calibrated by based on IEC 61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests in Acoustical and Electrical signal level of frequency weighting with Acoustic chamber and Reference Standard Instruments. For tests results of each items were made by observation of each instrument display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	ET-0009-23	07-11-24
Waveform Generator	33511D	MY52302742	ET-0010-23	07-11-24
Digital Multimeter	33461A	MY52220104	ET-1307-20-026	13-07-24
Digital Multimeter	33461A	MY52220056	ET-1307-20-056	13-07-24
Digital Multimeter	34461A	MY6060-273	ET-1307-20-056	14-07-24
Programmable Attenuator	MAT-1070	62100114	ET-0011-23	08-07-24
Condenser Microphone	4180	2977900	AA-1301-23	14-07-24
Measuring Amplifier	NA-42KA	34669495	AA-1302-23	14-07-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at

3.1 National Institute of Metrology (Thailand)

3.2 Thailand Institute of Scientific and Technological Research (TISTR)

QE-1512-04-04-02-0644

T. Petch



Cert. No. : ACL24126
Job No. : VC67AC0079
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Imp	94.0	94.0	0.0	±0.1

5. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.1

T. Petch



Cert. No. : ACL24126
Job No. : VC67AC0079
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, 1/6 (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 / -5.0
	2	8	117.0	117.0	0.0	1.0 / -2.5
	200	800	124.0	124.1	0.1	±1.0
Slow	0.25	1	108.0	108.0	0.0	1.5 / -5.0
	2	8	108.0	108.0	0.0	1.5 / -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 / -5.0
	2	8	108.0	108.0	0.0	1.0 / -2.5
	200	800	128.1	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, 1 cycle (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
Once	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

T. Petch



Cert. No. : ACL23215
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND 11 VEL METR
Manufacturer : RION
Model : NI-52A / Microphone UC-50 / Pre-amplifier NH-25
Serial No. : 00531293 / 22023 / 32969
ID No. :

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHUANG PHATTHANAKAN, KHUANG SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3.3) °C
Pressure : (101.3 ± 3.3) kPa
Relative Humidity : (50.0 ± 2.0) %

Received Date : 21 JUNE 2023
Calibration Date : 04-05 JULY 2023
Date of Issue : 06 JULY 2023

Calibrated by : Natchanon Prasarnpras

Approved by : T. Petch

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QE-1512-04-04-02-0644

Continuation of Calibration Certificate

Cert. No. : ACL23215
Job No. : VC66AC0071
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.9)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.4

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

Frequency Weighting	Measured value (dB)
A-weight	7.8
C-weight	13.2
Flat	19.2

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.1	0.1	0.1	+1.0
1000	0.2	0.2	0.2	+0.7
2000	0.0	0.1	0.1	+1.5, +2.5

QT-1512-04-04-02064

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23215
Job No. : VC66AC0071
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.1	0.1	±0.5
136.0	136.1	0.1	±0.5
135.0	135.1	0.1	±0.5
134.0	134.1	0.1	±0.5
133.0	133.0	0.0	±0.5
132.0	132.0	0.0	±0.5
131.0	131.0	0.0	±0.5
129.0	129.0	0.0	±0.5
124.0	124.0	0.0	±0.5
119.0	119.0	0.0	±0.5
114.0	114.0	0.0	±0.5
109.0	109.0	0.0	±0.5
104.0	104.1	0.1	±0.5
99.0	99.0	0.0	±0.5
94.0	94.0	0.0	±0.5
89.0	89.0	0.0	±0.5
84.0	84.0	0.0	±0.5
79.0	79.0	0.0	±0.5
74.0	74.0	0.0	±0.5
69.0	69.0	0.0	±0.5
64.0	64.0	0.0	±0.5
59.0	59.0	0.0	±0.5
54.0	54.0	0.0	±0.5
49.0	49.0	0.0	±0.5
44.0	44.0	0.0	±0.5
39.0	39.0	0.0	±0.5
34.0	34.0	0.0	±0.5
29.0	29.0	0.0	±0.5
24.0	24.0	0.0	±0.5
19.0	19.0	0.0	±0.5
14.0	14.0	0.0	±0.5
9.0	9.0	0.0	±0.5

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T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23215
Job No. : VC66AC0071
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.2	±1.5

12. High level stability

Frequency Weighting	SIM Display at initial (dB)	SIM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.1

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QT-1512-04-04-02064

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23215
Job No. : VC66AC0071
Pages : 3 of 8

Summary of Measurement Results

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings	✓	-	0.3	0.6
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
2000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings	✓	-	0.3	0.6
Flat 10 Hz to 4 kHz	✓	-	0.3	0.7
Flat 4 kHz to 10 kHz	✓	-	0.3	0.7
Flat 10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limits and the Maximum permitted uncertainty of measurement.

QT-1512-04-04-02064

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23215
Job No. : VC66AC0071
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)				Acceptance Limits
	Flat	C-weight	A-weight		
63	-0.1	0.0	0.0		±1.0
125	0.0	0.0	0.0		±1.0
250	0.0	0.0	0.0		±1.0
500	0.0	0.0	0.1		±1.0
1000	0.0	0.0	0.0		±1.0
2000	0.0	0.0	0.0		±1.0
4000	0.0	0.0	0.0		±1.5, ±2.5
16000	-0.1	-1.3	-1.2		+2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Leq	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SIM Display at initial (dB)	SIM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.1

QT-1512-04-04-02064

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23215
Job No. : VC66AC0071
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±0.5

9. Tone burst response

Time	Tone burst duration, Ts (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.0, -5.0
	2	8	117.0	117.0	0.0	1.0, -1.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	108.0	0.0	1.0, -5.0
	200	800	127.6	127.6	0.0	±0.5
	0.25	1	99.0	99.0	-0.1	1.0, -5.0
SIL	2	8	108.0	108.0	0.0	1.0, -1.5
	200	800	128.0	128.0	0.0	±0.5

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value Leqpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Dir	136.4	136.2	-0.2	±2.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±1.0
Positive half cycle	133.4	133.2	-0.2	±1.0
Negative half cycle	133.4	133.2	-0.2	±1.0

QT-1512-04-04-02064

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23333
Job No. : VC67AC0013
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-2 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For test results of each item were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	J3320A	MY52302705	12-0609-23	07-FEB-24
Waveform Generator	J3511U	MY52302742	12-0609-23	07-FEB-24
Digital Multimeter	33461A	MY5320104	EEI_BP 240266	13-FEB-24
Digital Multimeter	33461A	MY5320106	EEI_BP 240266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEI_BP 314266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EP-001-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-2KAT	34580495	AA-1002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QE-1512-04-04-020604

T. Petcha

Continuation of Calibration Certificate

Cert. No. : ACL23333
Job No. : VC67AC0013
Pages : 4 of 8

Result of Calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

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

Frequency Weighting	Measured value (dB)
A-weight	10.8
C-weight	16.8
Flat	22.5

3. Acoustical signal tests of frequency weightings

Meter free field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.1	0.1	±1.5
1000	0.0	0.0	0.0	±1.0
8000	0.3	0.4	0.4	±5.0

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T. Petcha

Continuation of Calibration Certificate

Cert. No. : ACL23333
Job No. : VC67AC0013
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	53.9	-0.1	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	38.9	-0.1	±1.1
34.0	33.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
24.0	23.9	-0.1	±1.1
19.0	18.9	-0.1	±1.1
14.0	13.9	-0.1	±1.1
9.0	8.9	-0.1	±1.1

QE-1512-04-04-020604

T. Petcha

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/11 Sithiporn Rd, Bangtumen, Bangkok 10700 THAILAND.
Tel:0-2435-8000 Fax:0-2431-1679 e-mail:calcenter@sithiporn.com http://www.sithiporn.comCert. No. : ACL23333
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42A/ Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 03422909 / 190965 / 25546
ID No. : NK11_PSD123

Condition As Found : GOOD

Customer : ALST LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHAO WANG PHATTHANAKAN, KHUET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.5 ± 3) kPa
Relative Humidity : (50.0 ± 2.0) %

Received Date : 20 OCTOBER 2023
Calibration Date : 01-02 NOVEMBER 2023
Date of Issue : 01 NOVEMBER 2023

Calibrated by : Natchanon Pitsupakorn

Approved by : T. Petcha
(Thirakul Petcha)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced
other than in full, except with the prior written approval of the head of Calibration Laboratory.

QE-1512-04-04-020604

SITHIPORN, SITHIPORN ASSOCIATES CO.,LTD.
ASSOCIATES CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23333
Job No. : VC67AC0013
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Time burst response	✓	-	0.2	0.3
10. Peak C-weight level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

NOTE : Pass/fail evaluation for each parameter.
will be considered together from the acceptance limit and the Maximum permitted uncertainty of measurement.

QE-1512-04-04-020604

T. Petcha

SITHIPORN, SITHIPORN ASSOCIATES CO.,LTD.
ASSOCIATES CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23333
Job No. : VC67AC0013
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Log	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QE-1512-04-04-020604

T. Petcha

Continuation of Calibration Certificate

Cert. No. : ACL23333
Job No. : VC67AC0013
Pages : 8 of 8

11. Overload Indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.5	-0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k=2$ or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QE-TS12-04-04-02864

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23349
Job No. : VC67AC0034
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustic and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For test results of each item were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	CF-0009-23	07-FEB-24
Waveform Generator	33511B	MY5220742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220168	ECL-01P-201288	13-FEB-24
Digital Multimeter	33461A	MY53220776	ECL-01P-201286	13-FEB-24
Digital Multimeter	34461A	MY60034773	ECL-01P-110286	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	LI-0011-23	08-FEB-24
Condenser Microphone	4189	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QE-TS12-04-04-02864

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23349
Job No. : VC67AC0024
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviated (dB)	Acceptance Limit (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.8

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

Frequency Weighting	Measured value (dB)
A-weight	9.9
C-weight	16.1
Flat	21.8

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.4	±1.5
1000	0.0	0.0	0.0	±1.0
8000	0.1	0.1	0.1	±5.0

QE-TS12-04-04-02864

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23333
Job No. : VC67AC0013
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
Aux	94.0	94.0	0.0	±1.1

9. Time burst response

Time Weighting	Tone burst duration, 1s (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	100.0	107.9	-0.1	1.5 : 5.0
	2	8	117.0	117.0	0.0	1.0 : 2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	100.0	100.0	0.0	1.5 : 5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	99.9	-0.1	1.5 : 5.0
SEL	2	8	100.0	100.0	0.0	1.0 : 2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leqpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.7	-0.7	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QE-TS12-04-04-02864

T. Petchum

451-451/1 Srinthorn Rd, Bangkhunru, Bangkok 10700 THAILAND
Tel:0-2435-8800 Fax:0-2431-1679 e-mail:center@sthitphorn.com http://www.sithiporn.comCert. No. : ACL23349
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42A / Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 00222560 / 195872 / 15192
ID No. : NKH_PS0117

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHUWAENG PHATTHANAKAN, KHUET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 1) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 07 NOVEMBER 2023
Calibration Date : 09-10 NOVEMBER 2023
Date of Issue : 14 NOVEMBER 2023

Calibrated by : Natsakorn Pitsatipon

Approved by : T. Petchum
(Thanakul Petchum)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QE-TS12-04-04-02864

Continuation of Calibration Certificate

Cert. No. : ACL23349
Job No. : VC67AC0024
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings	✓	-	0.3	0.6
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.7
8000 Hz	✓	-	0.3	1.0
4. Electrical signal tests of frequency weightings	✓	-	0.3	0.6
For 10 Hz to 4 kHz	✓	-	0.3	0.7
For > 4 kHz to 10 kHz	✓	-	0.3	1.0
For > 10 kHz to 20 kHz	✓	-	0.2	0.2
5. Frequency and time weightings at 1 kHz	✓	-	0.1	0.1
6. Long-term stability	✓	-	0.2	0.3
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Time burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.3	0.35
11. Overload indication	✓	-	0.3	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QE-TS12-04-04-02864

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23349
Job No. : VC67AC0024
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.1	0.1	±1.1
84.0	84.1	0.1	±1.1
79.0	79.0	0.0	±1.1
74.0	74.1	0.1	±1.1
69.0	69.1	0.1	±1.1
64.0	64.0	0.0	±1.1
59.0	59.1	0.1	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
29.0	29.1	0.1	±1.1
24.0	24.1	0.1	±1.1
19.0	19.1	0.1	±1.1
14.0	14.1	0.1	±1.1
9.0	9.1	0.1	±1.1

QT-TS12-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23349
Job No. : VC67AC0024
Pages : 8 of 8

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.0
89.6	89.6	0.0
		±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QT-TS12-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23350
Job No. : VC67AC0024
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments. For test results of each item were made by observations of each instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	GF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52303742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY5320104	EEL-RP-3002066	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-RP-3002066	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-RP-3102066	14-FEB-24
Programmable Attenuator	MA1-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- National Institute of Metrology (Thailand).
- Thailand Institute of Scientific and Technological Research (TISTR).

QT-TS12-04-04-02064

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23349
Job No. : VC67AC0024
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits (dB)
	F1st	C-weight	A-weight	
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
F1st	94.0	94.0	0.0	±0.2

5.2 Time weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Log	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23349
Job No. : VC67AC0024
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 / -5.0
	2	8	117.0	117.0	0.0	1.0 / -2.5
	200	300	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 / -5.0
	200	300	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 / -5.0
SEL	2	8	108.0	108.0	0.0	1.0 / -2.5
	200	300	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	132.9	-0.1	±3.0
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QT-TS12-04-04-02064

T. Petch

451-45171 Sathorn Rd, Bangsuan, Bangkok 10700 THAILAND
Tel: 0-2435-8800 Fax: 0-2433-1679 e-mail: cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL23350
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42A / Microphone UC-52 / Pre-amplifier N15-24
Serial No. : 00222599 / 195911 / 15431
ID No. : NKI_FS0118

Condition As Found : GOOD

Customer : AIS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN 40 PHATTANAKAN ROAD,
KHWAENG PHATTANAKAN KHUET SAN LUANG,
BANGKOK 10259 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3.1) °C
Pressure : (101.3 ± 3.3) kPa
Relative Humidity : (50.0 ± 20.1) %

Received Date : 07 NOVEMBER 2023
Calibration Date : 09-10 NOVEMBER 2023
Date of Issue : 14 NOVEMBER 2023

Cultivated by : Naitakorn Pitsuporn

Approved by : T. Petch
(Tharakul Petchurai)

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QT-TS12-04-04-02064

Continuation of Calibration Certificate

Cert. No. : ACL23350
Job No. : VCG7AC0024
Pages : 4 of 8

Result of Calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.8)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

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

Frequency Weighting	Measured value (dB)
A-weight	9.9
C-weight	16.6
Flat	22.4

3. Acoustic signal tests of frequency weightings

Mean free field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.2	0.2	±1.5
1000	0.0	0.0	0.0	±1.0
3200	0.5	0.6	0.5	±5.0

QI-TS12-04-01-02064

7. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23350
Job No. : VCG7AC0024
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	131.9	-0.1	±1.1
131.0	130.9	-0.1	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1
4.0	4.0	0.0	±1.1

QI-TS12-04-01-02064

7. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23350
Job No. : VCG7AC0024
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.1	±1.5
89.5	89.6		

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k = 2
or any value following calibration providing a level of confidence of approximately 95%

End of Calibration Certificate

QI-TS12-04-01-02064

7. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23350
Job No. : VCG7AC0024
Pages : 3 of 8

Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty		Maximum-permitted uncertainty of measurement (dB)
			(dB)	(dB)	
1. Absolute sensitivity	✓	-	0.2		N/A
2. Self-generated noise	✓	-	0.2		N/A
3. Acoustic signal tests of frequency weightings					
125 Hz	✓	-	0.3		0.6
1000 Hz	✓	-	0.3		0.6
3200 Hz	✓	-	0.3		0.7
4. Electrical signal tests of frequency weightings					
For 10 Hz to 4 kHz	✓	-	0.3		0.6
For > 4 kHz to 10 kHz	✓	-	0.3		0.7
For > 10 kHz to 20 kHz	-	-	-		1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2		0.2
6. Long-term stability	✓	-	0.1		0.1
7. Level linearity on the reference level range	✓	-	0.2		0.3
8. Level linearity including the level range control	✓	-	0.2		0.3
9. Tone burst response	✓	-	0.2		0.3
10. Peak C sound level	✓	-	0.2		0.35
11. Overload indication	✓	-	0.2		0.25
12. High level stability	✓	-	0.1		0.1

Note : Pass/fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QI-TS12-04-01-02064

7. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23350
Job No. : VCG7AC0024
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	0.0	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Long	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QI-TS12-04-01-02064

7. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23350
Job No. : VCG7AC0024
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 : 5.0
	2	8	117.0	117.0	0.0	1.0 : 2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 : 5.0
	200	800	127.0	127.0	0.0	±1.0
	0.25	1	99.0	99.9	+0.1	1.5 : 5.0
SEL	2	8	108.0	108.0	0.0	1.0 : 2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leq (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QI-TS12-04-01-02064

7. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23178
Job No. : VC66AC0060
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC 61072-3 (2017) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with A-weight, C-weight and Reference Standard Instruments.

For test results of each item were made by observation of each instrument's display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY48012076	EU-0009-23	07-03-24
Waveform Generator	33511B	MY52302742	EU-0010-23	07-03-24
Digital Multimeter	33461A	MY53220104	EU-0010-23	07-03-24
Digital Multimeter	33461A	MY53220076	EU-0010-23	07-03-24
Digital Multimeter	34461A	MY68043273	EU-0010-23	07-03-24
Pre-amplifier Attenuator	MAF-1070	62180114	AA-1001-23	14-03-24
Condenser Microphone	4180	2977000	AA-1001-23	14-03-24
Measuring Amplifier	NA42CAI	34560495	AA-1001-23	14-03-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibration only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Science and Technology of Research (TRFTR).

QH-TN12-04-04-020604

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23178
Job No. : VC66AC0060
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.9)	93.9	0.0	±0.3

2. Self-generated noise

2.1. Normal test

Measured Value (dB)
15.5

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

Frequency Weighting	Measured value (dB)
A-weight	10.6
C-weight	17.0
Flat	22.9

3. Acoustical signal tests of frequency weightings

Micro free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.2	0.2	0.2	±1.5
1000	0.0	0.0	0.0	±1.0
3000	-0.4	-0.3	-0.3	±2.0

QH-TN12-04-04-020604

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23178
Job No. : VC66AC0060
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.3
136.0	136.0	0.0	±1.3
135.0	135.0	0.0	±1.3
134.0	134.0	0.0	±1.3
133.0	133.0	0.0	±1.3
132.0	132.0	0.0	±1.3
131.0	131.0	0.0	±1.3
129.0	129.0	0.0	±1.3
124.0	124.0	0.0	±1.3
119.0	119.0	0.0	±1.3
114.0	114.0	0.0	±1.3
109.0	109.0	0.0	±1.3
104.0	104.0	0.0	±1.3
99.0	99.0	0.0	±1.3
94.0	94.0	0.0	±1.3
89.0	89.0	0.0	±1.3
84.0	84.0	0.0	±1.3
79.0	79.0	0.0	±1.3
74.0	74.0	0.0	±1.3
69.0	69.0	0.0	±1.3
64.0	64.0	0.0	±1.3
59.0	59.0	0.0	±1.3
54.0	53.9	-0.1	±1.3
49.0	49.0	0.0	±1.3
44.0	44.0	0.0	±1.3
39.0	39.0	-0.1	±1.3
34.0	33.9	-0.1	±1.3
29.0	29.0	-0.1	±1.3
24.0	24.0	-0.1	±1.3
19.0	19.0	-0.1	±1.3
14.0	14.0	-0.1	±1.3
9.0	9.0	-0.1	±1.3
4.0	4.0	-0.1	±1.3

QH-TN12-04-04-020604

T. Petch

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

451-451/3 Sathiporn Rd, Bangna, Bangkok 10700 THAILAND
Tel: 2435-1673 Fax: 2433-1679 e-mail: cal@calibrationlab.com http://www.sithiporn.com

Cert. No. : ACL23178
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NR-42 Microphone UC-52 + Pre-amplifier MU-24
Serial No. : 01000333-189240-01999
ID No. : NKH-190073

Condition As Found : GOOD

Customer : AIS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHAT THANAKAN 40, PHAT THANAKAN ROAD,
KHUAEANG PHAT THANAKAN, KHUAI SUAN 1 UANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (58.0 ± 2.0) %

Received Date : 29 MAY 2023
Calibration Date : 29-30 MAY 2023
Date of Issue : 31 MAY 2023

REVIEW BY : *T. Petch*
APPROVED BY : *T. Petch*
NEXT CAL. DATE : 29/5/24

Calibrated by : Nidhavan Praprasanna

Approved by : *T. Petch*
(Thasakorn Petchai)

QH-TN12-04-04-020604

Continuation of Calibration Certificate

Cert. No. : ACL23178
Job No. : VC66AC0060
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
3000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range covered	✓	-	0.2	0.3
9. Time burst response	✓	-	0.2	0.3
10. Peak C-weight level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter.
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QH-TN12-04-04-020604

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23178
Job No. : VC66AC0060
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.2
250	0.0	0.0	0.0	±1.2
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.7
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Leq	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at Initial (dB)	SLM Display at Final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QH-TN12-04-04-020604

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23178
Job No. : VC6AC0060
Pages : 8 of 8

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limit (dB)
Positive one-half cycle	89.7	0.1
Negative one-half cycle	89.7	-0.1

12. High level stability

Frequency (dB)	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limit (dB)
Weighting				
A-weight	135.0	135.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QT-TS12-04-04-02/064

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23332
Job No. : VC67AC0013
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on (IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For tests results of each item were made by observations of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	IF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	34461A	MY53220164	EEL-09-300266	13-FEB-24
Digital Multimeter	34461A	MY53220176	EEL-09-300266	13-FEB-24
Digital Multimeter	34461A	MY53220173	EEL-09-300266	14-FEB-24
Programmable Attenuator	MAT-107D	62100114	ES-601-23	05-FEB-24
Condenser Microphone	4180	2977990	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international systems of unit maintained at :

3.1 National Institute of Metrology (Thailand),

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QT-TS12-04-04-02/064

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23333
Job No. : VC67AC0013
Pages : 4 of 8

Results of Calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.0 (93.5)	93.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.4

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

Frequency (dB)	Measured value (dB)
Weighting	
A-weight	9.9
C-weight	16.5
Flat	22.3

3. Acoustical signal tests of frequency weightings

Microphone field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
3000	0.0	0.1	0.1	±5.0

QT-TS12-04-04-02/064

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23178
Job No. : VC6AC0060
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limit (dB)
A-weight	94.0	94.0	0.0	±1.3

9. Time burst response

Time	Time burst duration, t_b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limit (dB)
Weighting						
Fast	0.25	1	108.0	107.9	-0.1	1.5 / -5.0
	2	8	117.0	117.0	0.0	3.0 / -2.5
	200	200	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 / -5.0
	200	200	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 / -5.0
Std.	2	8	108.0	108.0	0.0	1.0 / -2.5
	200	200	126.0	126.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limit (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.7	-0.7	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limit (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QT-TS12-04-04-02/064

*T. Petchum*451-05171 Srinakharin Rd, Bangkok, Bangkok 10110 THAILAND
Tel: 0-2435-8030 Fax: 0-2435-1679 e-mail: cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL23332
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : KION
Model : NL-42A/ Microphone UC 52 / Pre-amplifier NH-24
Serial No. : 90322401 / 199913 / 15433
ID No. : NK11-F80120

Condition As Found :

GOOD

Customer :

ALS LABORATORY GROUP (THAILAND) CO., LTD.
101 PIATTHANAKAN 40, PIATTHANAKAN ROAD,
KUNWANG PIATTHANAKAN, KHUET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :

(25.0 ± 3) °C

Ambient Temperature :

(101.3 ± 3) kPa

Pressure :

(150.0 ± 20) %

Relative Humidity :

Received Date : 20 OCTOBER 2023

Calibration Date : 01-01 NOVEMBER 2023

Date of Issue : 03 NOVEMBER 2023

Calibrated by :

Nontakorn Pajunaisan

Approved by :

T. Petchum
(Thanatol Petchum)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QT-TS12-04-04-02/064

Continuation of Calibration Certificate

Cert. No. : ACL23333
Job No. : VC67AC0013
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
3000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Time burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum permitted uncertainty of measurement.

QT-TS12-04-04-02/064

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23332
Job No. : VC67AC0013
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
132.0	132.0	0.0	+1.1
136.0	136.0	0.0	+1.1
135.0	135.0	0.0	+1.1
134.0	134.0	0.0	+1.1
133.0	133.0	0.0	+1.1
132.0	132.0	0.0	+1.1
131.0	131.0	0.0	+1.1
129.0	129.0	0.0	+1.1
124.0	124.0	0.0	+1.1
119.0	119.0	0.0	+1.1
114.0	114.0	0.0	+1.1
109.0	109.0	0.0	+1.1
104.0	104.0	0.0	+1.1
99.0	99.0	0.0	+1.1
94.0	94.0	0.0	+1.1
89.0	89.0	0.0	+1.1
84.0	84.0	0.0	+1.1
79.0	79.0	0.0	+1.1
74.0	74.0	0.0	+1.1
69.0	69.0	0.0	+1.1
64.0	64.0	0.0	+1.1
59.0	59.0	0.0	+1.1
54.0	53.9	-0.1	+1.1
49.0	49.0	0.0	+1.1
44.0	44.0	0.0	+1.1
39.0	39.0	0.0	+1.1
34.0	33.9	-0.1	+1.1
29.0	28.9	-0.1	+1.1
24.0	23.9	-0.1	+1.1
19.0	18.9	-0.1	+1.1
14.0	13.9	-0.1	+1.1
9.0	8.9	-0.1	+1.1
4.0	3.9	-0.1	+1.1

QI-TS12-01-04-02064

T. Petch...

Continuation of Calibration Certificate

Cert. No. : ACL23332
Job No. : VC67AC0013
Pages : 8 of 8

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	
89.8	89.5	-0.3
		+1.5

12. High level stability

Frequency Weighting	S.M Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	+0.3

The reported uncertainty is based on standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation using a level of confidence of approximately 95 %

End of Calibration Certificate

QI-TS12-04-04-02064

T. Petch...

Continuation of Calibration Certificate

Cert. No. : ACL23320
Job No. : VC66AC0071
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC 61672-3 (2013) Standard for sound level meter (SLM). The SLM find tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For test results of each item were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY48012076	17-0009-23	07-FEB-24
Waveform Generator	33511H	MY52362742	E3-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	E3L-10P-30-0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	E3L-10P-30-0266	13-FEB-24
Digital Multimeter	33461A	MY46025273	E3L-10P-31-0266	13-FEB-24
Programmable Attenuator	MAT-1070	62100114	11-2011-23	08-FEB-24
Chromator Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34569495	AA-1002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- National Institute of Metrology (Thailand)
- Thailand Institute of Scientific and Technological Research (TISTR)

QI-TS12-04-04-02064

T. Petch...

Continuation of Calibration Certificate

Cert. No. : ACL23332
Job No. : VC67AC0013
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits (dB)
	Flat	C-weight	A-weight	
63	-0.1	-0.1	-0.1	+2.0
125	0.0	0.0	0.0	+1.5
250	0.0	0.0	0.0	+1.5
500	0.0	0.0	0.0	+1.5
1000	0.0	0.0	0.0	+1.0
2000	0.0	0.0	0.0	+2.0
4000	0.0	0.0	0.0	+3.0
8000	0.0	0.1	0.1	+5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	+0.2
C-weight	94.0	94.0	0.0	+0.2
Flat	94.0	94.0	0.0	+0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	+0.1
Slow	94.0	94.0	0.0	+0.1
Log	94.0	94.0	0.0	+0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	+0.3

QI-TS12-04-04-02064

T. Petch...

Continuation of Calibration Certificate

Cert. No. : ACL23332
Job No. : VC67AC0013
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	+1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	+1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	+1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	+1.0

10. Peak C-sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	+3.0
One	136.4	135.8	-0.6	+3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	+2.0
Positive half cycle	135.4	135.2	-0.2	+2.0
Negative half cycle	135.4	135.2	-0.2	+2.0

QI-TS12-04-04-02064

T. Petch...



451/451/1 Sithiporn Rd., Bangbanru, Bangkok 10700 THAILAND
Tel: 0-2435-9809 Fax: 0-2435-1679 e-mail: cal@cpa.sithiporn.com http://www.sithiporn.com

Cert. No. : ACL23320
Pages : 1 of 8

Calibration Certificate

Equipment : SOUNDMETER
Manufacturer : RION
Model : NI-52A Microphone UC-39 / Transcription NI-25
Serial No. : 90331306 / 23457 / 32792
ID No. :

Condition As Found : GOOD

Customer : AIS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHUET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 21 JUNE 2023
Calibration Date : 06-07 JULY 2023
Date of Issue : 11 JULY 2023

Calibrated by : Narasim Panchan

Approved by : T. Petch...
(Narasim Panchan)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QI-TS12-04-04-02064

Continuation of Calibration Certificate

Cert. No. : ACL23220
Job No. : YC66AC0071
Pages : 4 of 8

Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.0)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.0

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

Frequency Weighting	Measured value (dB)
A-weight	7.8
C-weight	13.3
Flat	19.1

3. Acoustical signal tests of frequency weightings

Meter free field random response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	±1.0
1000	0.2	0.2	0.2	±0.7
8000	-0.2	-0.2	-0.1	+1.5, -2.5

Q1-TS12-04-04-02064

7. R. John

Continuation of Calibration Certificate

Cert. No. : ACL23220
Job No. : YC66AC0071
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.6
136.0	136.0	0.0	±0.3
135.0	135.0	0.0	±0.6
134.0	134.0	0.0	±0.6
133.0	133.0	0.0	±0.6
132.0	132.0	0.0	±0.6
131.0	131.0	0.0	±0.6
129.0	129.0	0.0	±0.6
128.0	128.0	0.0	±0.6
119.0	119.0	0.0	±0.6
114.0	114.0	0.0	±0.6
109.0	109.0	0.0	±0.6
104.0	104.0	0.0	±0.6
99.0	99.0	0.0	±0.6
94.0	94.0	0.0	±0.6
89.0	89.0	0.0	±0.6
84.0	84.0	0.0	±0.3
79.0	79.0	0.0	±0.6
74.0	74.1	0.1	±0.6
69.0	69.1	0.1	±0.6
64.0	64.0	0.0	±0.6
59.0	59.1	0.1	±0.6
54.0	54.0	0.0	±0.6
49.0	49.0	0.0	±0.6
44.0	44.0	0.0	±0.6
39.0	39.0	0.0	±0.6
34.0	34.0	0.0	±0.6
29.0	29.0	0.0	±0.6
24.0	24.0	0.0	±0.6
19.0	19.0	0.0	±0.6
14.0	14.0	0.0	±0.6
9.0	9.0	0.0	±0.6

Q1-TS12-04-04-02064

7. R. John

Continuation of Calibration Certificate

Cert. No. : ACL23220
Job No. : YC66AC0071
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.0	89.7	0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.1

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k = 2
or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

Q1-TS12-04-04-02064

7. R. John

Continuation of Calibration Certificate

Cert. No. : ACL23220
Job No. : YC66AC0071
Pages : 3 of 8

Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty (dB)	Maximum permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.0	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Time burst response	✓	-	0.1	0.3
10. Peak C sound level	✓	-	0.2	0.25
11. Overload indication	✓	-	0.1	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum permitted uncertainty of measurement.

Q1-TS12-04-04-02064

7. R. John

Continuation of Calibration Certificate

Cert. No. : ACL23220
Job No. : YC66AC0071
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+1.5, -2.5
16000	0.0	-1.2	-1.2	+2.5, -15.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Eq	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.1

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7. R. John

Continuation of Calibration Certificate

Cert. No. : ACL23220
Job No. : YC66AC0071
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±0.3

9. Time burst response

Time Weighting	Pulse burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.0, -3.0
	2	8	117.0	117.0	0.0	1.0, -1.5
	200	300	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	108.0	0.0	1.0, -3.0
	200	300	127.6	127.6	0.0	±0.2
	0.25	1	99.0	98.9	-0.1	1.0, -3.0
SPL	2	8	108.0	108.0	0.0	1.0, -1.5
	200	300	128.0	128.1	0.1	±0.5

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, 1 cycle (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
One	136.4	136.3	-0.1	±2.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

Q1-TS12-04-04-02064

7. R. John

Continuation of Calibration Certificate

Cert. No. : ACL23206
Job No. : VC66AC0071
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3(2013) Standard for sound level meter (SLM).
The SLM had tests in Acoustical and Electrical signal tests of frequency weighting with Acoustic Chamber and Reference Standard Instruments.
For test results of each items were made by observation of each instrument display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Valid Date
Waveform Generator	33210A	MY48017076	11-0309-21	07-FEB-24
Waveform Generator	33511B	MY32302742	11-0310-23	07-FEB-24
Digital Multimeter	34461A	MY33220104	E33_1BP 3070266	13-FEB-24
Digital Multimeter	34461A	MY33220076	E33_1BP 3070266	13-FEB-24
Digital Multimeter	34461A	MY60062423	E33_1BP 3110266	14-FEB-24
Programmable Attenuator	MA1-1070	62100114	11-0011-23	06-FEB-24
Condenser Microphone	4189	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-2KAL	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is trustworthy to the international system of unit maintained at :

1. National Institute of Metrology (Thailand).
2. Thailand Institute of Scientific and Technological Research (TISTR).

QH-1512-04-04-02964

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23206
Job No. : VC66AC0071
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	94.0	0.0	±0.1

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.4

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

Frequency Weighting	Measured value (dB)
A-weight	8.7
C-weight	14.6
Flat	20.2

3. Acoustic signal tests of frequency weightings

Micro free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.1	0.1	±1.0
1000	0.1	0.1	0.1	±0.7
3000	-0.4	-0.4	-0.3	+1.5, -2.5

QH-1512-04-04-02964

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23206
Job No. : VC66AC0071
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.1	0.1	±0.3
126.0	126.1	0.1	±0.3
125.0	125.1	0.1	±0.3
124.0	124.1	0.1	±0.3
123.0	123.1	0.1	±0.3
122.0	122.1	0.1	±0.3
121.0	121.0	0.0	±0.3
120.0	120.1	0.1	±0.3
124.0	124.0	0.0	±0.3
119.0	119.1	0.1	±0.3
114.0	114.0	0.0	±0.3
109.0	109.0	0.0	±0.3
104.0	104.1	0.1	±0.3
99.0	99.1	0.1	±0.3
94.0	94.0	0.0	±0.3
89.0	89.0	0.0	±0.3
84.0	84.0	0.0	±0.3
79.0	79.0	0.0	±0.3
74.0	74.0	0.0	±0.3
69.0	69.0	0.0	±0.3
64.0	64.0	0.0	±0.3
59.0	59.0	0.0	±0.3
54.0	54.0	0.0	±0.3
49.0	49.0	0.0	±0.3
44.0	44.0	0.0	±0.3
39.0	39.0	0.0	±0.3
34.0	34.0	0.0	±0.3
29.0	29.0	0.0	±0.3
24.0	24.0	0.0	±0.3
19.0	19.0	0.0	±0.3
14.0	14.0	0.0	±0.3
9.0	9.0	0.0	±0.3

QH-1512-04-04-02964

T. Petchum

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

451-45181 Senthom Rd, Bangpattana, Bangkok 10700 THAILAND
Tel: 2435-5100 Fax: 2431-8079 e-mail: calcenter@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL23206
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Transmitter NH-25
Serial No. : 0051300 / 2321 / 32976
ID No. : 2321-1-1

Condition As Found : GOOD

Customer : AI SITHIPORN GROUP (THAILAND) CO., LTD.
106 PHAYATHANAKAN RD. PHAYATHANAKAN ROAD,
KIWAENG PHAYATHANAKAN, KHU SI MUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3.) °C
Pressure : (101.3 ± 3.) kPa
Relative Humidity : (50.0 ± 2.0) %

Received Date : 21 JUNE 2023
Calibration Date : 28-30 JUNE 2023
Date of Issue : 06 JULY 2023

Calibrated by : Nathakorn Petchum

Approved by : T. Petchum
(Tharakul Petchum)

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QH-1512-04-04-02964

Continuation of Calibration Certificate

Cert. No. : ACL23206
Job No. : VC66AC0071
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
3000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For >4 kHz to 10 kHz	✓	-	0.3	0.7
For >10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.3	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QH-1512-04-04-02964

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23206
Job No. : VC66AC0071
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.0	0.0	+1.5, -2.5
16000	0.0	-1.2	-1.2	+2.5, -15.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Leq	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.1

QH-1512-04-04-02964

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL23306
Job No. : VC66AC0071
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limit (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.8	0.2	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limit (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QE-1512-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23305
Job No. : VC66AC0071
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-1 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33701A	MY48017076	13-0000-23	07-FEB-24
Waveform Generator	33511B	MY52027242	13-0016-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	F11_BP 340266	13-FEB-24
Digital Multimeter	33461A	MY53220076	F11_BP 290266	13-FEB-24
Digital Multimeter	33461A	MY60021273	F11_BP 314266	14-FEB-24
Programmable Attenuator	MAT-1070	62100134	F1-0011-23	08-FEB-24
Compass Microphone	4180	297760	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-1000-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QE-1512-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23305
Job No. : VC66AC0071
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.9)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.1

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

Frequency Weighting	Measured value (dB)
A-weight	8.7
C-weight	13.9
Flat	19.6

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.2	0.2	±1.0
1000	0.2	0.1	0.2	±0.7
2000	-0.5	-0.4	-0.4	±1.5, ±2.5

QE-1512-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23306
Job No. : VC66AC0071
Pages : 7 of 8

16. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

9. Tone burst response

Time Weighting	Tone burst duration, T ₀ (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	104.0	107.9	-3.1	1.0; ±3.0
	2	8	117.0	117.0	0.0	1.0; ±4.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	104.0	106.0	-0.9	1.0; ±3.0
	200	800	127.6	127.6	0.0	±0.5
	0.25	1	99.0	99.9	-0.1	1.0; ±3.0
SEL	2	8	108.0	108.0	0.0	1.0; ±4.5
	200	800	128.0	128.0	0.0	±0.5

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
One	136.4	136.1	-0.3	±2.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

QE-1512-04-04-020664

T. Petch

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/1 Sathorn Rd, Bangumnu, Bangkok Bangkok 10700 THAILAND
Tel: 0-2435-6400 Fax: 0-2433-1079 e-mail: center@sitthiporn.com http://www.sitthiporn.comCert. No. : ACL23305
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NR-52A / Microphone UC-59 / Pre-amplifier NII-25
Serial No. : 02531299 / 23224 / 33975
ID No. : 23224

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD
104 PHATTANAKAN 40, PHATTANAKAN ROAD,
KHUANG PHATTANAKAN, KHUANG SUAN (UANG)
DANGKOK, 10250 THAILAND

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 2.0) %
Received Date : 21 JUN/ 2023
Calibration Date : 28-30 JUNE 2023
Date of Issue : 06 JULY 2023

Calibrated by : Nakhorn Pongpaon

Approved by : T. Petch
(Thanawat Petchumai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced
utterance in full, except with the prior written approval of the head of Calibration Laboratory.

QE-1512-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23305
Job No. : VC66AC0071
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum permitted uncertainty (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings	✓	-	0.3	0.6
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings	✓	-	0.3	0.6
For 10 Hz to 4 kHz	✓	-	0.3	0.7
For > 4 kHz to 10 kHz	✓	-	0.3	1.0
For > 10 kHz to 20 kHz	✓	-	0.2	0.2
5. Frequency and time weightings at 1 kHz	✓	-	0.1	0.1
6. Long-term stability	✓	-	0.2	0.3
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum permitted uncertainty of measurement.

QE-1512-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL23205
Job No. : VC66AC0071
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	25.0	0.0	±0.8

QE-TS12-04-04-02064

T. R. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23205
Job No. : VC66AC0071
Pages : 8 of 8

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	
89.5	89.5	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.1

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QE-TS12-04-04-02064

T. R. R. R.

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 10 November 2023
CERTIFICATE NUMBER 202087Cirrus Research plc
Acoustic House
Bridlington Road
Hummerby
North Yorkshire
YO14 0PH
United KingdomPage 1 of 2
Approved signatory
N Smith
Electronically signed

doseBadge Reader : IEC 60942:2003

Instrument Information

Manufacturer: Cirrus Research plc
Model: RC-110A
Serial number: T9025
Class: 2

Notes:

Test summary

Date of calibration: 10 November 2023

The doseBadge reader detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC 60942:2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and level duration were made.

The sound pressure level was measured using a W52F condenser microphone type MK224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The doseBadge Reader has been shown to conform to the Class 2 requirements for periodic testing, described in Annex B of IEC 60942:2003 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

However, as public evidence was not available, from a leading organisation responsible for pattern approval, to demonstrate that the model of doseBadge Reader conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, no general statement or conclusion can be made about conformance of the doseBadge Reader to the requirements of IEC 60942:2003.

Notes:

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, without the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

Continuation of Calibration Certificate

Cert. No. : ACL33305
Job No. : VC66AC0071
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with reference to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Fat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.0	0.1	±1.5, ±2.5
16000	0.0	-1.2	-1.2	±2.5, ±3.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
1 sec	94.0	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.1

QE-TS12-04-04-02064

T. R. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL33305
Job No. : VC66AC0071
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±0.5

9. Tone burst response

Time Weighting	Tone burst duration, Th (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	±1.0, ±3.0
	2	8	117.0	117.0	0.0	±1.0, ±1.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	108.0	0.0	±1.0, ±1.0
	200	800	127.6	127.6	0.0	±0.5
	0.25	1	99.0	98.9	-0.1	±1.0, ±3.0
SPL	2	8	108.0	108.0	0.0	±1.0, ±1.5
	200	800	128.0	128.0	0.0	±0.5

10. Peak C-weighted level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	135.0	135.0	0.0	±2.0
One	136.4	135.7	-0.7	±2.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	135.0	135.0	0.0	±1.0
Positive half cycle	135.4	135.1	-0.3	±1.0
Negative half cycle	135.4	135.1	-0.3	±1.0

QE-TS12-04-04-02064

T. R. R. R.

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 23 May 2023
CERTIFICATE NUMBER 192437Cirrus Research plc
Acoustic House
Bridlington Road
Hummerby
North Yorkshire
YO14 0PH
United KingdomPage 1 of 1
Test engineer
Nigel Smith
Electronically signed

doseBadge Reader

Instrument

Manufacturer: Cirrus Research plc
Model Number: RC-110A
Serial Number: 95969
Notes:

Calibration Procedure

The tests were carried out in accordance with the requirements of IEC 60942:2003 where applicable.

Date of Calibration: 22 May 2023

Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way R Link	Pass
Clock	Pass

Calibration Results

	Level (dB)	Frequency (Hz)	Distortion (% THD + Noise)
Initial	114.45	500 Hz	6.49
Adjusted	114.63	500 Hz	1.14
Uncertainty	±0.11	±0.14	±0.10
Tolerances	±0.60	±2.00	±4.00

Environmental Conditions

Pressure: 101.51 kPa
Temperature: 21.9 °C
Humidity: 43.3 %

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, without the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

Certificate of Calibration for Heat Stress Monitor. Equipment Name: Heat Stress Monitor, Manufacturer: Osha OHM, Model: HDS2.2, Serial No: 23015410, ID No: NAC-JF50104. Calibration date: 29 May 2023. Calibration date: 16 Jun 2023. Issue date: 08 Jun 2023. Reference Used During Calibration: 1 Standard Temperature Probe Model: STD-100-A500, Serial No: 9010410, Due date: 28 Nov 2024. 2 Digital Temperature Indicator Model: DTI-1000-A500, Serial No: 9010410, Due date: 28 Jul 2023. Calibration Condition: Temperature: 23.5°C, Relative Humidity: 50-55%. Calibration Procedure: The temperature calibration was done by immersing calibration material in WCL 021 according to comparison method with standard digital temperature indicator and standard temperature probe. The non-perturbative probe was used as per ISO 9001:2015. Traceability: The measurement results are traceable to the International System of Units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0008-23, Certificate number: EN-0008-22. Note: This certificate is valid only for the item calibrated on date and place of calibration.

Certificate of Calibration for Heat Stress Monitor. Equipment Name: Heat Stress Monitor, Manufacturer: Osha OHM, Model: HDS2.2, Serial No: 23015411, ID No: NAC-JF50104. Calibration date: 29 May 2023. Calibration date: 16 Jun 2023. Issue date: 08 Jun 2023. Reference Used During Calibration: 1 Standard Temperature Probe Model: STD-100-A500, Serial No: 9010410, Due date: 28 Nov 2024. 2 Digital Temperature Indicator Model: DTI-1000-A500, Serial No: 9010410, Due date: 28 Jul 2023. Calibration Condition: Temperature: 23.5°C, Relative Humidity: 50-55%. Calibration Procedure: The temperature calibration was done by immersing calibration material in WCL 021 according to comparison method with standard digital temperature indicator and standard temperature probe. The non-perturbative probe was used as per ISO 9001:2015. Traceability: The measurement results are traceable to the International System of Units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0008-23, Certificate number: EN-0008-22. Note: This certificate is valid only for the item calibrated on date and place of calibration.

Certificate of Calibration for Heat Stress Monitor. Equipment Name: Heat Stress Monitor, Manufacturer: Osha OHM, Model: HDS2.2, Serial No: 23015419, ID No: NAC-JF50103. Calibration date: 29 May 2023. Calibration date: 16 Jun 2023. Issue date: 08 Jun 2023. Reference Used During Calibration: 1 Standard Temperature Probe Model: STD-100-A500, Serial No: 9010410, Due date: 28 Nov 2024. 2 Digital Temperature Indicator Model: DTI-1000-A500, Serial No: 9010410, Due date: 28 Jul 2023. Calibration Condition: Temperature: 23.5°C, Relative Humidity: 50-55%. Calibration Procedure: The temperature calibration was done by immersing calibration material in WCL 021 according to comparison method with standard digital temperature indicator and standard temperature probe. The non-perturbative probe was used as per ISO 9001:2015. Traceability: The measurement results are traceable to the International System of Units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0008-23, Certificate number: EN-0008-22. Note: This certificate is valid only for the item calibrated on date and place of calibration.

Certificate of Calibration. Environmental conditions: Before Pressure: 98.74 kPa, Temperature: 21.8 °C, Humidity: 40.4 %; After Pressure: 98.75 kPa, Temperature: 22.7 °C, Humidity: 37.5 %. Test equipment: Equipment, Manufacturer, Model, Serial number. Calibration Results: Level (dB), Distortion (%), Frequency (Hz). The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance. Functionality Results: Function, Result.

Certificate of Calibration. Result of Calibration: 03 With Adjustment, 02 With Adjustment. Calibration Range: 20 - 40 °C. Function: Table 1: This equipment was connected with wet bulb globe Model: HP3201.2 S/N: 22025575, Dimension: Diameter 14 mm, Length 170 mm. Table 2: This equipment was connected with wet bulb globe Model: HP3201.2 S/N: 22025575, Dimension: Diameter 14 mm, Length 170 mm. Table 3: This equipment was connected with temperature probe Model: TP3201.2 S/N: 22025575, Dimension: Diameter 14 mm, Length 170 mm.

Certificate of Calibration. Result of Calibration: 03 With Adjustment, 03 With Adjustment. Calibration Range: 20 - 40 °C. Function: Table 1: This equipment was connected with wet bulb globe Model: HP3201.2 S/N: 22025575, Dimension: Diameter 14 mm, Length 170 mm. Table 2: This equipment was connected with wet bulb globe Model: HP3201.2 S/N: 22025575, Dimension: Diameter 14 mm, Length 170 mm. Table 3: This equipment was connected with temperature probe Model: TP3201.2 S/N: 22025575, Dimension: Diameter 14 mm, Length 170 mm.

CERTIFICATE OF CALIBRATION

Certificate No. 0307162
Page 2 of 2

Equipment Name: Heat Stress Monitor
Manufacturer: Ikon DMM
Model: H04-1
Serial No.: 1-0311-150
ID No.: N/A

Customer:
Name: S. Phatthana Group (Thailand) Co., Ltd.
Address: 104 Phatthana Rd., Phatthana Rd.,
Klongkum Suburb, Bangkok 10110 Thailand

Received date: 07 Aug 2023
Calibration date: 08 Aug 2023
Issue date: 10 Aug 2023

Reference Used During Calibration:
1. Standard: Ikon DMM H04-1, ITS 100 AHD
Serial No.: 967902410, Expiry Date: 31 Mar 2024
2. Standard: Ikon DMM H04-1, ITS 100 AHD
Serial No.: 967902410, Expiry Date: 31 Mar 2024

Calibration Condition:
Temperature: 23.0 ± 0.1 °C
Relative Humidity: 50 ± 5 %

Calibration Procedure

The temperature calibration was performed by comparing the temperature of the equipment with the standard temperature of the standard. The temperature of the equipment was measured by the standard temperature of the standard. The temperature of the equipment was measured by the standard temperature of the standard.

Traceability

The measurement results are traceable to the International System of Units (SI) by the National Institute of Metrology (NIM) of Thailand. The measurement results are traceable to the International System of Units (SI) by the National Institute of Metrology (NIM) of Thailand.

Notes: This certificate is valid only for the specified date and scope of calibration.

Calibrated by:
1. Mr. Jiraporn Thanasri
2. Mr. Jiraporn Thanasri
3. Mr. Jiraporn Thanasri

Approved Signature:
Mr. Jiraporn Thanasri
Calibration Department Manager

THIS CERTIFICATE AND THE TEST REPORTS ARE VALID FOR THE USE OF THE EQUIPMENT FOR THE PURPOSES OF THE TEST REPORTS.



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
SHRITESTANAKARNROD SOI 18, NAKHONSI, NAKHONSI, BANGKOK, 10110
TEL: 0-2712-10034 FAX: 0-2719-0442



Certificate of Calibration

Certificate No.: 2309167
Page: 1 of 2

Equipment:
Manufacturer:
Model:
Serial No.:
ID No.:
Condition As-Received:
Received Date:
Calibration Date:
Reference:
Ambient Temperature:
Relative Humidity:

Lee Motor
Duo 08M
HD 1102-2
2023159
N/A
Used Item
30 January 2023
08 February 2023
2301-091650
23 ± 2 °C
(50 ± 5) %

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

Submitted by: ALS Laboratory Group (Thailand) Co. Ltd.

104 Phatthana Rd., Phatthana Rd.,
Klongkum Suburb, Bangkok 10110 Thailand

Procedure used: Calibration was conducted using in-house calibration procedure (CP-090) by measuring against luminous intensity standard lamp (NIST-traceable method) according to the inverse square law measurement method.

Condition of Use Result of Calibration

1. Reference standards instruments

- 1) Precision A Divider
2) Luminous Intensity standard lamp
3) Test Equipment: Programmable Voltage/Current Source (Model: OLPSA, SN: 1621294)
4) Test Equipment: Luminance Meter (Model: S1002, SN: 000129)
5) The certificate is valid only for the item calibrated on date and place of calibration
6) This certificate is issued by the National Institute of Metrology (NIM) of Thailand

Calibrated by: Huel Nims
Issue Date: 08 February 2023

Approved Signature:

1. Phatthana Thanasri
2. Chichanan Khunphak
3. Huel Nims

0307162

Certificate No. 0307162
Page 2 of 2

Result of Calibration: 1. Without Adjustment 2. With Adjustment
Calibration Range: 20 - 40 °C
Function:

Table 1: This equipment was compared with built-in probe Model: TP3207.2 S/N: 22055573.
Dimension: Diameter 24 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
25	25.000	25.000	0.0	0.000
30	25.000	25.000	0.0	0.000
35	25.000	25.000	0.0	0.000
40	25.000	25.000	0.0	0.000
45	25.000	25.000	0.0	0.000

Table 2: This equipment was compared with built-in probe Model: TP3207.2 S/N: 22055573.
Dimension: Diameter 24 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	25.000	25.000	0.0	0.000
115	25.000	25.000	0.0	0.000
120	25.000	25.000	0.0	0.000
125	25.000	25.000	0.0	0.000
130	25.000	25.000	0.0	0.000

Table 3: This equipment was compared with built-in probe Model: TP3207.2 S/N: 22055573.
Dimension: Diameter 24 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	25.000	25.000	0.0	0.000
75	25.000	25.000	0.0	0.000
75	25.000	25.000	0.0	0.000
75	25.000	25.000	0.0	0.000
75	25.000	25.000	0.0	0.000

UUC = Unit Under Calibration
The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.



Certificate No. 0307162
Page 2 of 2

Result of Calibration: 1. Without Adjustment 2. With Adjustment
Calibration Range: 20 - 40 °C
Function:

Table 4: This equipment was compared with built-in probe Model: TP3207.2 S/N: 22055573.
Dimension: Diameter 24 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
25	25.000	25.000	0.0	0.000
30	25.000	25.000	0.0	0.000
35	25.000	25.000	0.0	0.000
40	25.000	25.000	0.0	0.000
45	25.000	25.000	0.0	0.000

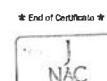
Table 5: This equipment was compared with built-in probe Model: TP3207.2 S/N: 22055573.
Dimension: Diameter 24 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	25.000	25.000	0.0	0.000
115	25.000	25.000	0.0	0.000
120	25.000	25.000	0.0	0.000
125	25.000	25.000	0.0	0.000
130	25.000	25.000	0.0	0.000

Table 6: This equipment was compared with built-in probe Model: TP3207.2 S/N: 22055573.
Dimension: Diameter 24 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	25.000	25.000	0.0	0.000
75	25.000	25.000	0.0	0.000
75	25.000	25.000	0.0	0.000
75	25.000	25.000	0.0	0.000
75	25.000	25.000	0.0	0.000

UUC = Unit Under Calibration
The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
SHRITESTANAKARNROD SOI 18, NAKHONSI, NAKHONSI, BANGKOK, 10110
TEL: 0-2712-10034 FAX: 0-2719-0442



Certificate of Calibration

Cert No.: 2309167
Page: 1 of 2

Equipment:
Manufacturer:
Model:
Serial No.:
ID No.:
Condition As-Received:
Received Date:
Calibration Date:
Reference:
Submitted by:

pH Meter
Hach
HQ411d
200100031103
BHK-EN042
Used Item
28 October 2023
27 October 2023
2310-08950G-0

Ambient Temperature:
Relative Humidity:
Calibration Procedure:

(25 ± 2) °C
(50 ± 15) %
In-house method:
- CP-CHS by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CHS by comparison with standard thermometer

Calibrated by:

Warorn Lomgagrukl

Approved by:

1. Warorn Lomgagrukl
2. Warorn Lomgagrukl
3. Pong Papiem

Issue Date:

31 October 2023

For Uncertainties are for a confidence probability of approximately 95%.

This certificate is issued by the Technology Promotion Association (TPA) and is valid for the purpose of the test report.

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

Calibration with Probe SN: 20027124

UUC = Unit Under Calibration.



Cert.No.: 25CH1359
Page: 3 of 3

Calibration Results

Function: Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model: PHC201

- Serial No.: 230473042902

Dimension of probe:

- Length: 100 mm

- Diameter: 12 mm

- Immersion Depth: 80 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.1	0.098	0.13	2.00

Remark: - UUC* = Unit Under Calibration

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

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a 1187343



Cert.No.: 25CH1359
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument: -

Instrument: Serial No. 4802054 ID No. 110RCD04 Cert. No. 230603 Due Date 28 Jul 2024

This certification is traceable to the International System of Unit maintained through:

- Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials: - The measurement results are traceable to SI through CPA chem Ltd., AMB-ASQ National Accreditation Board, Accredited No. AP-1826

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	913098	14 July 2025
pH 6.865	CPA chem	913990	14 July 2024
pH 9.997	CPA chem	921961	30 Sep 2024

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

Calibration Results

Function: pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode SN 230473042902	4.009	4.002	166.5	0.0044	2.00
	6.865	6.987	-10.4	0.0064	2.00
	9.997	10.065	-188.3	0.0071	2.00

Remark: - Can not connect the BNC because the plug does not match with the socket.

Sathip

a 1187344

ภาคผนวก จ

สำเนาหนังสือใบอนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

ที่ ๑๓ ๐๓๑๐(๑)/ ๑ ๖ ๑ ๖ ๘



กรมโรงงานอุตสาหกรรม
ถนนราชมรรคา ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒ ๐ พฤศจิกายน ๒๕๖๖

เรื่อง ค่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอนเอเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ค่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๕ สิงหาคม ๒๕๖๖

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๓ แผ่น
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผ่น
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๓ แผ่น
ตามหนังสือที่อ้างถึง บริษัท เอนเอเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอค่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพหลโยธิน ๔๐
ถนนพหลโยธิน แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

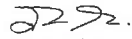
กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอนเอเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด
ค่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ ๑๘๑ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย สิ่งปฏิกูล
หรือวัสดุที่ไม่ใช่แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะค่ออายุในวันที่ ๒ กันยายน ๒๕๖๘ หากประสงค์จะค่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอค่ออายุพร้อมเอกสารประกอบคำขอต่อ
กรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นสุดของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ทั้งนี้ผ่านเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ


(นายศิระ จันทร์โอ)

นักวิทยาศาสตร์ชั้นชำนาญพิเศษ กรมโรงงานอุตสาหกรรม
ผู้อำนวยการกองวิจัยและพัฒนาสิ่งแวดล้อมโรงงาน
ปฏิบัติงานตามระเบียบวิธีกรมโรงงานอุตสาหกรรม

กองวิจัยและพัฒนาสิ่งแวดล้อมโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๒๒ ต่อ ๒๓๐๓๕

โทรสาร ๐ ๒๕๓๐ ๖๓๒๒ ต่อ ๒๓๕๔

ไปรษณีย์อิเล็กทรอนิกส์ saraban@div.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทนิยมก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



สิ่งที่ส่งมาด้วย ๑

เอกสารแนบท้ายหนังสือรับค่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอนเอเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๖-๒๐๔
ที่ ๑๓ ๐๓๑๐(๑)/ ๑ ๖ ๑ ๖ ๘ ลงวันที่ ๒ ๐ พฤศจิกายน ๒๕๖๖

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

- ๑) นางสาวพาริษา จันทร์ปลั่ง
- ๒) นางสาวชัชฌิยา โภมากรกุล ณ นคร
- ๓) นายศราวุธ จิตราพันธ์
- ๔) นางสาวกนกกร เอนก
- ๕) นายสุริยา สอนแก้ว
- ๖) นายวิชาญ ขุนพริศ

ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๐๑
ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๐๒
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ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๐๔
ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๐๕
ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๐๖



สิ่งที่ส่งมาด้วย ๒

เอกสารแนบท้ายหนังสือรับค่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอนเอเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๖-๒๐๔
ที่ ๑๓ ๐๓๑๐(๑)/ ๑ ๖ ๑ ๖ ๘ ลงวันที่ ๒ ๐ พฤศจิกายน ๒๕๖๖

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๘๑ ราย

- ๑) นายภาณุวัฒน์ คีตฤทธิชัย
- ๒) นายภัทรพล สว่างใจธรรม
- ๓) นายธนกร พิเศษกิจ
- ๔) นายศิริโชค พันธ์ประสม
- ๕) นายณัฐวุฒิ คำแพง
- ๖) นางสาวจินดา ไชยธรรม
- ๗) นางสาววิมล น้อยเจริญ
- ๘) นางสาวณัฏฐาญจน์ อิ่มชน
- ๙) นางสาวนันทิยา สายสิง
- ๑๐) นางสาวนันทิยา สมบูรณ์
- ๑๑) นางสาวนันทิยา เจริญธรรม
- ๑๒) นางสาวณัฏฐา มงคลเจริญ
- ๑๓) นางสาวศิริลักษณ์ บุญนาค
- ๑๔) นายพนมกร จันทพันธ์
- ๑๕) นายธนกรไชย โภมากร
- ๑๖) นายธนากร จิรายุ
- ๑๗) นางสาวเกศรินทร์ แก้วมณี
- ๑๘) นางสาวสุวิมล ชัยเรืองกุล
- ๑๙) นางสาวสุภาวดี ธรรมการ
- ๒๐) นางสาวเบญจมา ชัยธรรมกุล
- ๒๑) นางสาวศศิธร พูลสวัสดิ์
- ๒๒) นางสาวสุภาวดี ธรรมการ
- ๒๓) นายอภิสิทธิ์ สิงหา
- ๒๔) นายศศิธร พูลสวัสดิ์
- ๒๕) ว่าที่ร้อยตรีหญิง พรรณีภา จ่าเจริญ
- ๒๖) นางจิตตา คำคุณแก้ว
- ๒๗) นางสาวอรรณพ รักขม
- ๒๘) นางสาวนันทิยา แก้วกรานต์
- ๒๙) นายจุฑาเดช วารินทร์
- ๓๐) นางสาวศุภาวดี รุ่งคำ
- ๓๑) นายพนมกร จันทพันธ์
- ๓๒) นายสุวิมล ชัยเรืองกุล
- ๓๓) ว่าที่ร้อยตรี เจริญธรรม อรรถวิเศษ
- ๓๔) นางสาววิภา สร้างมา
- ๓๕) นายอนุพงษ์ รัตนศิริประเสริฐ

ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๐๑
ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๐๒
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ทะเบียนเลขที่ ๖-๒๐๔-๑-๐๐๓๕



๓๖) นางสาวจุฑาทิพย์...

- ๒ -

- ๓๖) นางสาวจุฑาทิพย์ โอบนทิพย์
- ๓๗) นางสาวจางจาวรรณ พิมพ์กัญญา
- ๓๘) นางสาวปรารถนาทิพย์ กิจไพศาลศักดิ์
- ๓๙) นางสาวเดือนใจ หางกลาง
- ๔๐) นางสาวจิราพร ศิริเวช
- ๔๑) นายวรกร ภูริรักษ์
- ๔๒) นายพนม วิริยะสกิจ
- ๔๓) นายณัฐกร เจริญ
- ๔๔) นายณัฐกร ชำเพชร
- ๔๕) นายภูวิช พรหมมณี
- ๔๖) นายณัฐกร ภิรมย์พันธ์
- ๔๗) นายชวฤทธิ์ วงษ์จันทร์
- ๔๘) นายอภิสิทธิ์ ศรีเลน
- ๔๙) นายเจษฎาพร คงศักดิ์ไทย
- ๕๐) นายชวฤทธิ์ บุญยั้ง
- ๕๑) นายณัฐกร เจริญ
- ๕๒) นายอภิสิทธิ์ ภูมิบุญ
- ๕๓) นางสาวสุภาวดี ธรรมการ
- ๕๔) นางสาวพัชราพร ขวาลสมบูรณ์
- ๕๕) นางสาววิมล บุญนาค
- ๕๖) นางสาวภาณุมาศ นามวัฒน์
- ๕๗) นางสาวจุฑาทิพย์ พันธ์ประสม
- ๕๘) นายธีรวัฒน์ ปางสุข
- ๕๙) นายอภิสิทธิ์ ยะโส
- ๖๐) นายประจักษ์ วรรณชัย
- ๖๑) นายชวฤทธิ์ พันธ์ทิพย์
- ๖๒) นางสาวกนกกร เอนก
- ๖๓) นายอภิสิทธิ์ ธรรมการ
- ๖๔) นายธีรวัฒน์ ปางสุข
- ๖๕) นางสาวพัชราพร ขวาลสมบูรณ์
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- ๖๘) นายณัฐกร ภิรมย์พันธ์
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๘๔) นายประเสริฐ...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
19	Copper	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
20	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
21	2,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
33	Formaldehyde	Distillation, Colorimetric Method ⁽⁴⁾
34	Free Chlorine	1) DPD Ferrous Titrimetric Method ⁽⁴⁾ 2) DPD Colorimetric Method ⁽⁴⁾
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
36	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
37	Hexavalent Chromium	Colorimetric Method ⁽⁴⁾
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method ⁽⁴⁾
39	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾

40 Manganese...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
40	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
42	Methiocarb	High-Performance Liquid Chromatographic Method ⁽⁴⁾
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
44	Methomyl	High-Performance Liquid Chromatographic Method ⁽⁴⁾
45	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾ 2) Soxhlet Extraction Method ⁽⁴⁾
47	Oxamyl	High-Performance Liquid Chromatographic Method ⁽⁴⁾
48	Propoxur	High-Performance Liquid Chromatographic Method ⁽⁴⁾
49	pH	Electrometric Method ⁽⁴⁾
50	Phenols	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾
51	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
52	Sulfide	Iodometric Method ⁽⁴⁾
53	Temperature	Laboratory and Field Methods ⁽⁴⁾
54	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ⁽⁴⁾
56	Total Phosphorus	Digestion, Colorimetric Method ⁽⁴⁾
57	Total Suspended Solids	Dried from 103-105 °C ⁽⁴⁾
58	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
59	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾
60	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁴⁾

น้ำดื่ม...

น้ำดื่ม จำนวน 126 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
8	Barium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
9	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
11	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
12	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
13	Benzoic Acid	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
14	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
15	Benzo(g,h,i)perylene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

18 Bis(2-ethylhexyl)phthalate...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
21	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
27	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾
35	Chromium (VI)	Colorimetric Method ⁽⁴⁾

36 Chrysene...

ลำดับที่	สารเคมี	วิธีการตรวจ
36	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
37	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
39	DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
40	DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
41	DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
42	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
43	Di-n-Butyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
47	3,3-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

56 1,3-Dichloropropene...

ลำดับที่	สารเคมี	วิธีการตรวจ
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
57	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
58	Diethyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
63	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
64	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
65	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
67	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
68	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
69	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
70	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
74	α-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
75	β-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

76 γ-HCH...

ลำดับที่	สารเคมี	วิธีการตรวจ
76	γ-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
81	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
83	Mercury	1) Digestion, Cold Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
84	Methanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
86	Methyl bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
87	Methylene chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
90	Methyl tert-butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

94 N-Nitrosodiphenylamine...

ลำดับที่	สารเคมี	วิธีการตรวจ
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
100	Phenol	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾ 3) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
102	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
103	Silver	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
109	TPH (C ₉ -C ₁₀)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(4,25)

110 TPH (C₉-C₁₀)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
110	TPH (C ₈ -C ₁₆)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^{18,22)}
111	TPH (C ₁₀ -C ₂₅)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^{18,22)}
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method ⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾
120	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
121	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
122	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
123	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
124	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁴⁾
126	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾

ภาคผนวก...

ภาคผนวก (ข้อมูลขยาย) จำนวน 28 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾
2	Arsenic	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾ 1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾
3	Beryllium	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾ 1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾
4	Cadmium	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾ 1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾
5	Carbon Monoxide	1) Instrumental Analyzer Method ⁴⁾ 2) Sampling Bag Non-Dispersive Infrared Method ⁴⁾
6	Chlorine	1) Absorption Sampling, Ion Chromatographic Method ⁴⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁴⁾
7	Chromium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾
8	Cobalt	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾
9	Copper	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾
10	Cresol	Absorption Sampling, Gas Chromatographic Method ⁴⁾
11	Dioxins	Isokinetic Sampling ⁴⁾
12	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method ⁴⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁴⁾
13	Hydrogen Fluoride	1) Absorption Sampling, Ion Chromatographic Method ⁴⁾ 2) Isokinetic Sampling, Ion Chromatographic Method ⁴⁾
14	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ⁴⁾

15 Lead...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	Lead	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾
16	Manganese	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾
17	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁴⁾ 2) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁴⁾
18	Nickel	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾
19	Opacity	Ringelmann's Method ⁴⁾
20	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ⁴⁾ 2) Absorption Sampling, Alkaline Permanganate/Colorimetric Method ⁴⁾ 3) Instrumental Analyzer Method ⁴⁾
21	Selenium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾
22	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ⁴⁾ 2) Instrumental Analyzer Method ⁴⁾
23	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ⁴⁾
24	Tellurium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾
25	Tin	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾
26	Total Suspended Particulate	1) Isokinetic Sampling, Gravimetric Method ⁴⁾ 2) Paired Train, Isokinetic Sampling, Gravimetric Method ⁴⁾

27 Vanadium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Vanadium	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁴⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁴⁾
28	Xylene	Absorption Sampling, Gas Chromatographic Method ⁴⁾

สิ่งปฏิกูลหรือวัสดุที่ไม่ได้ใช้ จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^{1),2,4)} 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^{1),2,5)} 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^{1),2,5)}
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{1),4,9)} 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^{1),4,11)} 3) Digestion, Inductively Coupled Plasma Method ^{7),4)} 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^{7),11)}
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{1),4,10)} 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^{1),4,12)} 3) Digestion, Inductively Coupled Plasma Method ^{7),11)} 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^{7),11)}
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^{1),4,13)} 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^{1),4,17)} 3) Digestion, Inductively Coupled Plasma Method ^{7),11)} 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^{7),11)}

5 Beryllium...

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ลำดับที่	สารเคมี	วิธีการตรวจ
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.17) 3) Digestion, Inductively Coupled Plasma Method ^(7.14) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.17)
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.17) 3) Digestion, Inductively Coupled Plasma Method ^(7.14) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.17)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24)
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.17) 3) Digestion, Inductively Coupled Plasma Method ^(7.14) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.17)
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1.6.14, 1.9) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1.6.17, 1.9) 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7.14, 1.9) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7.17, 1.9)

10 Chromium (VI)...

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ลำดับที่	สารเคมี	วิธีการตรวจ
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(1.6.19) 2) Alkaline Digestion, Colorimetric Method ^(1.6.19)
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.17) 3) Digestion, Inductively Coupled Plasma Method ^(7.14) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.17)
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.17) 3) Digestion, Inductively Coupled Plasma Method ^(7.14) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.17)
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24)
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24)
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24)

2) Soxhlet...

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ลำดับที่	สารเคมี	วิธีการตรวจ
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24)
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.17) 3) Digestion, Inductively Coupled Plasma Method ^(7.14) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.17)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24)

22 Mercury...

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ลำดับที่	สารเคมี	วิธีการตรวจ
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1.6.23) 2) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1.6.23) 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1.6.23) 4) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1.6.23) 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(1.6.23)
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24)
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24)
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.17) 3) Digestion, Inductively Coupled Plasma Method ^(7.14) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.17)
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.17) 3) Digestion, Inductively Coupled Plasma Method ^(7.14) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.17)
27	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.24)

- 2-Chlorobiphenyl...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	- 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,6-Nonachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,6,24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24) Electrometric Method ^(23,24) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
29	pH	
30	Selenium	

31 Silver...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,6,24) 2) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 3) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
35	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,17) 3) Digestion, Inductively Coupled Plasma Method ^(7,16) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)

ดิน...

ดิน จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
2	Acetone	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,24) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ⁽¹²⁾
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
4	Anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
8	Barium	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
9	Benz(a)anthracene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,24)

11 Benzo(b)fluoranthene

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Benzo(b)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
12	Benzo(k)fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
13	Benzoic acid	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
14	Benzo(a)pyrene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
15	Benzo(g,h,i)perylene	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,17)
17	Bis(2-chloroethyl)ether	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
18	Bis(2-ethylhexyl)phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
21	Butanol	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,24)
22	Butyl Benzyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,24)

23 Cadmium...

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ลำดับที่	สารเคมี	วิธีการตรวจ
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(1,17)
24	Carbazole	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
28	p-Chloroaniline	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
32	2-Chlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(1,17)
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,16,19) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,17,18)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,18)

36 Chrysene...

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ลำดับที่	สารเคมี	วิธีการตรวจ
36	Chrysene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(21,25,29)
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
39	DDO	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
40	DDE	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
41	DDT	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
42	Dibenz[a,h]anthracene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
43	Di-n-Butyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
47	3,3-Dichlorobenzidine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)

49 1,2-Dichloroethane...

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ลำดับที่	สารเคมี	วิธีการตรวจ
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
53	2,4-Dichlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
58	Diethyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
59	2,4-Dimethylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
60	2,4-Dinitrophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
61	2,4-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
62	2,6-Dinitrotoluene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)

63 Di-n-Octyl Phthalate...

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ลำดับที่	สารเคมี	วิธีการตรวจ
63	Di-n-Octyl Phthalate	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
67	Fluoranthene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
68	Fluorene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
70	Heptachlor epoxide	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23)
73	n-Hexane	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,23) 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(11,24)

73 n-Hexane...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
74	α -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
75	β -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
76	γ -HCH	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
77	Hexachlorocyclopentadiene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
78	Hexachloroethane	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
79	Indeno(1,2,3-cd)pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
80	Isophorone	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
81	Lead	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽²⁰⁾ 2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry ⁽²¹⁾ 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²⁰⁾

84 Methanol...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25) 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(13,25)
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25)
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25)
88	2-methylphenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
89	2-Methylnaphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
90	Methyl, tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25)
91	Naphthalene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
93	Nitrobenzene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
94	N-Nitrosodiphenylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
95	N-Nitrosodi-n-propylamine	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

96 Polychlorinated biphenyls (PCBs)

ลำดับที่	สารเคมี	วิธีวิเคราะห์
96	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4,6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
97	Pentachlorophenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
98	Phenanthrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)

99 Phenol...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
99	Phenol	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
100	Pyrene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
101	Selenium	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
102	Silver	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,17)
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25)
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25)
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25)
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,26) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,26)
108	TPH (C ₁₀ -C ₁₆)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25)
109	TPH (C ₁₆ -C ₁₈)	1) Automated Extraction, Gas Chromatographic Method ^(12,23) 2) Solvent Extraction, Gas Chromatographic Method ^(12,23) 3) Ultrasonic Extraction, Gas Chromatographic Method ^(12,23)
110	TPH (C ₁₈ -C ₂₅)	1) Automated Extraction, Gas Chromatographic Method ^(12,23) 2) Solvent Extraction, Gas Chromatographic Method ^(12,23) 3) Ultrasonic Extraction, Gas Chromatographic Method ^(12,23)
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25)
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25)
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(15,25)

115 2,4,5-Trichlorophenol...

อนึ่ง เพื่อบันทึกและเผยแพร่ความรู้แก่ผู้เกี่ยวข้องและหน่วยงานอื่นที่สนใจ
ในวันที่ ๒ กันยายน ๒๕๖๓

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ


(นายเกรียงศักดิ์ สอนิธิกุล)
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