

## Continuation of Calibration Certificate

Cert. No. : ACC23005

Job No. : VC66AC0024

Pages : 3 of 3

**Result of calibration :****1. Sound pressure level**

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	93.98	-0.02	0.14	0.40

**2. Frequency**

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1000.0	0.0	0.1	1.0

**3. Total distortion**

Measured value ( % )	Uncertainty ( % )	Tolerance limit ( % )
0.35	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 —————

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.  
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22193

Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-42/ Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 00597167 / 157778 / 34375  
**ID No.:** RYG\_FS0437

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWANG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

**Location :** -  
**Ambient Temperature :** ( 23.0  $\pm$  3 ) °C  
**Pressure :** ( 101.3  $\pm$  3 ) kPa  
**Relative Humidity :** ( 50.0  $\pm$  20 ) %

**Received Date :** 06 SEPTEMBER 2022  
**Calibration Date :** 07-09 SEPTEMBER 2022  
**Date of Issue :** 14 SEPTEMBER 2022



**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

(  )  
( Thanakul Petchurai )

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## Continuation of Calibration Certificate

Cert. No. : ACL22193

Job No. : VC65AC0081

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 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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

## Continuation of Calibration Certificate

Cert. No. : ACL22193

Job No. : VC65AC0081

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



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Cert. No. : ACL22193

Job No. : VC65AC0081

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**Result of calibration :****1. Absolute sensitivity**

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.95)	93.9	0.0	±0.3

**2. Self-generated noise**

## 2.1 Normal test

Measured Value ( dB )
18.3

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	21.4
Flat	27.0

**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	0.3	0.4	0.3	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-0.6	-0.6	-0.6	±5.0

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Job No. : VC65AC0081

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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	-0.1	±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	0.0	±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	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

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



## Continuation of Calibration Certificate

Cert. No. : ACL22193

Job No. : VC65AC0081

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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	89.1	0.1	± 1.1
84.0	84.1	0.1	± 1.1
79.0	79.1	0.1	± 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
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	24.9	-0.1	± 1.1

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**Cert. No. : ACL22193**  
**Job No. : VC65AC0081**  
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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. 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
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	128.0	128.1	0.1	±1.0

**10. Peak C sound level**

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



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## 11. Overload indication

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

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Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com



Cert. No. : ACL22194

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## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-42/ Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 00597168 / 179117 / 87524  
**ID No.:** RYG\_FS0438

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

**Location :** -  
**Ambient Temperature :** ( 23.0  $\pm$  3 ) °C  
**Pressure :** ( 101.3  $\pm$  3 ) kPa  
**Relative Humidity :** ( 50.0  $\pm$  20 ) %

**Received Date :** 06 SEPTEMBER 2022  
**Calibration Date :** 07-09 SEPTEMBER 2022  
**Date of Issue :** 14 SEPTEMBER 2022

REVIEW BY	Nathakorn P.
APPROVED BY	[Signature]
NEXT CAL. DATE	4/9/23

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

[Signature]  
( Thanakul 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.



## Continuation of Calibration Certificate

Cert. No. : ACL22194

Job No. : VC65AC0081

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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 Anechoic 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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

## Continuation of Calibration Certificate

Cert. No. : ACL22194

Job No. : VC65AC0081

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



## Continuation of Calibration Certificate

Cert. No. : ACL22194

Job No. : VC65AC0081

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**Result of calibration :****1. Absolute sensitivity**

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.95)	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	18.1
Flat	23.8

**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	0.1	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	1.7	1.8	1.8	±5.0

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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	0.1	0.0	±1.5
250	0.0	0.0	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	0.1	±2.0
4000	0.1	0.1	0.1	±3.0
8000	0.1	0.1	0.1	±5.0

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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



## Continuation of Calibration Certificate

Cert. No. : ACL22194

Job No. : VC65AC0081

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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	$\pm 1.1$
136.0	136.0	0.0	$\pm 1.1$
135.0	135.1	0.1	$\pm 1.1$
134.0	134.1	0.1	$\pm 1.1$
133.0	133.0	0.0	$\pm 1.1$
132.0	132.0	0.0	$\pm 1.1$
131.0	131.0	0.0	$\pm 1.1$
129.0	129.0	0.0	$\pm 1.1$
124.0	124.0	0.0	$\pm 1.1$
119.0	119.1	0.1	$\pm 1.1$
114.0	114.1	0.1	$\pm 1.1$
109.0	109.0	0.0	$\pm 1.1$
104.0	104.1	0.1	$\pm 1.1$
99.0	99.1	0.1	$\pm 1.1$
94.0	94.0	0.0	$\pm 1.1$
89.0	89.0	0.0	$\pm 1.1$
84.0	84.0	0.0	$\pm 1.1$
79.0	79.0	0.0	$\pm 1.1$
74.0	74.0	0.0	$\pm 1.1$
69.0	69.0	0.0	$\pm 1.1$
64.0	64.0	0.0	$\pm 1.1$
59.0	59.0	0.0	$\pm 1.1$
54.0	54.0	0.0	$\pm 1.1$
49.0	49.0	0.0	$\pm 1.1$
44.0	44.0	0.0	$\pm 1.1$
39.0	39.0	0.0	$\pm 1.1$
34.0	34.0	0.0	$\pm 1.1$
30.0	30.0	0.0	$\pm 1.1$
29.0	29.0	0.0	$\pm 1.1$
28.0	27.9	-0.1	$\pm 1.1$
27.0	26.9	-0.1	$\pm 1.1$
26.0	25.9	-0.1	$\pm 1.1$
25.0	24.9	-0.1	$\pm 1.1$

## Continuation of Calibration Certificate

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Job No. : VC65AC0081

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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. 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	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
SEL	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
	2	8	108.0	107.9	-0.1	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, Lcpeak ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	-
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	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0



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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** —————

# SITHIPORN ASSOCIATES CO.,LTD.

## CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.  
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACC23009

Pages : 1 of 3

### Calibration Certificate

**Equipment :** SOUND CALIBRATOR  
**Manufacturer :** RION  
**Model :** NC-74  
**Serial No.:** 34178121  
**ID No.:** RYG\_FS0213

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWANG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

**Location :** -  
**Ambient Temperature :** ( 23.0  $\pm$  3 ) °C  
**Pressure :** ( 101.3  $\pm$  3 ) kPa  
**Relative Humidity :** ( 50.0  $\pm$  20 ) %

**Received Date :** 24 JANUARY 2023  
**Calibration Date :** 26 JANUARY 2023  
**Date of Issue :** 27 JANUARY 2023

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

  
( Thanakul Petchurai )



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## Continuation of Calibration Certificate

Cert. No. : ACC23009

Job No. : VC66AC0031

Pages : 2 of 3

Calibration Procedure : CP-AC-03

**Calibration Method :**

This equipment was calibrated by based on IEC-60942-2003 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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	33461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-22	07-Feb-23

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).

## Continuation of Calibration Certificate

Cert. No. : ACC23009

Job No. : VC66AC0031

Pages : 3 of 3

**Result of calibration :****1. Sound pressure level**

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	94.16	0.16	0.14	0.40

**2. Frequency**

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1003.2	0.3	0.1	1.0

**3. Total distortion**

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
1.97	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 —————



# SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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Cert. No. : ACL23039

Pages : 1 of 9

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-21/ Microphone UC-52 / Preamplifier NH-21  
**Serial No.:** 01133046 / 157226 / 09873  
**ID No.:** RYG\_FS0006

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWANG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

**Location :** -  
**Ambient Temperature :** ( 23.0  $\pm$  3 ) °C  
**Pressure :** ( 101.3  $\pm$  3 ) kPa  
**Relative Humidity :** ( 50.0  $\pm$  20 ) %

**Received Date :** 06 JANUARY 2023  
**Calibration Date :** 13-18 JANUARY 2023  
**Date of Issue :** 19 JANUARY 2023

REVIEW BY	Nathakorn P.
APPROVED BY	[Signature]
NEXT CAL. DATE	13/1/24

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

[Signature]  
( Thanakul Petchurai )

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## Continuation of Calibration Certificate

Cert. No. : ACL23039

Job No. : VC66AC0024

Pages : 2 of 9

Calibration Procedure : CP-AC-02

**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 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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	8846A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).



Continuation of Calibration Certificate

Cert. No. : ACL23039  
Job No. : VC66AC0024  
Pages : 3 of 9

**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

## Continuation of Calibration Certificate

Cert. No. : ACL23039

Job No. : VC66AC0024

Pages : 4 of 9

**Result of calibration :****1. Absolute sensitivity**

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.95)	93.9	0.0	±0.3

**2. Self-generated noise**

## 2.1 Normal test

Measured Value ( dB )
22.0

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

Frequency Weighting	Measured value ( dB )
A - weight	21.4
C - weight	21.9
Flat	24.2

**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	1.7	1.7	1.7	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-5.0	-4.9	-4.9	±5.0



## Continuation of Calibration Certificate

Cert. No. : ACL23039

Job No. : VC66AC0024

Pages : 5 of 9

## 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	-0.1	-0.1	±1.5
250	-0.1	-0.1	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.1	0.1	0.1	±2.0
4000	0.1	0.1	0.1	±3.0
8000	0.1	0.1	0.2	±5.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

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

## 5.2 Time weighting at 1 kHz

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

## Continuation of Calibration Certificate

Cert. No. : ACL23039

Job No. : VC66AC0024

Pages : 6 of 9

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
135.0	134.9	-0.1	± 1.1
134.0	133.9	-0.1	± 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	128.9	-0.1	± 1.1
124.0	123.9	-0.1	± 1.1
119.0	118.9	-0.1	± 1.1
114.0	113.9	-0.1	± 1.1
109.0	108.9	-0.1	± 1.1
104.0	103.9	-0.1	± 1.1
99.0	98.9	-0.1	± 1.1
94.0	94.0	0.0	± 1.1
89.0	88.9	-0.1	± 1.1
84.0	83.9	-0.1	± 1.1
79.0	78.9	-0.1	± 1.1
74.0	73.9	-0.1	± 1.1
69.0	68.9	-0.1	± 1.1
64.0	63.9	-0.1	± 1.1
59.0	58.9	-0.1	± 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	38.7	-0.3	± 1.1



Continuation of Calibration Certificate

Cert. No. : ACL23039

Job No. : VC66AC0024

Pages : 7 of 9

**8. Level linearity including the level range control**

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	94.0	94.0	0.0	±0.5
120	94.0	94.0	0.0	±0.5
110	94.0	94.0	0.0	±0.5
100	94.0	94.0	0.0	±0.5
90	94.0	94.0	0.0	±0.5

Level linearity on each level range

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	43.0	43.0	0.0	±0.5
120	33.0	33.0	0.0	±0.5

**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	134.1	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
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	128.0	128.0	0.0	±1.0

Continuation of Calibration Certificate

Cert. No. : ACL23039  
Job No. : VC66AC0024  
Pages : 8 of 9

**10. Peak C sound level**

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

**11. Overload indication**

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.4	89.1	-0.3	±1.5



## Continuation of Calibration Certificate

Cert. No. : ACL23039

Job No. : VC66AC0024

Pages : 9 of 9

## 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

# SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com



Cert. No. : ACL23038  
Pages : 1 of 9

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-21/ Microphone UC-52 / Preamplifier NH-21  
**Serial No.:** 00465461 / 108081 / 19513  
**ID No.:** RYG\_FS0007

**Condition As Found :** GOOD

**Customer :** ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWANG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

**Location :** -  
**Ambient Temperature :** ( 23.0  $\pm$  3 ) °C  
**Pressure :** ( 101.3  $\pm$  3 ) kPa  
**Relative Humidity :** ( 50.0  $\pm$  20 ) %

**Received Date :** 06 JANUARY 2023  
**Calibration Date :** 13-18 JANUARY 2023  
**Date of Issue :** 19 JANUARY 2023

REVIEW BY	Narakorn P.
APPROVED BY	[Signature]
NEXT CAL. DATE	13/1/24

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

[Signature]  
( Thanakul Petchurai )

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## Continuation of Calibration Certificate

Cert. No. : ACL23038

Job No. : VC66AC0024

Pages : 2 of 9

Calibration Procedure : CP-AC-02

**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 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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	8846A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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).

Continuation of Calibration Certificate

Cert. No. : ACL23038

Job No. : VC66AC0024

Pages : 3 of 9

**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	✓	-	0.4	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



## Continuation of Calibration Certificate

Cert. No. : ACL23038

Job No. : VC66AC0024

Pages : 4 of 9

**Result of calibration :****1. Absolute sensitivity**

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.95)	93.9	0.0	±0.3

**2. Self-generated noise**

## 2.1 Normal test

Measured Value ( dB )
23.5

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

Frequency Weighting	Measured value ( dB )
A - weight	22.2
C - weight	21.6
Flat	22.2

**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)			
	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	0.1	0.2	0.2	±5.0

Continuation of Calibration Certificate

Cert. No. : ACL23038

Job No. : VC66AC0024

Pages : 5 of 9

**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	-0.1	-0.1	-0.1	±1.5
250	-0.1	-0.1	-0.1	±1.5
500	-0.1	-0.1	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.1	0.1	0.0	±2.0
4000	0.1	0.0	0.0	±3.0
8000	0.1	0.1	0.1	±5.0

**5. Frequency and time weightings at 1 kHz**

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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



## Continuation of Calibration Certificate

Cert. No. : ACL23038

Job No. : VC66AC0024

Pages : 6 of 9

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
135.0	135.0	0.0	$\pm 1.1$
134.0	134.0	0.0	$\pm 1.1$
133.0	133.0	0.0	$\pm 1.1$
132.0	132.0	0.0	$\pm 1.1$
131.0	131.0	0.0	$\pm 1.1$
129.0	129.0	0.0	$\pm 1.1$
124.0	124.0	0.0	$\pm 1.1$
119.0	119.0	0.0	$\pm 1.1$
114.0	114.0	0.0	$\pm 1.1$
109.0	109.0	0.0	$\pm 1.1$
104.0	104.0	0.0	$\pm 1.1$
99.0	99.0	0.0	$\pm 1.1$
94.0	94.0	0.0	$\pm 1.1$
89.0	89.0	0.0	$\pm 1.1$
84.0	84.0	0.0	$\pm 1.1$
79.0	79.0	0.0	$\pm 1.1$
74.0	74.0	0.0	$\pm 1.1$
69.0	69.0	0.0	$\pm 1.1$
64.0	64.0	0.0	$\pm 1.1$
59.0	59.0	0.0	$\pm 1.1$
54.0	54.0	0.0	$\pm 1.1$
49.0	49.0	0.0	$\pm 1.1$
44.0	44.0	0.0	$\pm 1.1$
39.0	39.0	0.0	$\pm 1.1$

Continuation of Calibration Certificate

**Cert. No. : ACL23038**

**Job No. : VC66AC0024**

**Pages : 7 of 9**

**8. Level linearity including the level range control**

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	94.0	94.0	0.0	±0.5
120	94.0	94.0	0.0	±0.5
110	94.0	94.0	0.0	±0.5
100	94.0	94.0	0.0	±0.5
90	94.0	94.0	0.0	±0.5

Level linearity on each level range

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	43.0	43.0	0.0	±0.5
120	33.0	32.6	-0.4	±0.5

**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
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	128.0	128.0	0.0	±1.0



**Continuation of Calibration Certificate**

**Cert. No. : ACL23038**  
**Job No. : VC66AC0024**  
**Pages : 8 of 9**

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>cpeak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	-
One	136.4	135.9	-0.5	±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	-
Positive half cycle	135.4	135.0	-0.4	±2.0
Negative half cycle	135.4	135.0	-0.4	±2.0

**11. Overload indication**

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.4	89.3	-0.1	±1.5

## Continuation of Calibration Certificate

Cert. No. : ACL23038

Job No. : VC66AC0024

Pages : 9 of 9

## 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 \_\_\_\_\_



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Cert.No.: 23CH275  
Page.: 1 of 3

## Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Mettler Toledo
Model :	SevenCompact S220
Serial No. :	C104059460
ID No. :	RYG_EN0183
Condition As-Received:	Used Item
Received Date :	24 February 2023
Calibration Date :	27 February 2023
Reference :	2302-0886DSC-2
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM) - CP-CH8 by comparison with standard thermometer

REVIEW BY N. Banit  
APPROVED BY [Signature]  
NEXT CAL. DATE 27/2/24.

Calibrated by : Walalak Sirithean

Approved by :

Saithip

Approved Signatory

- ( ) Malee Butkruea  
(✓) Saithip Meangmai  
( ) Warakorn Lerngagtrakul

Issue Date : 28 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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A 0051538





Cert.No.: 23CH275

Page.: 2 of 3

**Condition of this calibration result**

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	22I1306	27 Oct 2023

This certification is traceable to the International System of Unit maintained at:-

- Traceable to National Institute of Metrology (Thailand), NIMT

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

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	826588	09 July 2024
pH 6.987	CPA chem	826589	09 July 2023
pH 10.010	CPA chem	863835	28 Dec 2023

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 Fluke at pH (4,7,10)**

<u>Unit Under Calibration</u>	<u>Nominal Value</u>	<u>Standard Voltage Input</u>	<u>Actual Reading</u>		<u>Uncertainty of Measurement</u> ( ±mV )	<u>Coverage factor</u> <i>k</i>
	<u>pH</u>	<u>mV</u>	<u>mV</u>	<u>pH</u>		
pH Meter S/N.: C104059460	4.000	177.48	177.4	4.000	0.058	2.00
	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

Saithip



Cert.No.: 23CH275

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 ( $\pm$ )	Coverage factor $k$
pH Electrode S/N.: 1453404	4.008	4.008	179.1	0.0046	2.00
	6.987	6.988	4.7	0.0084	2.00
	10.010	10.013	-172.4	0.0069	2.00

**Function : Temperature Measurement****( \* ) Without adjustment**

This equipment was connected with Temperature Probe;

- Model : InLabExpert Pro-ISM  
- Serial No. : 1453404

Dimension of probe;

- Length : 120 mm.  
- Diameter : 12 mm.  
- Immersion Depth : 100 mm.

Calibration Point ( $^{\circ}\text{C}$ )	Standard Temperature ( $^{\circ}\text{C}$ )	UUC* Reading ( $^{\circ}\text{C}$ )	Error ( $^{\circ}\text{C}$ )	Uncertainty of measurement ( $\pm$ $^{\circ}\text{C}$ )	Coverage factor $k$
25.0	25.001	24.8	-0.201	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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*Saitip*



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## Certificate of Calibration

Certificate No. : 23E753

Page : 1 of 2

Equipment : pH Meter  
Manufacturer: Mettler Toledo  
Model : SevenCompact S220  
Serial No.: C104059460  
ID No.: RYG\_EN0183

Condition As-Received: Used Item  
Received Date: 24 February 2023  
Calibration Date: 28 February 2023

Reference: 2302-0886DSC  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 10 ) %

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Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)  
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,  
Rayong 21140, Thailand

Procedure used: Calibration were conducted using In-house calibration Procedure CP-E17 According to direct measurement method with Multi-Product Calibrator.

### Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Multi-Product Calibrator	5500A	6440007	22E1670	18 May 2023

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

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

4.This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Wutchareeporn Wongchutikrane  
Issue Date : 02 March 2023

Approved Signatory :

- ☐ Phalinee Prabpaipal  
☒ Nuntawat Khamchai  
☐ Pornthippa Tameyakul





Cert. No.: 23E753

Page.: 2 of 2

**Result of calibration :-** (\*) Without adjustment ( ) After adjustment

**Function:** DC voltage measuremer

**Range:** 2000

mV

**Standard Value**

**UUC\* Reading**

**Error**

**Uncertainty**

( mV )	( mV )	( mV )	( $\pm \mu V$ )
-200.0000	-200.0	0.0	72
-150.0000	-150.0	0.0	69
-100.0000	-100.0	0.0	65
-50.0000	-50.0	0.0	62
0.0000	0.0	0.0	58
50.0000	50.0	0.0	62
100.0000	99.9	-0.1	65
150.0000	149.9	-0.1	69
200.0000	199.9	-0.1	72

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 %

**UUC\* = Unit Under Calibration.**

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Cert.No.: 22TW34

Page.: 1 of 2

## Certificate of Testing

Equipment :	DO Meter
Manufacturer :	YSI
Model :	5000-115V
Serial No. :	15E102796
ID No. :	RYG_EN0032
Received Date :	11 February 2022
Test Date :	14 February 2022
Reference :	2202-0404DSC-4
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand
Laboratory Condition :	Temperature ( $25 \pm 5$ ) °C Humidity ( $50 \pm 20$ ) %
Test Procedure :	In - house method : CP-CH9 by Comparison Technique with Azide Modification Method
Tested by :	Walalak Sirithean
Approved by :	 Approved Signatory
( ) Malee Butkruea	
( <input checked="" type="checkbox"/> ) Saithip Meangmai	
( ) Warakorn Lernagtrakul	
Issue Date :	18 February 2022

REVIEW BY	<u>N. Banerji</u>
APPROVED BY	<u>D. [Signature]</u>
NEXT CAL. DATE	<u>15/8/23</u>



Cert.No.: 22TW34

Page.: 2 of 2

**Result :** Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 15E100464

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.02	8.02	0.0084

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 to 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

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*Saithip*

a 1094744





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Cert. No.: 22LM12

Page.: 1 of 2

## Certificate of Calibration

**Equipment :** DO Meter with Sensor

**Manufacturer :** YSI

**Model :** 5000-115V

**Serial No. :** 15E102796

**ID No. :** RYG\_EN0032

**Submitted by :** ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)  
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng,  
Rayong 21140, Thailand

**Location :** TPA On Site Calibration Laboratory

**Received Order :** 11 February 2022


**Calibrated Date :** 21 February 2022

**Ambient Temperature :** (  $26 \pm 10$  ) °C

**Relative Humidity :** (  $50 \pm 30$  ) %

**AC Line Voltage :** (  $220 \pm 22$  ) V

**Calibrated by :** Kunchit Promprat

**Approved by :**   
Approved Signatory

( ) Pornthippa Tameyakul  
(✓) Malee Butkruea  
( ) Suwit Imjai

**Issue Date :** 21 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0038008



Equipment : DO Meter with Sensor

Condition As-Received : Used Item

Reference : 2202-0404DSC-5

Cert. No.: 22LM12

Page.: 2 of 2

**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:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Digital Thermometer	1523	2188080	21I1273	22 Nov 2022

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.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function :** Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 15E100464

<u>Calibration Point</u> ( °C )	<u>Immersion Depth</u> ( mm )	<u>Standard Temperature</u> ( °C )	<u>UUC* Reading</u> ( °C )	<u>Error</u> ( °C )	<u>Uncertainty</u> ( ± °C )	<u>Coverage Factor</u> <i>k</i>
20.00	45	20.001	19.88	-0.121	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 %.

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*Malu*



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## Certificate of Calibration

Cert. No.: 22TM317

Page.: 1 of 3

**Equipment :** Low Temp. Incubator

**Manufacturer :** Memmert

**Model :** IPP750

**Serial No. :** V818.0084

**ID No. :** RYG\_EN0154

**Submitted by :** ALS Laboratory Group (Thailand) Co.,Ltd.  
(Rayong Branch)  
616/10 Moo 5 T.Maenam Khu,  
A.Pluakdaeng, Rayong 21140, Thailand

**Location :** BOD Room

**Received Order :** 22 April 2022

**Calibration Date :** 22 April 2022

**Ambient Temperature :** ( 26 ± 10 ) °C

**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Man Pattanapongpaiboon

REVIEW BY	<i>N. Banrajit</i>
APPROVED BY	<i>D. [Signature]</i>
NEXT CAL. DATE	21/10/23

**Approved by :**

*Malee*  
Approved Signatory

- ( ) Pornthippa Tameyakul  
( ☒ ) Malee Butkruea  
( ) Suwit Imjai

**Issue Date :**

3 May 2022

**The Uncertainties are for a confidence probability of approximately 95%**

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

A 0040735





**Equipment :** Low Temp. Incubator

**Condition As-Received :** Used Item

**Reference :** 2204-0146OC-1

**Cert. No.:** 22TM317

**Page.:** 2 of 3

**Procedure Used :-**

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1 ) Data Acquisition	34970A	MY44031769	21LM12	02 Sep 2022

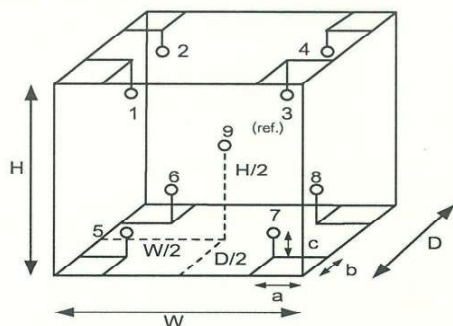
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Close



Environment during calibration		
	Beginning	Finished
Temp. ( °C )	25	25
REL.Humid. ( % )	54	58
AC Supply ( Volt )	221	223

**Probe Installation Details :**

a = 10 cm  
b = 10 cm  
c = 10 cm

**Dimension of Chamber :**

D = 0.60 m  
W = 1.0 m  
H = 1.2 m  
Capacity = 0.75 m<sup>3</sup>

Position :	Ref. Std. ID No.:
1	9RTD-2/1
2	9RTD-2/2
3	9RTD-2/3
4	9RTD-2/4
5	9RTD-2/5
6	9RTD-2/6
7	9RTD-2/7
8	9RTD-2/8
9 (ref.)	9RTD-2/9

*Malu*



Equipment : Low Temp. Incubator  
Condition As-Received : Used Item  
Reference : 2204-0146OC-1  
Result of Calibration :- ( \* ) Without Adjustment

Cert. No.: 22TM317

Page.: 3 of 3

Function of UUC\* : Temperature Source

Fresh air setting : Close

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
20.0	20.0	20.0	0.022	0.20	0.22	0.30	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.209	20.174	20.199	20.110	20.075	20.062	20.027	20.069	20.030

**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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Malu



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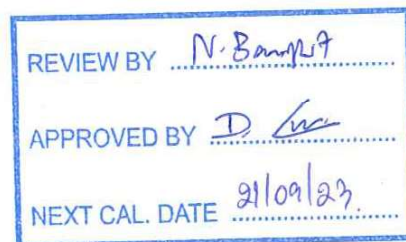


Cert.No.: 18CG4595

Page.: 1 of 2

## Certificate of Calibration

Equipment :	Burette
Capacity :	50 mL
Serial No. :	-
ID. No. :	243007
Manufacturer :	Witeg
Made in :	Germany
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Eastern Seaboard Industrial Estate (Rayong) 64/77 Moo 4, Building No.B1, Highway 331, km 91.5 T.Pluakdaeng, A.Pluakdaeng, Rayong 21140
Ambient Temperature :	(22 ± 2.5) °C
Relative Humidity :	(50 ± 10) %
Barometric Pressure :	757 mmHg
Calibration Procedure :	ASTM E 542 - 01
Calibrated by :	Natcha Chayingcheiw



Approved by :

*malu.*

Approved Signatory

- ( ) Pornthippa Tameyakul
- ( ) Malee Butkruea
- ( ) Ponpan Paipim
- ( ) Srisuda Khamtha

Issue Date :

27 September 2018

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

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A 0087224





Equipment : Burette  
Capacity : 50 mL  
Serial No. : -  
ID. No. : 243007  
Manufacturer : Witeg  
Received Date : 10 September 2018  
Condition As-Received : Used Item  
Calibration Date : 21 September 2018  
Reference : 1809-0411DPC

Cert.No.: 18CG4595

Page.: 2 of 2

**Condition of this result of calibration**

1. Reference Standard Instruments :

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID. No.</u>	<u>Certificate No.</u>	<u>Traceability</u>	<u>Due date</u>
1) Balance	XP205DR	1126143764	140RC004	18MM1	NIMT	2 Jan 2019

This certification is traceable to SI Unit

2. This certificate was certified only for the measuring instrument we calibrated.
3. This result of calibration was found accurate as shown on date and place of calibration only.
4. 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	49.9901	0.010	2.00

**Remark** mL = cm<sup>3</sup>

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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malu.



# Certificate of Calibration

<b>Equipment:</b>	SPECTROPHOTOMETER	<b>Certificate No.:</b>	C06220464
<b>Model:</b>	DR6000	<b>Issued Date:</b>	27 September 2022
<b>Serial No. (or ID.):</b>	1627845 (RYG_EN0037)	<b>Job No.:</b>	KSPR2212224
<b>Manufacturer:</b>	HACH	<b>Page:</b>	1 of 3
<b>Condition:</b>	In Condition		

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

616/10 Moo 5 T.Maenam Khu,  
A.Pluakdaeng, Rayong 21140, Thailand.

REVIEW BY *N.Barnet*

APPROVED BY *D. [Signature]*

NEE CAL. DATE 27/13/24

**Environment Condition:**

Temperature	23.1	°C	±
Humidity	65.4	%RH	±

3.2 %RH

**Calibration Place:** ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) ( Wet Chemistry )  
616/10 Moo 5 T.Maenam Khu,  
A.Pluakdaeng, Rayong 21140, Thailand.

**Calibration By:** Mr. Chattuphon Foithong

**Calibration Date:** 27 September 2022

**The Method used:** In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04

**Traceability:** This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.

The standard for Wavelength Certificate No. 91418 and 91435

The standard for Photometric Certificate No. 91441 and 101088

The standard for Stray light Certificate No. 101041 and 101040

The standard for Spectral resolution Certificate No. 101037

*[Signature]*  
(Mr. Chattuphon Foithong)

Person in charge

*[Signature]*  
(Mr. Thalerngkeat Pongngam)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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DKSH Technology Limited

2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260

2533 Sukhumvit Road, Bangchak, Phraekhanong, Bangkok 10260

Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

**Calibration Results:**
**Without Adjustment**
**Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm**

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.61	418.4	0.21	0.14
536.66	536.7	-0.04	0.14
637.98	638.3	-0.32	0.14
748.48	748.8	-0.32	0.14
807.03	807.4	-0.37	0.13

**Photometric Accuracy (Absorbance)**

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5605	0.563	-0.0025	0.0045
	0.7334	0.737	-0.0036	0.0045
	1.0534	1.057	-0.0036	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5503	0.553	-0.0027	0.0045
	0.7179	0.720	-0.0021	0.0045
	1.0312	1.034	-0.0028	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5024	0.506	-0.0036	0.0045
	0.6693	0.672	-0.0027	0.0045
	0.9604	0.964	-0.0036	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5168	0.519	-0.0022	0.0045
	0.6903	0.691	-0.0007	0.0045
	0.9904	0.992	-0.0016	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5525	0.554	-0.0015	0.0045
	0.7175	0.718	-0.0005	0.0045
	1.0301	1.031	-0.0009	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5367	0.538	-0.0013	0.0045
	0.6847	0.685	-0.0003	0.0046
	0.9823	0.983	-0.0007	0.0045



**Calibration Results:**
**Without Adjustment**
**Photometric Accuracy (Absorbance)**

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7423	0.744	-0.0017	0.0083
257 nm	0.0000	0.000	0.0000	0.0080
	0.8609	0.861	-0.0001	0.0084
313 nm	0.0000	0.000	0.0000	0.0080
	0.2895	0.292	-0.0025	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6381	0.638	0.0001	0.0080

**Stray light \***

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
260.67 +/- 0.11 nm	260.7	2.1	1.678
391.94 +/- 0.11 nm	391.9	1.7	1.770

**Spectral Resolution \***

Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength ( nm )	268.60	266.63	1.39	2.00
UUC: Wavelength (nm)	268.2	266.1		
Std Absorbance ( A )	0.4810	0.3176		
Absorbance ( A )	0.373	0.268		

\* Calibration Marked " Not TISI Accredited " in this Certificate have been included for completeness.

**The End of Certificate**

## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2212224

ชนิดเครื่องมือ: SPECTROPHOTOMETER

รุ่น: DR6000

หมายเลขเครื่อง: 1627845

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
27 Sep 2022			27 Sep 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด ( ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิทช์ ปิด – เปิด เครื่อง (On-Off Swicth)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	656.1 ได้ 656.1 nm
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		pH Meter and Conductivity Meter			
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด ( Electrode and Connection Cable )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพิ่มเติม/ข้อแนะนำ :

Mr. Chattuphon Foithong

Service Engineer



**Sartorius (Thailand) Co., Ltd.**

129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310

Tel: +66 2643 8361-6, e-mail: service.thailand@sartorius.com



NSC-TISI-TIS 17025

CALIBRATION 0426

**SARTORIUS**

REVIEW BY	<i>Thavitall.</i>
APPROVED BY	<i>D. [Signature]</i>
NEXT CAL. DATE	01/03/24

# Certificate of Calibration

Model Number : MSE224S-100-DU

Description : Analytical Balance

Serial Number : 0026207038

ID No. : RYG\_EN0002

Manufacturer : Sartorius

Certificate No. : 23BCI0112

Issued Date : Friday, March 03, 2023

Reference No. : 204833

Page No. : 1 of 2

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

616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.

Calibrated Place : ALS Laboratory Group (Thailand) Co., Ltd.(Balance Room)

616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong.21140, Thailand.

Calibrated By : Mr.Chonchai Inthana

Calibration Date : Wednesday, March 01, 2023

Calibration

Procedure No. : This calibration was conducted by

Using in-house calibration procedure number (WI-003)

Based on UKAS LAB 14 : 2019

**Metrological data :**

Capacity : 220 g Readability : 0.0001 g

**Ambients Conditions:**

Temperature : 23.6 °C ± 5.0 °C

Humidity : 60.0 % RH ± 10.0 % RH

Pressure : ±

**Reasons for calibration**
☐ New Installation
 ☐ Service / Repaired
 ☒ Re-calibration/ Maintenance
Equipment Condition: ☒ Good Operate ☐ Fair

## Measurement Method UKAS Publication Ref :Lab 14

The measurement uncertainty stated is the expended uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to 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 realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came form list of Sartorius Metrological Specifications.

## Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2,YCS011-522-00	SPC-RT	C02212565	14-Sep-2023
MHB-382SD	Humidity/Barometer/Temp Lutron MHB-382SD	DKSH	C19220444	5-Sep-2023

This certificate relate and apply this equipment only.

This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division  
Sartorius (Thailand) Co., Ltd.

Mr.chonchai Inthana(Technical Manager)

S  
T  
A  
M  
P



**Sartorius (Thailand) Co., Ltd.**

129 Rama 9 Road, Huaykwang, Bangkok 10310

Tel: +66 2643 8361-6 Fax: +66 2643-8367, e-mail: service.thailand@sartorius.com

**SARTORIUS**

# Certificate of Calibration

Model Number : MSE224S-100-DUCertificate No. : 23BCI0112Description : Analytical BalanceIssued Date : Friday, March 03, 2023Serial Number : 0026207038Reference No. : 204833ID No. : RYG\_EN0002Manufacturer : SartoriusPage No. : 2 of 2

## Calibration Results : Without Adjustment

### Repeatability

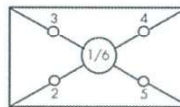
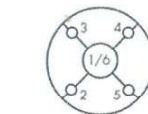
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.

Nominal Value : (Low Load)	20.0000	199.9999
20 g	20.0000	200.0000
Tolerance	20.0000	199.9999
0.0001 g	20.0000	200.0000
	20.0000	199.9999
Nominal Value : (High Load)	20.0000	199.9999
200 g	19.9999	200.0000
Tolerance	20.0000	200.0000
0.0001 g	20.0000	199.9999
	20.0000	200.0000
Standard Deviation	0.00003	0.00005

### Eccentricity (Off-center loading error)

The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).

Nominal value : 100 g  
Tolerance 0.0004 g



#### Difference

1	—
2	-0.0001
3	-0.0001
4	0.0001
5	0.0002
6	-

### Linearity

The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolerance 0.0002 g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00014
0.05	0.0500	0.0500	0.0000	0.00014
0.1	0.1000	0.1000	0.0000	0.00014
0.5	0.5000	0.5000	0.0000	0.00014
1	1.0000	1.0000	0.0000	0.00014
5	5.0000	5.0000	0.0000	0.00014
10	10.0000	10.0001	0.0001	0.00014
20	20.0000	20.0000	0.0000	0.00024
50	50.0000	50.0000	0.0000	0.00015
100	100.0000	99.9999	-0.0001	0.00019
200	200.0000	200.0000	0.0000	0.00032

End of Report.



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM1517

Page : 1 of 3

## Certificate of Calibration

<b>Equipment :</b>	Hot Air Oven
<b>Manufacturer :</b>	Memmert
<b>Model :</b>	UFE 500
<b>Serial No. :</b>	G511.1572
<b>ID No. :</b>	RYG_EN0010
<b>Submitted by :</b>	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng, Rayong 21140 Thailand
<b>Location :</b>	Oven Room
<b>Received Order :</b>	20 October 2022
<b>Calibration Date :</b>	20 October 2022
<b>Ambient Temperature :</b>	( 26 ± 10 ) °C
<b>Relative Humidity :</b>	( 50 ± 30 ) %
<b>Calibrated by :</b>	Man Pattanapongpaiboon

REVIEW BY	Thanitall.
APPROVED BY	D. [Signature]
NEXT CAL. DATE	30/04/24

Approved by :

*Malu.*

Approved Signatory

- ( ) Pornthippa Tameyakul  
(✓) Malee Butkruea  
( ) Suwit Imjai

Issue Date :

2 November 2022

The Uncertainties are for a confidence probability of approximately 95%

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





Equipment : Hot Air Oven  
 Condition As-Received : Used Item  
 Reference : 2210-0376OC-2

Cert. No.: 22TM1517

Page : 2 of 3

**Procedure Used :-**

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34972A	MY49023932	22LM97	29 Jul 2023

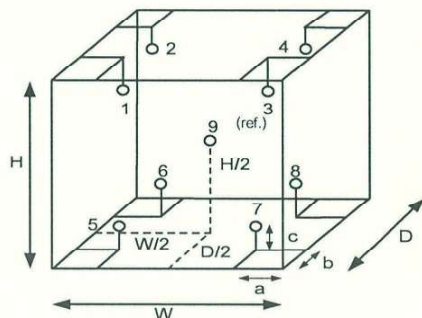
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Close



Environment during calibration		
	Beginning	Finished
Temp. ( °C )	25	25
REL.Humid. ( % )	54	59
AC Supply ( Volt )	223	225

Probe Installation Details :			Dimension of Chamber :		
a =	5.0	cm	D =	0.40	m
b =	5.0	cm	W =	0.56	m
c =	5.0	cm	H =	0.48	m
Capacity =			0.11 m <sup>3</sup>		

Ref. Std. ID No.: @ Calibration Point		
Position :	( 180 ) °C	( 104 ) °C
1	21-16TC-01	20-16RTD-01
2	21-16TC-02	20-16RTD-02
3	21-16TC-03	20-16RTD-03
4	21-16TC-04	20-16RTD-04
5	21-16TC-05	22-16RTD-05
6	21-16TC-06	20-16RTD-06
7	21-16TC-07	20-16RTD-07
8	21-16TC-08	22-16RTD-08
9 (ref.)	21-16TC-09	22-16RTD-09

*Malu*





Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2210-0376OC-2  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 22TM1517  
Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
104.0	104.0	104.0	0.076	0.52	0.60	0.42	2
180.0	180.0	180.0	0.13	0.88	1.2	1.1	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.768	103.734	103.723	103.800	104.215	104.131	104.132	103.740	103.747
180.0	179.723	179.359	179.439	179.489	180.361	180.114	180.131	180.243	179.605

**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 %.

-o0o-

*Mulu*



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM1492

Page : 1 of 3

## Certificate of Calibration

<b>Equipment :</b>	Hot Air Oven
<b>Manufacturer :</b>	Memmert
<b>Model :</b>	UM 400
<b>Serial No. :</b>	b495.0899
<b>ID No. :</b>	RYG_EN0006
<b>Submitted by :</b>	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5, T. Maenam Khu, A. Pluakdaeng, Rayong 21140, Thailand
<b>Location :</b>	Oven Room
<b>Received Order :</b>	20 October 2022
<b>Calibration Date :</b>	20 October 2022
<b>Ambient Temperature :</b>	( 26 ± 10 ) °C
<b>Relative Humidity :</b>	( 50 ± 30 ) %
<b>Calibrated by :</b>	Preecha Hlahib



Approved by :

Approved Signatory

- ( ) Pornthippa Tameyakul  
( ✓ ) Malee Butkruea  
( ) Suwit Imjai

Issue Date :

2 November 2022

The Uncertainties are for a confidence probability of approximately 95%

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





Equipment : Hot Air Oven  
 Condition As-Received : Used Item  
 Reference : 2210-0376OC-1

Cert. No.: 22TM1492  
 Page : 2 of 3

**Procedure Used :-**

Calibration were 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	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34970A	MY44035217	21LM30	23 Dec 2022

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

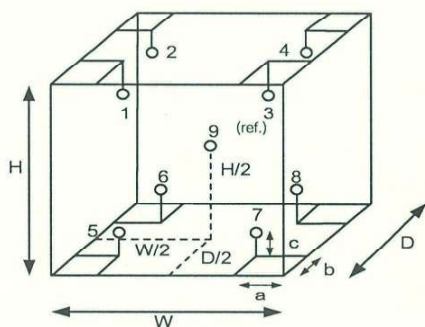
3. This certification is traceable to the International System of Unit.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Close

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	28	29
REL.Humid. ( % )	43	47
AC Supply ( Volt )	220	221



**Probe Installation Details :**

a = 5.0 cm  
 b = 5.0 cm  
 c = 5.0 cm

**Dimension of Chamber :**

D = 0.33 m  
 W = 0.40 m  
 H = 0.40 m  
 Capacity = 0.053 m<sup>3</sup>

Position :	Ref. Std. ID No.:
1	18-10RTD-01
2	18-10RTD-02
3	18-10RTD-03
4	18-10RTD-04
5	18-10RTD-05
6	18-10RTD-06
7	18-10RTD-07
8	18-10RTD-08
9 (ref.)	18-10RTD-09

*Malu .*





Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2210-0376OC-1  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 22TM1492  
Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
70.0	70.0	70.0	0.079	0.47	0.77	0.42	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
70.0	70.262	69.995	70.079	70.177	70.664	70.039	70.688	70.149	70.328

**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 %.

-o0o-

*Malu.*



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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM1491

Page : 1 of 3

## Certificate of Calibration

<b>Equipment :</b>	Water Bath
<b>Manufacturer :</b>	Memmert
<b>Model :</b>	WNB22
<b>Serial No. :</b>	L513.0648
<b>ID No. :</b>	RYG_EN0061
<b>Submitted by :</b>	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5, T. Maenam Khu, A. Pluakdaeng, Rayong 21140, Thailand
<b>Location :</b>	Wet Chemistry Lab
<b>Received Order :</b>	20 October 2022
<b>Calibration Date :</b>	20 October 2022
<b>Ambient Temperature :</b>	( 26 ± 10 ) °C
<b>Relative Humidity :</b>	( 50 ± 30 ) %
<b>Calibrated by :</b>	Preecha Hlahib



Approved by :

*Malee*  
Approved Signatory

- ( ) Pornthippa Tameyakul  
( / ) Malee Butkruea  
( ) Suwit Imjai

Issue Date :

2 November 2022

The Uncertainties are for a confidence probability of approximately 95%

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





Equipment : Water Bath  
 Condition As-Received : Used Item  
 Reference : 2210-0376OC-4

Cert. No.: 22TM1491  
 Page : 2 of 3

**Procedure Used :-**

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer ( IPRT ).

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1 ) Data Acquisition	34970A	MY44035217	21LM30	23 Dec 2022

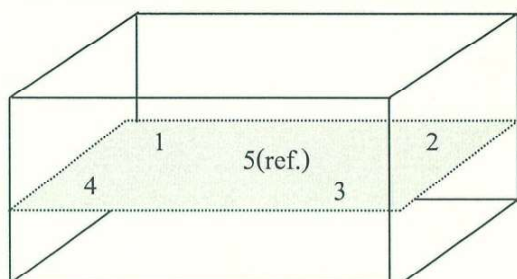
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

	<u>Environmental</u>		<u>AC Voltage Supply</u>
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	24	53	222
Finished of Calibration	24	50	221



Front

<u>Position :</u>	<u>Ref. Std. S/N.:</u>
1	N37P300726
2	N37P300727
3	N37P300728
4	N37P300729
5(ref.)	N37P300730

*Malu*





Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2210-0376OC-4  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 22TM1491  
Page : 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			Position				
			1	2	3	4	5 (ref.)
85.0	85.0	85.0	84.527	84.563	84.628	84.516	84.580

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
85.0	0.12	0.081	0.18	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 %.

-o0o-

Malu.

Certificate Number CPH-0167-22

## Calibration Certificate

### Seven2Go™ pH/mV meter S2

#### Customer

Company ALS LABORATORY GROUP (THAILAND)  
 Address 616/10 Moo 5, T.Maenamkoo, A.Pluakdaeng  
RAYONG 21140  
 Customer ID number 301868073  
 Customer representative -

#### Instrument

Type Seven2Go™ pH/mV S2 Instrument Serial Number C221115514  
 Internal identification - Firmware version 1.01

#### Technical specifications

Measuring Range	-1999.9 ... 1999.9 mV	-2 ... 20 pH
Resolution	1 mV	0.01 pH
Limit of Error	± 1 mV	± 0.01 pH
Temperature range MTC	-5 ... 105 °C	
Temperature range ATC	-5 ... 105 °C	
Resolution	0.1 °C	
Limit of Error	± 0.5 °C	

#### Procedure Statement

METTLER TOLEDO Seven2Go Service Manual Section B (Doc. No. 30232219) will be used as referring documentation to adjust and certify the instrument indicated in the "Type" and "Serial number" section. The measurement results of this certification were obtained at ambient conditions.

REVIEW BY	<u>Tanasit</u>
APPROVED BY	<u>Supt S.</u>
NEXT CAL. DATE	<u>26 July 2023</u>

**Certificate Number** CPH-0167-22

**Certification Tools**

<b>Certified digital voltmeter</b>	Manufacturer <u>HEWLETT PACKARD / 34401A</u>	Serial number <u>US36033161</u>
	Type <u>-</u>	Certificate number <u>E1U214188</u>
		Date of Certification <u>October 6, 2021</u>

<b>Certified Temperature Resistors</b>	Manufacturer <u>METTLER-TOLEDO</u>	Serial number <u>A227</u>
	Type <u>51302410</u>	Certificate number <u>63871</u>
		Date of Certification <u>April 27, 2022</u>

Designation	Nominal value	Certified value
NTC 30 kΩ, 0 °C	94.980 kΩ	94.9814 kΩ
NTC 30 kΩ, 25 °C	30.000 kΩ	30.0022 kΩ
NTC 30 kΩ, 50 °C	10.969 kΩ	10.96530 kΩ
NTC 30 kΩ, 75 °C	4.528 kΩ	4.52584 kΩ
NTC 30 kΩ, 100 °C	2.070 kΩ	2.06926 kΩ



Certificate Number CPH-0167-22

**Certification Measurements**

pH/mV Sensor Input	Designation	Certified value	Measured value	Max. Tolerance	Passed / Failed
	-1900 mV	-1900.0 mV	-1900 mV	1 mV	Passed
	-1000 mV	-1000.0 mV	-1000 mV	1 mV	Passed
	-500 mV	-500.0 mV	-500 mV	1 mV	Passed
	-180 mV	-180.0 mV	-180 mV	1 mV	Passed
	0 mV	0.0 mV	0 mV	1 mV	Passed
	180 mV	180.0 mV	180 mV	1 mV	Passed
	500 mV	500.0 mV	500 mV	1 mV	Passed
	1000 mV	1000.0 mV	1000 mV	1 mV	Passed
	1900 mV	1900.0 mV	1900 mV	1 mV	Passed

Temperature Sensor Input	Designation	Nominal value	Measured value	Max. Tolerance	Passed / Failed
	NTC 30 k $\Omega$ , 0 °C	0.0 °C	0.0 °C	0.5 °C	Passed
	NTC 30 k $\Omega$ , 25 °C	25.0 °C	25.1 °C	0.5 °C	Passed
	NTC 30 k $\Omega$ , 50 °C	50.0 °C	50.1 °C	0.5 °C	Passed
	NTC 30 k $\Omega$ , 75 °C	75.0 °C	75.1 °C	0.5 °C	Passed
	NTC 30 k $\Omega$ , 100 °C	100.0 °C	100.0 °C	0.5 °C	Passed

**Summary of Certification**

Certification of instrument

Passed

The instrument referred to in this certificate has fulfilled the criteria of the certification. This is indicated by the notation Passed in the column above.

Remarks \_\_\_\_\_

Certification of the instrument was performed by

Name Preecha Manoonyarat

Function Service Technician

Company METTLER-TOLEDO

Date July 27, 2022

Signature 

**Performance Test**

Attachment to Certificate No. CPH-0167-22

**pH Electrode**

Type: InLab Expert Go-ISM S/N: 2103768

**Certified standards used**

<b>Standard 1:</b>	Type: <b>pH Buffer</b>	Manufacturer: METTLER TOLEDO	Exp. date: Jun-24
	Nominal value: pH ( 25.00 °C):	<b>4.01</b>	Lot No.: 1H158G
<b>Standard 2:</b>	Type: <b>pH Buffer</b>	Manufacturer: METTLER TOLEDO	Exp. date: Jan-24
	Nominal value: pH ( 25.00 °C):	<b>7.00</b>	Lot No.: 1H013D
<b>Standard 3:</b>	Type: <b>pH Buffer</b>	Manufacturer: METTLER TOLEDO	Exp. date: May-24
	Nominal value: pH ( 25.00 °C):	<b>9.20</b>	Lot No.: 1H139A
<b>Standard 4:</b>	Type: <b>Redox Solution</b>	Manufacturer: METTLER TOLEDO	Exp. date: -
	Nominal value: pH ( 25.00 °C):	-	Lot No.: -

**Adjustment**

Set Calibration Buffer	B2 (25 °C) 2.00, 4.01,7.00, 9.21,11.00								
Select Calibration Mode	3-Point calibration			2-Point calibration			2-Point calibration		
3-Point Calibration	°C		pH	°C		pH	°C		pH
Cal 1	ATC	25.4	4.01	ATC	25.0	-	ATC	25.0	-
Cal 2	ATC	25.3	7.00	ATC	25.0	-	ATC	25.0	-
Offset (mV)	5			-			-		
Slope % (or mV/pH)	99.9			-			-		
Cal 3	ATC	25.4	9.21						
Slope % (or mV/pH)	99.0								

**Measurements**

Before adjustment					After adjustment				
Buffer Values		Measured		Difference	Buffer Values		Measured		Difference
pH	°C	pH		pH	pH	°C	pH		pH
4.01	25.4	ATC	3.96	-0.05	4.01	25.4	ATC	4.01	0.00
7.00	25.2	ATC	6.95	-0.05	7.00	25.4	ATC	6.99	-0.01
9.20	25.4	ATC	9.13	-0.07	9.20	25.4	ATC	9.21	0.01

Redox Measurement Result = - mV

Note: The difference result of calibrated electrode should be within +/- 0.05 pH

Remarks: -

Place: Chemical roomCalibration Date: July 27, 2022Service Specialist: Preecha ManoonyaratSignature: 