

ภาคผนวกที่ 4

---

สรุปเอกสารสอบเทียบอุปกรณ์เครื่องมือ

เอกสารการสอบเทียบเครื่องมือตรวจวัดระดับเสียงในบรรยากาศ



**ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**  
975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,  
Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280  
Tel: +66 2709 4860 Fax: +66 2324 0917




NSC-181-TIS 17025  
CALIBRATION 0119

---

Certificate No.: CP20240384EA  
Operation No.: CP2024100365

### Certificate of Calibration

Equipment: Sound Level Meter  
Manufacturer: ACO  
Model/Type: 6236 (Meter), 7052 (Microphone), - (Preamplifier)  
Serial No.: 222129 (Meter), 72838 (Microphone), - (Preamplifier)  
ID No.: NS-03-014  
Customer: C.E.M. Technology (Thailand) Co.,Ltd.  
Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran,  
Nakorn Phatom 73210  
Received Date: 29 October 2024  
Calibrated Date: 8 - 11 November 2024  
Issued Date: 15 November 2024  
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:   
( Mr. Sittichai Swaksuriyawong )  
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.  
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

Page 1 of 7

F-CAL-004 Ed.1



**ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**

Certificate No.: CP20240384EA

**Calibration Report**

Equipment: Sound Level Meter  
Manufacturer: ACO  
Model/Type: 6236 (Meter), 7052 (Microphone), - (Preamplifier)  
Serial No.: 222129 (Meter), 72838 (Microphone), - (Preamplifier)  
ID No.: NS-03-014  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-  
IEC61672-3:2013.

**Condition of this result of calibration**

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1007-24	6 June 2025
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2913	EF-0021-24	3 June 2025
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P240022 CD20240180EA	20 March 2025 7 August 2025
6) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20240069EA	13 February 2025 19 September 2025

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

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

- Reference standards instrument for Acoustic function
- National Institute of Metrology (Thailand)
- Electrical and Electronics Institute; NSC Accredited Calibration No.0119
- Reference standards instrument for Electrical function
- National Institute of Metrology (Thailand)
- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

**Result of Calibration:-**

Function : 1. Indication at the calibration check frequency

Reference	Measured value	Deviation	Acceptance limits
Acoustic Signal (dB)	(dB)	(dB)	(dB)
-	-	-	-



**ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**

Certificate No.: CP20240384EA

**Calibration Report**

Function : 2. Self-generated Noise

**2.1 Microphone Installed**

Measured value
(dB)
20.7

**2.2 Microphone replaced by the electrical input signal device**

Frequency	Measured value
Weighting	(dB)
A-weighting	15.5
C-weighting	20.6
Z-weighting	26.5

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

Meter free-field acoustic response at a level of 84 dB.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	-0.4	-0.6	-0.5	±1.5
1000	-0.7	-0.7	-0.7	±1.0
8000	1.5	1.8	1.8	±5.0

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	-0.2	-0.1	±2.0
125	0.0	-0.2	0.0	±1.5
250	0.0	-0.1	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	-0.3	-0.3	-0.1	±3.0
8000	-0.4	-0.4	-0.1	±5.0

Certificate No.: CP20240384EA

## Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.3

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	109.0	0.0	±1.1
114.0	114.0	0.0	±1.1
119.0	119.0	0.0	±1.1
120.0	120.1	0.1	±1.1
121.0	121.1	0.1	±1.1
122.0	122.0	0.0	±1.1
123.0	123.0	0.0	±1.1

Page 4 of 7

F-CAL-005 Ed.1

Certificate No.: CP20240384EA

## Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	58.9	-0.1	±1.1
54.0	53.9	-0.1	±1.1
49.0	48.9	-0.1	±1.1
44.0	43.9	-0.1	±1.1
39.0	38.9	-0.1	±1.1
34.0	33.9	-0.1	±1.1
33.0	33.0	0.0	±1.1
32.0	32.1	0.1	±1.1
31.0	31.2	0.2	±1.1
30.0	30.4	0.4	±1.1
29.0	29.7	0.7	±1.1

Function : 8. Level Linearity including level range control

8.1. Level Linearity Including the Level Range (Reference Signal)

Range	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
20-100	94.0	94.0	0.0	±1.1
20-110	94.0	94.0	0.0	±1.1
30-120	94.0	94.0	0.0	±1.1
40-130	94.0	94.0	0.0	±1.1

8.2. Level Linearity Including the Level range (5dB Above Under-range)

Range	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
20-80	25.0	25.5	0.5	±1.1
20-90	25.0	25.7	0.7	±1.1
20-100	25.0	25.8	0.8	±1.1
20-110	25.0	25.7	0.7	±1.1
30-120	35.0	35.0	0.0	±1.1
40-130	45.0	45.0	0.0	±1.1

Page 5 of 7

F-CAL-005 Ed.1

Certificate No.: CP20240384EA

## Calibration Report

Function : 9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	116.0	0.0	±1.0
	2	98.9	-0.1	+1.0 ; -2.5
	0.25	89.8	-0.2	+1.5 ; -5.0
Slow	200	109.5	-0.1	±1.0
	2	89.8	-0.2	+1.0 ; -5.0
	200	109.9	-0.1	±1.0
LAE	2	90.0	0.0	+1.0 ; -2.5
	0.25	80.9	-0.1	+1.5 ; -5.0

Function : 10. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	125.4	125.1	-0.3	±3.0
Positive half cycle	124.4	124.2	-0.2	±2.0
Negative half cycle	124.4	124.2	-0.2	±2.0

Function : 11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
-	-	-	-

Function : 12. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	129.0	129.0	0.0	±0.3

Page 6 of 7

F-CAL-005 Ed.1

Certificate No.: CP20240384EA

## Calibration Report

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Level Linearity including level range control	0.30	0.30
9) Tone burst response	0.20	0.30
10) Peak C sound level	0.20	0.35
11) Overload indication	0.24	0.25
12) High-Level Stability	0.10	0.10

- Remarks:
1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
  2. Overload indication can not measured because sound level meter can not set to Reference value of the standard calibration.
  3. The acceptance limit is for the deviated value.
  4. Acceptance limits was IEC61672-3:2013 Class 2.
  5. The coverage factor  $k = 2.00$

-- End of Report --

Page 7 of 7

F-CAL-005 Ed.1



Certificate No.: CP20240426EA  
Operation No.: CP2024120406

### Certificate of Calibration

Equipment: Sound Level Meter  
Manufacturer: ACO  
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)  
Serial No.: 222197 (Meter), 82953 (Microphone), - (Preamplifier)  
ID No.: NS-03-020  
Customer: C.E.M. Technology (Thailand) Co.,Ltd.  
Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran,  
Nakorn Phatom 73210  
Received Date: 16 December 2024  
Calibrated Date: 20 - 23 December 2024  
Issued Date: 24 December 2024  
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:   
( Mr. Sittichai Swaksuriyawong )  
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

Page 1 of 7

F-CAL-004 Ed.1



Certificate No.: CP20240426EA

### Calibration Report

Equipment: Sound Level Meter  
Manufacturer: ACO  
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)  
Serial No.: 222197 (Meter), 82953 (Microphone), - (Preamplifier)  
ID No.: NS-03-020  
Ambient Temperature: (23 ± 2) °C  
Relative Humidity: (50 ± 15) %  
Pressure: (101.3 ± 1.5) kPa  
Method of Calibration :-  
IEC61672-3:2013.

#### Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1007-24	6 June 2025
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2913	EF-0021-24	3 June 2025
4) 6.5 Digit precision multimeter	8846A	9609027	CB20240128EA	31 July 2025
5) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P240022 CD20240180EA	20 March 2025 7 August 2025
6) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20240069EA	13 February 2025 19 September 2025

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

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

Reference standards instrument for Acoustic function  
- National Institute of Metrology (Thailand)  
- Electrical and Electronics Institute; NSQ Accredited Calibration No.0119  
Reference standards instrument for Electrical function  
- National Institute of Metrology (Thailand)  
- Electrical and Electronics Institute; NSQ Accredited Calibration No.0119

#### Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference	Measured value	Deviation	Acceptance limits
Acoustic Signal (dB)	(dB)	(dB)	(dB)
-	-	-	-

Page 2 of 7

F-CAL-005 Ed.1



Certificate No.: CP20240426EA

### Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value
(dB)
21.4

2.2 Microphone replaced by the electrical input signal device

Frequency	Measured value
Weighting	(dB)
A-weighting	19.0
C-weighting	26.0
Z-weighting	32.3

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

Meter free-field acoustic response at a level of 84 dB.

Frequency	Deviation from various Frequency Weighting Response Curve			
	C-Weighting	A-Weighting	Z-Weighting	Acceptance limits
(Hz)	(dB)	(dB)	(dB)	(dB)
125	0.2	-0.1	0.1	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-0.5	-0.3	-0.3	±5.0

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency	Deviation from various Frequency Weighting Response Curve			
	C-Weighting	A-Weighting	Z-Weighting	Acceptance limits
(Hz)	(dB)	(dB)	(dB)	(dB)
63	-0.3	-0.2	0.0	±2.0
125	-0.2	-0.2	0.0	±1.5
250	-0.2	-0.1	0.0	±1.5
500	-0.1	-0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	-0.2	-0.1	0.0	±2.0
4000	-0.4	-0.3	0.0	±3.0
8000	-0.6	-0.3	-0.1	±5.0

Page 3 of 7

F-CAL-005 Ed.1



Certificate No.: CP20240426EA

### Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency	Measured value	Deviated value	Acceptance limits
Weighting	(dB)	(dB)	(dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time	Measured value	Deviated value	Acceptance limits
Weighting	(dB)	(dB)	(dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to	Reference	Record SPL at	Deviated value	Acceptance limits
Apply Signal	SPL	Conclusion of Time	(dB)	(dB)
(min)	(dB)	Period (dB)		
30	94.0	94.0	0.0	±0.3

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated	Measured value	Deviated value	Acceptance limits
Value (dB)	(dB)	(dB)	(dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	109.0	0.0	±1.1
114.0	114.0	0.0	±1.1
119.0	119.0	0.0	±1.1
120.0	120.1	0.1	±1.1
121.0	121.1	0.1	±1.1
122.0	122.1	0.1	±1.1
123.0	123.1	0.1	±1.1

Page 4 of 7

F-CAL-005 Ed.1



Certificate No.: CP20240426EA

### Calibration Report

#### 7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	78.9	-0.1	±1.1
74.0	73.8	-0.2	±1.1
69.0	68.7	-0.3	±1.1
64.0	63.7	-0.3	±1.1
59.0	58.7	-0.3	±1.1
54.0	53.7	-0.3	±1.1
49.0	48.7	-0.3	±1.1
44.0	43.7	-0.3	±1.1
39.0	38.7	-0.3	±1.1
34.0	33.7	-0.3	±1.1
33.0	32.9	-0.1	±1.1
32.0	32.0	0.0	±1.1
31.0	31.1	0.1	±1.1
30.0	30.4	0.4	±1.1
29.0	29.5	0.5	±1.1

#### Function : 8. Level Linearity including level range control

##### 8.1. Level Linearity Including the Level Range (Reference Signal)

Range	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
20-100	94.0	94.0	0.0	±1.1
20-110	94.0	94.0	0.0	±1.1
30-120	94.0	94.0	0.0	±1.1
40-130	94.0	94.0	0.0	±1.1

##### 8.2. Level Linearity Including the Level range (5dB Above Under-range)

Range	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
20-80	25.0	26.0	1.0	±1.1
20-90	25.0	25.9	0.9	±1.1
20-100	25.0	26.0	1.0	±1.1
20-110	25.0	26.0	1.0	±1.1
30-120	35.0	35.0	0.0	±1.1
40-130	45.0	44.9	-0.1	±1.1

Certificate No.: CP20240426EA

### Calibration Report

#### Function : 9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	116.0	0.0	±1.0
	2	98.9	-0.1	+1.0 ; -2.5
	0.25	89.9	-0.1	+1.5 ; -5.0
Slow	200	109.5	-0.1	±1.0
	2	89.8	-0.2	+1.0 ; -5.0
	0.25	109.9	-0.1	±1.0
LAE	2	90.0	0.0	+1.0 ; -2.5
	0.25	80.9	-0.1	+1.5 ; -5.0

#### Function : 10. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	125.4	125.1	-0.3	±3.0
Positive half cycle	124.4	124.2	-0.2	±2.0
Negative half cycle	124.4	124.2	-0.2	±2.0

#### Function : 11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
-	-	-	-

#### Function : 12. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	129.0	129.0	0.0	±0.3

Certificate No.: CP20240426EA

### Calibration Report

#### Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Level Linearity including level range control	0.30	0.30
9) Tone burst response	0.20	0.30
10) Peak C sound level	0.20	0.35
11) Overload indication	0.24	0.25
12) High-Level Stability	0.10	0.10

- Remarks:
1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
  2. Overload indication can not measured because sound level meter can not set to Reference value of the standard calibration.
  3. The acceptance limit is for the deviated value.
  4. Acceptance limits was IEC61672-3:2013 Class 2.
  5. The coverage factor  $k = 2.00$

-- End of Report --

Certificate No.: CP20250138EA  
Operation No.: CP2025040133

### Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: ACO

Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)

Serial No.: 222195 (Meter), 84163 (Microphone), - (Preamplifier)

ID No.: NS-03-025

Customer: C.E.M. Technology (Thailand) Co.,Ltd.

Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran, Nakorn Phatom 73210

Received Date: 21 April 2025

Calibrated Date: 28 - 29 April 2025

Issued Date: 30 April 2025

Calibrated by: Ms. Juntaporn Kunhakom

Approved by:   
( Mr. Sittichai Swaksuriyawong )  
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

Certificate No.: CP20250138EA

### Calibration Report

Equipment: Sound Level Meter  
Manufacturer: ACO  
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)  
Serial No.: 222195 (Meter), 84163 (Microphone), - (Preamplifier)  
ID No.: NS-03-025  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-  
IEC 61672-3:2013

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1007-24	6 June 2025
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2913	EF-0021-24	3 June 2025
4) 6.5 Digit precision multimeter	8846A	9609027	CB20240128EA	31 July 2025
5) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P250028	23 March 2026
6) Performance Audio Analyzer	U8903B	MY56510003	CB20250030EA	13 February 2026
			CK20240069EA	19 September 2025

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

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

- Reference standards instrument for Acoustic function
  - National Institute of Metrology (Thailand)
  - Electrical and Electronics Institute; NSC Accredited Calibration No.U1119
- Reference standards instrument for Electrical function
  - National Institute of Metrology (Thailand)
  - Electrical and Electronics Institute; NSC Accredited Calibration No.U1119

### Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

Certificate No.: CP20250138EA

### Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
18.7

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	12.2
C-weighting	17.4
Z-weighting	23.5

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

Meter free-field acoustic response at a level of 84 dB.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.2	-0.1	0.2	±1.5
1000	-0.1	-0.1	-0.2	±1.0
8000	-1.6	-1.5	-0.0	±5.0

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	-0.1	-0.1	±2.0
125	0.0	-0.1	-0.1	±1.5
250	0.0	0.0	0.0	±1.5
500	0.1	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	-0.4	-0.3	-0.1	±3.0
8000	0.3	0.4	0.2	±5.0

Certificate No.: CP20250138EA

### Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	93.9	-0.1	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
Imp	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.3

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	108.9	-0.1	±1.1
114.0	113.9	-0.1	±1.1
119.0	119.0	0.0	±1.1
120.0	120.0	0.0	±1.1
121.0	121.0	0.0	±1.1

Certificate No.: CP20250138EA

### Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	68.9	-0.1	±1.1
64.0	63.8	-0.2	±1.1
59.0	58.8	-0.2	±1.1
54.0	53.8	-0.2	±1.1
49.0	48.8	-0.2	±1.1
44.0	43.8	-0.2	±1.1
39.0	38.8	-0.2	±1.1
34.0	33.8	-0.2	±1.1
33.0	32.8	-0.2	±1.1
32.0	31.8	-0.2	±1.1
31.0	31.0	0.0	±1.1
30.0	30.1	0.1	±1.1

Function : 8. Level Linearity including level range control

8.1. Level Linearity Including the Level Range (Reference Signal)

Range	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
20-100	94.0	94.0	0.0	±1.1
20-110	94.0	94.0	0.0	±1.1
30-120	94.0	94.0	0.0	±1.1
40-130	94.0	94.0	0.0	±1.1

8.2. Level Linearity Including the Level range (5dB Above Under-range)

Range	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
20-80	25.0	25.3	0.3	±1.1
20-90	25.0	25.4	0.4	±1.1
20-100	25.0	25.5	0.5	±1.1
20-110	25.0	25.5	0.5	±1.1
30-120	35.0	35.0	0.0	±1.1
40-130	45.0	45.1	0.1	±1.1

Certificate No.: CP20250138EA

### Calibration Report

Function : 9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	116.0	0.0	±1.0
	2	98.9	-0.1	+1.0 ; -2.5
	0.25	89.9	-0.1	+1.5 ; -5.0
Slow	200	109.5	-0.1	±1.0
	2	89.8	-0.2	+1.0 ; -5.0
	200	109.9	-0.1	±1.0
LAE	2	90.0	0.0	+1.0 ; -2.5
	0.25	80.9	-0.1	+1.5 ; -5.0

Function : 10. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	125.4	125.6	0.2	±3.0
Positive half cycle	124.4	124.3	-0.1	±2.0
Negative half cycle	124.4	124.2	-0.2	±2.0

Function : 11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
-	-	-	-

Function : 12. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	129.0	129.0	0.0	±0.3

Certificate No.: CP20250138EA

### Calibration Report

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10 Hz to 4 kHz) 0.70 (>4 kHz to 10 kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Level Linearity including level range control	0.30	0.30
9) Tone burst response	0.20	0.30
10) Peak C sound level	0.20	0.30
11) Overload indication	0.24	0.25
12) High-Level Stability	0.10	0.10

Remarks:

1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. Overload indication can not measured because sound level meter can not set to Reference value of the standard calibration.
3. The acceptance limit is for the deviated value.
4. Acceptance limits was IEC61672-3:2013 Class 2.
5. The coverage factor  $k = 2.00$

-- End of Report --

Certificate No.: CP20250053EA  
Operation No.: CP2025020040

### Certificate of Calibration

Equipment: Sound Level Meter  
Manufacturer: SCARLEI TECH  
Model/Type: ST11D (Meter), AWA14425 (Microphone), - (Preamplifier)  
Serial No.: 820891 (Meter), 60237 (Microphone), - (Preamplifier)  
ID No.: NS-12-002  
Customer: C.E.M. Technology (Thailand) Co.,Ltd.  
Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran, Nakorn Phatom 73210  
Received Date: 31 January 2025  
Calibrated Date: 17 - 19 February 2025  
Issued Date: 24 February 2025  
Calibrated by: Ms. Juntaporn Kunkhaker

Approved by:   
( Mr. Sittichai Swaksuriyawong )  
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor ( $k$ ) providing a level of confidence or approximately 95%. This certificate may not be reproduced other than in full, except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

Certificate No.: CP20250053EA

### Calibration Report

Equipment: Sound Level Meter  
Manufacturer: SCARLEI TECH  
Model/Type: ST11D (Meter), AWA14425 (Microphone), - (Preamplifier)  
Serial No.: 820891 (Meter), 60237 (Microphone), - (Preamplifier)  
ID No.: NS-12-002  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Pressure: (101.3 ± 1.5) kPa  
Method of Calibration :-  
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1007-24	6 June 2025
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2913	EF-0021-24	3 June 2025
4) 6.5 Digit precision multimeter	8846A	9609027	CB20240128EA	31 July 2025
5) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P240022 CD20240180EA	20 March 2025 7 August 2025
6) Performance Audio Analyzer	U8903B	MY56510003	CB20250030EA CK20240069EA	13 February 2026 19 September 2025

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

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

Reference standards instrument for Acoustic function  
- National Institute of Metrology (Thailand)  
- Electrical and Electronics Institute; NSC Accredited Calibration No.0119  
Reference standards instrument for Electrical function  
- National Institute of Metrology (Thailand)  
- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-





Certificate No.: CP20250053EA

### Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
15.5

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	5.6
C-weighting	6.5
Z-weighting	12.2

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.2	0.1	0.1	±1.0
1000	0.0	0.1	0.0	±0.7
8000	-1.7	-1.3	-1.5	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.0	0.0	±0.8
125	0.0	-0.1	0.0	±1.0
250	0.0	0.1	0.0	±1.0
500	0.1	-0.1	0.0	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.1	0.1	0.0	±1.0
8000	-0.1	-0.1	0.0	+1.5; -2.5
16000	-5.2	-5.2	0.1	+2.5; -16.0



Certificate No.: CP20250053EA

### Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	93.9	-0.1	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8
140.0	139.9	-0.1	±0.8

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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



Certificate No.: CP20250053EA

### Calibration Report

7.2 Level Linearity on the reference level range, Lower (Cont.)

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	33.8	-0.2	±0.8
29.0	28.8	-0.2	±0.8
24.0	23.8	-0.2	±0.8
21.0	20.8	-0.2	±0.8
20.0	19.3	-0.7	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.9	-0.1	+1.0; -1.5
	0.25	109.8	-0.2	+1.0; -3.0
Slow	200	129.6	0.0	±0.5
	2	109.9	-0.1	+1.0; -3.0
	0.25	100.9	-0.1	+1.0; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	135.1	-0.3	±2.0
Positive half cycle	134.4	134.1	-0.3	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0



Certificate No.: CP20250053EA

### Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
142.6	142.6	0.0	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.24	0.25
11) High-level Stability	0.10	0.10

- Remarks:
1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
  2. The acceptance limit is for the deviated value.
  3. Acceptance limits was IEC61672-3:2013 Class 1.
  4. The coverage factor  $k = 2.00$

-- End of Report --

# G.Ruamkit Panich Co.,Ltd.


219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130


CERTIFICATE No : GR 17 E 30064

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER  
MANUFACTURER : ACO  
MODEL : TYPE 6226  
SERIAL No. : 090057  
ID No. : CEM-SI-02  
SUBMITTED BY : C,E,M TECHNOLOGY (THAILAND) CO.,LTD.  
219/43 MOO 12, PETCHKASEM RD., OMNOI,  
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY :   
CALIBRATION DATE : 10-April-25

APPROVED BY :   
PRUDIT P.

ISSUED DATE : 10-April-25

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
G.RUAMKIT PANICH CO.,LTD.

# G.Ruamkit Panich Co.,Ltd.


219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130


CERTIFICATE No : GR 17 E 30063

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER  
MANUFACTURER : ACO  
MODEL : TYPE 6226  
SERIAL No. : 060210  
ID No. : CEM-SI-03  
SUBMITTED BY : C,E,M TECHNOLOGY (THAILAND) CO.,LTD.  
219/43 MOO 12, PETCHKASEM RD., OMNOI,  
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY :   
CALIBRATION DATE : 10-April-25

APPROVED BY :   
PRUDIT P.

ISSUED DATE : 10-April-25

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
G.RUAMKIT PANICH CO.,LTD.

# G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30064

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : SOUND LEVEL METER  
MANUFACTURER : ACO  
MODEL : TYPE 6226  
ID No. : CEM-SI-02  
RECEIVED DATE : 7-April-25  
AMBIENT TEMPERATURE : 22 °C ± 3°C  
SERIAL NUMBER : 090057  
CALIBRATION DATE : 10-April-25  
RELATIVE HUMIDITY : 50%RH ± 20%RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR.  
THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.  
2. REFERENCE STANDARD INSTRUMENTS : -

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.68/09/74	10-Jan-26

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO :-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

### 1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.80	-9.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

### 2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

### 3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC\* : UNIT UNDER CALIBRATION  
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

# G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30063

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : SOUND LEVEL METER  
MANUFACTURER : ACO  
MODEL : TYPE 6226  
ID No. : CEM-SI-03  
RECEIVED DATE : 7-April-25  
AMBIENT TEMPERATURE : 22 °C ± 3°C  
SERIAL NUMBER : 060210  
CALIBRATION DATE : 10-April-25  
RELATIVE HUMIDITY : 50%RH ± 20%RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR.  
THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.  
2. REFERENCE STANDARD INSTRUMENTS : -

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.68/09/74	10-Jan-26

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO :-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

### 1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.80	-9.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

### 2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

### 3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC\* : UNIT UNDER CALIBRATION  
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

# G.Ruamkit Panich Co.,Ltd.

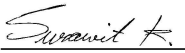
219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130


CERTIFICATE No : GR 17 E 30066

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER  
MANUFACTURER : ACO  
MODEL : TYPE 6226  
SERIAL No. : 150006  
ID No. : CEM-SI-06  
SUBMITTED BY : C,E,M TECHNOLOGY (THAILAND) CO.,LTD.  
219/43 MOO 12, PETCHKASEM RD., OMNOI,  
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY :   
CALIBRATION DATE : 10-April-25

APPROVED BY :   
AUDIT P.

ISSUED DATE : 10-April-25

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
G.RUAMKIT PANICH CO.,LTD.

# G.Ruamkit Panich Co.,Ltd.

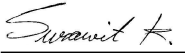
219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30067

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER  
MANUFACTURER : ACO  
MODEL : TYPE 6226  
SERIAL No. : 150007  
ID No. : CEM-SI-07  
SUBMITTED BY : C,E,M TECHNOLOGY (THAILAND) CO.,LTD.  
219/43 MOO 12, PETCHKASEM RD., OMNOI,  
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY :   
CALIBRATION DATE : 10-April-25

APPROVED BY :   
AUDIT P.

ISSUED DATE : 10-April-25

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
G.RUAMKIT PANICH CO.,LTD.

# G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30066

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : SOUND LEVEL METER  
MANUFACTURER : ACO  
MODEL : TYPE 6226 SERIAL NUMBER : 150006  
ID No. : CEM-SI-06  
RECEIVED DATE : 7-April-25 CALIBRATION DATE : 10-April-25  
AMBIENT TEMPERATURE : 22 °C ± 3°C RELATIVE HUMIDITY : 50%RH ± 20%RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR.  
THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.  
2. REFERENCE STANDARD INSTRUMENTS : -

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR	1986	01827	EEL.SP.68/09/74	10-Jan-25

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO :-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND  
TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

### 1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

### 2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

### 3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY  
A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

# G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30067

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : SOUND LEVEL METER  
MANUFACTURER : ACO  
MODEL : TYPE 6226 SERIAL NUMBER : 150007  
ID No. : CEM-SI-07  
RECEIVED DATE : 7-April-25 CALIBRATION DATE : 10-April-25  
AMBIENT TEMPERATURE : 22 °C ± 3°C RELATIVE HUMIDITY : 50%RH ± 20%RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR.  
THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.  
2. REFERENCE STANDARD INSTRUMENTS : -

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR	1986	01827	EEL.SP.68/09/74	10-Jan-25

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO :-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND  
TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

### 1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

### 2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

### 3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

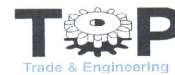
STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY  
A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

เอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพอากาศในบรรยากาศ



# Certificate of Analyzer Performance Testing

Calibrated Date : 2-Aug-24 Certificate No. : 0824-001  
 Page : 1/1

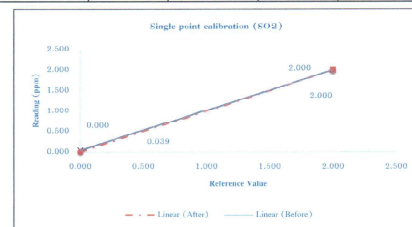
**Analyzer Instruments**  
 Analyzer Type : SO2 Analyzer Manufacturer : Thermo Environmental  
 Model : 43C Serial No. : 43C-62201-334

**Environmental**  
 Temperature : 29.1 °C  
 Humidity : 44.6 %RH

**Calibration System**  
**Calibrator Units**  
 Gas Calibration : Thermo Environmental Zero Air Generator : API  
 Model : 146C Model : 701  
 Serial No. : 514811458 Serial No. : 179

**Standard Gas**  
 NO Conc. : 2 ppm Cylinder No. : 307199  
 SO2 Conc. : 2 ppm Expire Date : 10-Oct-25  
 CO Conc. : 50 ppm

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
SO2	0.038	0.000	0.04	2.00	2.000	0.00
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by : *Tong*  
 (Mr./Tong Pimsa)



# Certificate of Analyzer Performance Testing

Calibrated Date : 20-Aug-24 Certificate No. : 0824-004  
 Page : 1/1

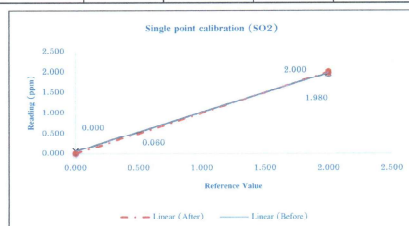
**Analyzer Instruments**  
 Analyzer Type : SO2 Analyzer Manufacturer : Thermo Environmental  
 Model : 43C Serial No. : 43C-70853-367

**Environmental**  
 Temperature : 29.1 °C  
 Humidity : 40.4 %RH

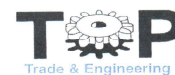
**Calibration System**  
**Calibrator Units**  
 Gas Calibration : Thermo Environmental Zero Air Generator : API  
 Model : 146C Model : 701  
 Serial No. : 514811458 Serial No. : 179

**Standard Gas**  
 NO Conc. : 2 ppm Cylinder No. : 307199  
 SO2 Conc. : 2 ppm Expire Date : 10-Oct-25  
 CO Conc. : 50 ppm

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
SO2	0.060	0.000	0.06	1.88	2.000	-1.00
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by : *Tong*  
 (Mr./Tong Pimsa)



# Certificate of Analyzer Performance Testing

Calibrated Date : 26-Sep-24 Certificate No. : 0924-001  
 Page : 1/1

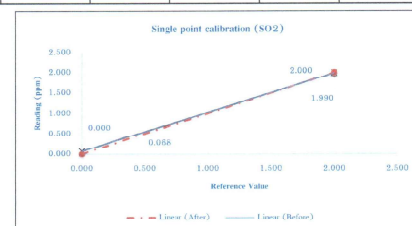
**Analyzer Instruments**  
 Analyzer Type : SO2 Analyzer Manufacturer : Thermo Environmental  
 Model : 43C Serial No. : CT143588-340

**Environmental**  
 Temperature : 24.2 °C  
 Humidity : 48.3 %RH

**Calibration System**  
**Calibrator Units**  
 Gas Calibration : Thermo Environmental Zero Air Generator : API  
 Model : 146C Model : 701  
 Serial No. : 514811458 Serial No. : 179

**Standard Gas**  
 NO Conc. : 2 ppm Cylinder No. : 307199  
 SO2 Conc. : 2 ppm Expire Date : 10-Oct-25  
 CO Conc. : 50 ppm

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
SO2	0.068	0.000	0.07	1.89	2.000	-0.50
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by : *Tong*  
 (Mr./Tong Pimsa)



**Certificate of Analyzer Performance Testing**

Calibrated Date : 25-Mar-25 Certificate No. : 0325-003  
Page : 1/1

**Analyzer Instruments**  
Analyzer Type : NO/NO<sub>x</sub>/NO<sub>x</sub> Analyzer Manufacturer : Thermo Environmental  
Model : 49C Serial No. : 72454-371

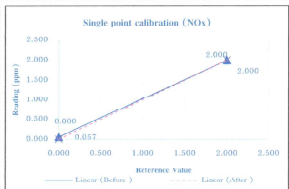
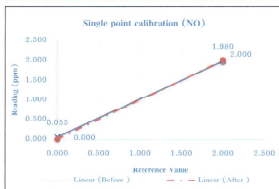
**Environmental**  
Temperature : 25.1 °C  
Humidity : 46.9 %RH

**Calibration System**  
**Calibrator Units**  
Gas Calibration : Thermo Environmental Zero Air Generator : API  
Model : 146C Model : 701  
Serial No. : 514811458 Serial No. : 179

**Standard Gas**  
NO Conc. : 2 ppm Cylinder No. : 307199  
SO<sub>2</sub> : 2 ppm Expire Date : 10-Oct-25  
CO Conc. : 50 ppm

**Calibration Check**

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
NO	0.055	0.000	0.06	1.98	2.00	-1.00
NO <sub>x</sub>	0.057	0.000	0.00	2.00	2.00	0.00
After						
NO	0.000	0.000	0.00	2.00	2.00	0.00
NO <sub>x</sub>	0.000	0.000	0.00	2.00	2.00	0.00



Calibrated by :

*Tong*  
(Mr. Tong Pima)

**Certificate of Analyzer Performance Testing**

Calibrated Date : 1-Jul-24 Certificate No. : 0724-001  
Page : 1/1

**Analyzer Instruments**  
Analyzer Type : NO/NO<sub>x</sub>/NO<sub>x</sub> Analyzer Manufacturer : Thermo Environmental  
Model : 42C Serial No. : 63470-339

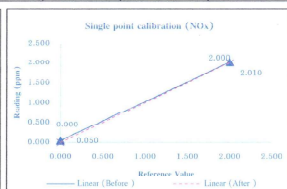
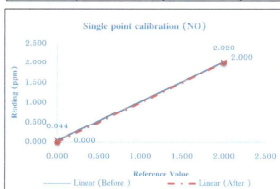
**Environmental**  
Temperature : 26.3 °C  
Humidity : 42.5 %RH

**Calibration System**  
**Calibrator Units**  
Gas Calibration : Thermo Environmental Zero Air Generator : API  
Model : 146C Model : 701  
Serial No. : 514811458 Serial No. : 179

**Standard Gas**  
NO Conc. : 2 ppm Cylinder No. : 307199  
SO<sub>2</sub> : 2 ppm Expire Date : 10-Oct-25  
CO Conc. : 50 ppm

**Calibration Check**

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
NO	0.044	0.000	0.04	2.00	2.00	1.00
NO <sub>x</sub>	0.050	0.000	0.05	2.01	2.00	0.50
After						
NO	0.000	0.000	0.00	2.00	2.00	0.00
NO <sub>x</sub>	0.000	0.000	0.00	2.00	2.00	0.00



Calibrated by :

*Tong*  
(Mr. Tong Pima)

**Certificate of Analyzer Performance Testing**

Calibrated Date : 9-Aug-24 Certificate No. : 0824-003  
Page : 1/1

**Analyzer Instruments**  
Analyzer Type : NO/NO<sub>x</sub>/NO<sub>x</sub> Analyzer Manufacturer : Thermo Environmental  
Model : 42C Serial No. : 39405-323

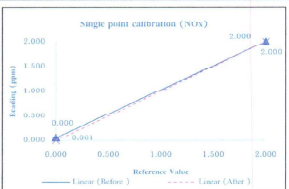
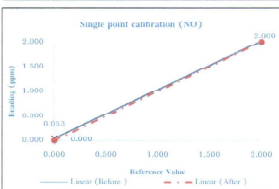
**Environmental**  
Temperature : 25.7 °C  
Humidity : 46.6 %RH

**Calibration System**  
**Calibrator Units**  
Gas Calibration : Thermo Environmental Zero Air Generator : API  
Model : 146C Model : 701  
Serial No. : 514811458 Serial No. : 179

**Standard Gas**  
NO Conc. : 2 ppm Cylinder No. : 307199  
SO<sub>2</sub> : 2 ppm Expire Date : 10-Oct-25  
CO Conc. : 50 ppm

**Calibration Check**

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
NO	0.053	0.000	0.05	2.02	2.00	1.00
NO <sub>x</sub>	0.061	0.000	0.06	2.00	2.00	0.00
After						
NO	0.000	0.000	0.00	2.00	2.00	0.00
NO <sub>x</sub>	0.000	0.000	0.00	2.00	2.00	0.00



Calibrated by :

*Tong*  
(Mr. Tong Pima)

**Certificate of Analyzer Performance Testing**

Calibrated Date : 18-Jul-24 Certificate No. : 0724-001  
Page : 1/1

**Analyzer Instruments**  
Analyzer Type : CO Analyzer Manufacturer : Thermo Environmental  
Model : 48C Serial No. : 508011061

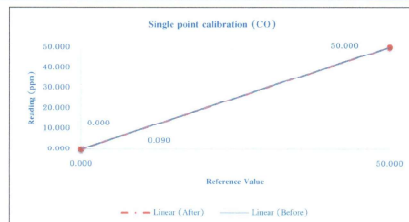
**Environmental**  
Temperature : 26.7 °C  
Humidity : 47.7 %RH

**Calibration System**  
**Calibrator Units**  
Gas Calibration : Thermo Environmental Zero Air Generator : API  
Model : 146C Model : 701  
Serial No. : 514811458 Serial No. : 179

**Standard Gas**  
NO Conc. : 2 ppm Cylinder No. : 307199  
SO<sub>2</sub> : 2 ppm Expire Date : 10-Oct-25  
CO Conc. : 50 ppm

**Calibration Check**

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
CO	0.080	0.000	0.08	50.1	50.000	0.20
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



Calibrated by :

*Tong*  
(Mr. Tong Pima)



**Certificate of Analyzer Performance Testing**

Calibrated Date : 3 Mar 25 Certificate No. : 0925-001  
Page : 1/1

**Analyzer Instruments**  
Analyzer Type : CO Analyzer Manufacturer : Thermo Environmental  
Model : 48C Serial No. : 65775350

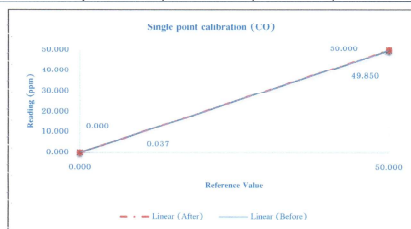
**Environmental**  
Temperature : 25.6 °C  
Humidity : 42.9 %RH

**Calibration System**  
**Calibrator Units**  
Gas Calibration : Thermo Environmental Zero Air Generator : API  
Model : 146C Model : 701  
Serial No. : 514811458 Serial No. : 179

**Standard Gas**  
NO Conc. : 2 ppm Cylinder No. : 007199  
SO<sub>2</sub> Conc. : 2 ppm Expire Date : 10-Oct-25  
CO Conc. : 50 ppm

**Calibration Check**

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
CO	0.037	0.000	0.04	49.850	50.000	-0.30
After						
CO	0.000	0.000	0.00	50.000	50.000	0.00



Calibrated by :

*Tong*  
(Mr. Tong Pima)

**Certificate of Analyzer Performance Testing**

Calibrated Date : 23-Aug-24 Certificate No. : 0824-008  
Page : 1/1

**Analyzer Instruments**  
Analyzer Type : CO Analyzer Manufacturer : Thermo Environmental  
Model : 48C Serial No. : 508011064

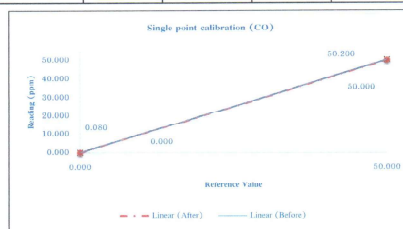
**Environmental**  
Temperature : 26.2 °C  
Humidity : 51.3 %RH

**Calibration System**  
**Calibrator Units**  
Gas Calibration : Thermo Environmental Zero Air Generator : API  
Model : 146C Model : 701  
Serial No. : 514811458 Serial No. : 179

**Standard Gas**  
NO Conc. : 2 ppm Cylinder No. : 007199  
SO<sub>2</sub> Conc. : 2 ppm Expire Date : 10-Oct-25  
CO Conc. : 50 ppm

**Calibration Check**

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
CO	0.080	0.000	0.08	50.2	50.000	0.40
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



Calibrated by :

*Tong*  
(Mr. Tong Pima)

**Certificate of Analyzer Performance Testing**

Calibrated Date : 13-Jan-25 Certificate No. : 0125-001  
Page : 1/1

**Analyzer Instruments**  
Analyzer Type : THC Analyzer Manufacturer : Thermo Environmental  
Model : 51 Serial No. : 51HT-73244-373

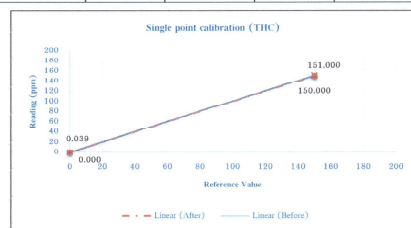
**Environmental**  
Temperature : 26.2 °C  
Humidity : 44.1 %RH

**Calibration System**  
**Calibrator Units**  
Gas Calibration : Thermo Environmental Zero Air Generator : API  
Model : 146C Model : 701  
Serial No. : 514811458 Serial No. : 179

**Standard Gas**  
Propane Conc. : 150 ppm Cylinder No. : 21W281048  
Expire Date : 26-Sep-25

**Calibration Check**

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
THC	0.039	0.000	0.039	151	150	0.667
After						
THC	0.000	0.000	0.000	150	150	0.000



Calibrated by :

*Tong*  
(Mr. Tong Pima)

**Certificate of Analyzer Performance Testing**

Calibrated Date : 13-Jan-25 Certificate No. : 0125-002  
Page : 1/1

**Analyzer Instruments**  
Analyzer Type : THC Analyzer Manufacturer : Baseline  
Model : Series 8800 Serial No. : 584

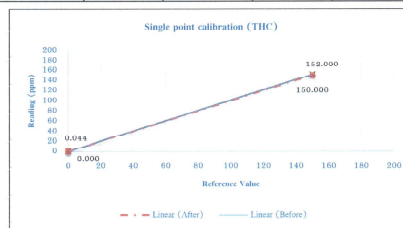
**Environmental**  
Temperature : 26.7 °C  
Humidity : 44.0 %RH

**Calibration System**  
**Calibrator Units**  
Gas Calibration : Thermo Environmental Zero Air Generator : API  
Model : 146C Model : 701  
Serial No. : 514811458 Serial No. : 179

**Standard Gas**  
Propane Conc. : 150 ppm Cylinder No. : 21W281048  
Expire Date : 26-Sep-25

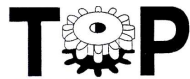
**Calibration Check**

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
THC	0.044	0.000	0.044	152	150	1.333
After						
THC	0.000	0.000	0.000	150	150	0.000



Calibrated by :

*Tong*  
(Mr. Tong Pima)



Trade & Engineering  
TSP High Volume Sampler  
TE-5000 TSP Sampler Verification

Site Information

Location: -	Site ID: -	Date: 14 Oct 24
Sampler: TE-5000 TSP	Serial No: 3269	Tech: Tong, P

Site Conditions

Barometric Pressure (in Hg): 27.75	Corrected Pressure (mm Hg): 704.9
Temperature (deg F): 76.5	Temperature (deg K): 297.9
Average Press. (in Hg): 27.31	Corrected Average (mm Hg): 693.7
Average Temp (Deg F): 74.9	Average Temp (Deg K): 297.0

Calibration Orifice

Make: Tisch	Qstd Slope: 1.57894
Model: TE-5028A	Qstd Intercept: -0.01520
Serial#: 1179	Calibration Due Date: 10 December 2024

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	8.00	1.735	60.1	57.89	Slope: 39.5761
2	6.55	1.571	55.7	53.65	Intercept: -9.7403
3	5.15	1.394	47.8	46.04	Corr. Coeff: 0.9955
4	4.55	1.311	43.3	41.71	
5	4.00	1.112	35.2	33.91	# of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$
$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate  
IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

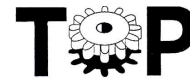
$$1/m[(I)/(\text{Sqrt}(298/Tav)(Pav/760))]-b]$$

m = sampler slope  
b = sampler intercept  
I = chart response  
Tav = daily average temperature  
Pav = daily average pressure

Enter Average I (chart): 48.4  
Average Flow Calculation m3/min  
1.416976485  
Average Flow Calculation in cfm  
50.03447975  
Sample Time (Hrs): 24.0  
Total flow in 24 hours m3/min  
2040.446139  
Total flow in 24 hours cfm  
72049.65084

NOTE: Ensure calibration orifice has been certified within 12 months of use

Tisch Environmental 145 South Miami Ave, Cleves OH 45002 • 877.263.7610 • sales@tisch-env.com • www.tisch-env.com



Trade & Engineering  
TSP High Volume Sampler  
TE-5000 TSP Sampler Verification

Site Information

Location: -	Site ID: -	Date: 14 Oct 24
Sampler: TE-5000 TSP	Serial No: 3270	Tech: Tong, P

Site Conditions

Barometric Pressure (in Hg): 28.00	Corrected Pressure (mm Hg): 711.2
Temperature (deg F): 75.5	Temperature (deg K): 297.3
Average Press. (in Hg): 27.29	Corrected Average (mm Hg): 693.2
Average Temp (Deg F): 75.3	Average Temp (Deg K): 297.2

Calibration Orifice

Make: Tisch	Qstd Slope: 1.57894
Model: TE-5028A	Qstd Intercept: -0.01520
Serial#: 1179	Calibration Due Date: 10 December 2024

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	8.25	1.771	60.2	58.30	Slope: 38.4149
2	6.60	1.585	55.6	53.85	Intercept: -8.6412
3	5.30	1.422	47.7	46.20	Corr. Coeff: 0.9946
4	4.60	1.325	43.2	41.84	
5	4.15	1.112	34.9	33.80	# of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$
$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate  
IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m[(I)/(\text{Sqrt}(298/Tav)(Pav/760))]-b]$$

m = sampler slope  
b = sampler intercept  
I = chart response  
Tav = daily average temperature  
Pav = daily average pressure

Enter Average I (chart): 48.3  
Average Flow Calculation m3/min  
1.427813103  
Average Flow Calculation in cfm  
50.41712868  
Sample Time (Hrs): 24.0  
Total flow in 24 hours m3/min  
2056.050868  
Total flow in 24 hours cfm  
72600.6653

NOTE: Ensure calibration orifice has been certified within 12 months of use

Tisch Environmental 145 South Miami Ave, Cleves OH 45002 • 877.263.7610 • sales@tisch-env.com • www.tisch-env.com



Trade & Engineering  
PM10 High Volume Sampler Verification

Site Information

Location: -	Site ID: -	Date: 20 September 2024
Sampler: TE-6070 PM10	Serial No: 3183	Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 27.03	Corrected Pressure (mm Hg): 686.6
Temperature (deg F): 75.4	Temperature (deg K): 297.1
Average Press. (in Hg): 26.73	Corrected Average (mm Hg): 678.9
Average Temp. (deg F): 75.9	Average Temp. (deg K): 297.4

Calibration Orifice

Make: Tisch Environmental, Inc.	Qstd Slope: 1.57894
Model: TE-5028A	Qstd Intercept: -0.01520
Serial#: 1179	Calibration Due Date: 10 Dec 24

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	9.40	1.287	60.0	39.47	Slope 30.7100
2	7.80	1.173	57.3	37.69	Intercept 0.7813
3	6.50	1.072	52.9	34.80	Corr. Coeff 0.9489
4	5.80	1.037	50.3	33.09	SFR 1.116
5	5.05	1.006	45.7	30.06	SSP 53.31
# of Observations: 5					

Calculations

$$Qa = 1/m[\text{Sqrt}((H2O)/(Ta/Pa))-b]$$
$$IC = I[\text{Sqrt}(Ta/Pa)]$$

Qa = actual flow rate  
IC = corrected chart response

m = calibrator slope

b = calibrator intercept

Ta = actual temperature (deg K)

Pa = actual pressure (mm Hg)

For subsequent calculation

of sampler flow:

$$SFR = 1.13(Ps/Pa)(Ta/Ts)$$
$$SSP = (m*SFR+b)/(\text{Sqrt}(Pa/Ta))$$

SFR = sampler set point flow rate  
SSP = sampler chart set point

m = sampler slope

b = sampler intercept

Ta = actual temperature (deg K)

Pa = actual pressure (mm Hg)

Ts = Average temperature (deg K)

Ps = Average pressure (mm Hg)

m = sampler slope  
b = sampler intercept  
I = chart response  
Tav = daily average temperature  
Pav = daily average pressure

Average I (chart): 53.2  
Average Flow over Sample (m3/min)  
1.121929464  
Enter Total Time (Hrs): 24.0  
Total flow over sample (m3/min)  
1615.578428  
Total flow over sample (CFM)  
57046.0743

NOTE: Ensure calibration orifice has been certified within 12 months of use

Tisch Environmental 145 South Miami Ave, Cleves OH 45002 • 877.263.7610 • sales@tisch-env.com • www.tisch-env.com



Trade & Engineering  
PM10 High Volume Sampler Verification

Site Information

Location: -	Site ID: -	Date: 20 September 2024
Sampler: TE-6070 PM10	Serial No: 3245	Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 27.07	Corrected Pressure (mm Hg): 687.6
Temperature (deg F): 75.8	Temperature (deg K): 297.3
Average Press. (in Hg): 26.80	Corrected Average (mm Hg): 680.7
Average Temp. (deg F): 76.0	Average Temp. (deg K): 297.4

Calibration Orifice

Make: Tisch Environmental, Inc.	Qstd Slope: 1.57894
Model: TE-5028A	Qstd Intercept: -0.01520
Serial#: 1179	Calibration Due Date: 10 Dec 24

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	9.45	1.290	61.1	40.18	Slope 30.4605
2	7.85	1.177	57.7	37.94	Intercept 1.5124
3	6.55	1.076	53.4	35.12	Corr. Coeff 0.9651
4	5.85	1.037	51.2	33.67	SFR 1.118
5	5.10	1.006	46.8	30.78	SSP 54.10
# of Observations: 5					

Calculations

$$Qa = 1/m[\text{Sqrt}((H2O)/(Ta/Pa))-b]$$
$$IC = I[\text{Sqrt}(Ta/Pa)]$$

Qa = actual flow rate  
IC = corrected chart response

m = calibrator slope

b = calibrator intercept

Ta = actual temperature (deg K)

Pa = actual pressure (mm Hg)

For subsequent calculation

of sampler flow:

$$SFR = 1.13(Ps/Pa)(Ta/Ts)$$
$$SSP = (m*SFR+b)/(\text{Sqrt}(Pa/Ta))$$

SFR = sampler set point flow rate  
SSP = sampler chart set point

m = sampler slope

b = sampler intercept

Ta = actual temperature (deg K)

Pa = actual pressure (mm Hg)

Ts = Average temperature (deg K)

Ps = Average pressure (mm Hg)

m = sampler slope  
b = sampler intercept  
I = chart response  
Tav = daily average temperature  
Pav = daily average pressure

Average I (chart): 54.0  
Average Flow over Sample (m3/min)  
1.123074473  
Enter Total Time (Hrs): 24.0  
Total flow over sample (m3/min)  
1617.227241  
Total flow over sample (CFM)  
57104.29387

NOTE: Ensure calibration orifice has been certified within 12 months of use

Tisch Environmental 145 South Miami Ave, Cleves OH 45002 • 877.263.7610 • sales@tisch-env.com • www.tisch-env.com

**Certificate of Calibration**

Calibrated Date : 30-Aug-24 Certificate No. : 0024-001  
Page : 1/1

**Instruments**

Instruments : PM2.5-PM10 Air Sampler Manufacturer : Thermo Scientific  
Model : 2090-D Serial No. : 000DA00010701

**Environmental**

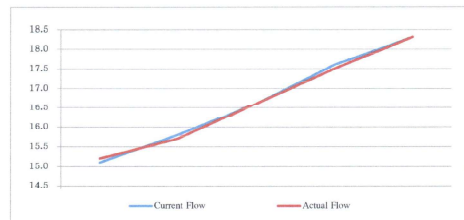
Temperature : 26.3 °C  
Humidity : 42.5 %RH

**Calibration System**

Instruments : Drycal Manufacturer : Bios  
Model : DCL-H Serial No. : 102591  
Calibration due date : 1-Nov-24

**Flow Testing**

Value	Set Flow Instrument (L/min)	Current Flow Instrument reading (L/min)	Actual Flow Reference Standard (L/min)
47 mm.	16.6	16.6	16.6
	17.6	17.6	17.5
	15.8	15.8	15.7
	16.3	16.3	16.3
	15.0	15.1	15.2



Calibrated by : *Tong*  
(Mr. Tong Pima)

เอกสารการสอบเทียบเครื่องมือวัดความสิ้นสะเทือน



**ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37  
Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280  
Tel. +66 2709 4800 Fax. +66 2324 0917

Certificate No.: CP20240344EA  
Operation No.: CP2024090317

**Certificate of Calibration**

Equipment: Vibration Meter

Manufacturer: InstanTel

Model/Type: Micromate

Serial No.: UM21467

ID No.: VB-01-009

Customer: C.E.M. Technology (Thailand) Co.,Ltd.

Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran,  
Nakorn Phatom 73210

Received Date: 9 September 2024

Calibrated Date: 23 - 25 September 2024

Issued Date: 30 September 2024

Calibrated by: Ms. Juntaporn Kunhakom

Approved by: *Sittichai Swaksuriyawong*  
( Mr. Sittichai Swaksuriyawong )  
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full, except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.



**ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**

Certificate No.: CP20240344EA

**Calibration Report**

Equipment: Vibration Meter  
Manufacturer: InstanTel  
Model: Micromate  
Serial No.: UM21467  
ID No.: VB-01-009  
Ambient Temperature: ( 25 ± 5 ) °C  
Relative Humidity: ( 50 ± 15 ) %

Method of Calibration :-  
In-house method : CC-SV004 by comparison with standard accelerometer.

**Condition of this result of calibration**

**1. Reference standards instrument :-**

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard Accelerometer	8305-001	30120	AV-0028-24	23-Jun-2025
2) Measuring Amplifier	2525	3016651	AV-0029-24	23-Jun-2025
3) PULSE Multi-analyzer system	3560-C	2705645	CQ20230026EA	25-Dec-2024
4) Humidity and Temperature Transmitter	HMT331	K3810009	CD20240141EA	12-Jun-2025

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

3 This certification is traceable to the international system of unit maintained at :-  
- National Institute of Metrology (Thailand)  
- Electrical and Electronics Institute, NSC Accredited Calibration No.0119



Certificate No.: CP20240344EA

### Calibration Report

#### Result of Calibration:-

Function : Frequency response and Linearity test at 16 Hz

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty ± (%)	Direction
4.0	10.000	10.006	10.522	0.516	1.50	Longitudinal (L)
5.0	10.000	10.013	10.514	0.501	1.50	
6.3	10.000	9.997	10.693	0.696	1.50	
8.0	10.000	10.001	10.286	0.285	1.50	
10.0	10.000	10.020	10.325	0.305	1.50	
12.5	10.000	10.004	10.365	0.361	1.50	
16.0	10.000	10.004	10.270	0.266	1.50	
	20.000	19.997	20.608	0.611	1.50	
	30.000	30.010	31.004	0.994	1.50	
	50.000	49.992	51.294	1.302	1.50	
20.0	10.000	10.003	10.365	0.362	1.50	
25.0	10.000	9.997	10.428	0.431	1.50	
31.5	10.000	10.013	10.625	0.612	1.50	
40.0	10.000	9.997	10.577	0.580	1.50	
50.0	10.000	9.996	10.593	0.597	1.50	
52.0	10.000	9.997	10.640	0.643	1.50	
63.0	10.000	10.003	10.770	0.767	1.50	
80.0	10.000	9.998	10.885	0.887	1.50	



Certificate No.: CP20240344EA

### Calibration Report

Function : Frequency response and Linearity test at 16 Hz (Cont.)

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty ± (%)	Direction
4.0	10.000	10.003	10.808	0.805	1.50	Transverse (T)
5.0	10.000	10.001	10.727	0.726	1.50	
6.3	10.000	10.003	10.722	0.719	1.50	
8.0	10.000	10.003	10.325	0.322	1.50	
10.0	10.000	10.001	10.278	0.277	1.50	
12.5	10.000	10.014	10.246	0.232	1.50	
16.0	10.000	10.001	10.191	0.190	1.50	
	20.000	19.997	20.493	0.496	1.50	
	30.000	29.995	30.857	0.862	1.50	
	50.000	49.992	51.122	1.130	1.50	
20.0	10.000	10.003	10.199	0.196	1.50	
25.0	10.000	9.994	10.254	0.260	1.50	
31.5	10.000	9.998	10.451	0.453	1.50	
40.0	10.000	9.996	10.451	0.455	1.50	
50.0	10.000	10.006	10.436	0.430	1.50	
52.0	10.000	9.995	10.475	0.482	1.50	
63.0	10.000	10.003	10.664	0.661	1.50	
80.0	10.000	10.006	10.932	0.926	1.50	



Certificate No.: CP20240344EA

### Calibration Report

Function : Frequency response and Linearity test at 16 Hz (Cont.)

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty ± (%)	Direction
4.0	10.000	9.997	10.309	0.312	1.50	Vertical (V)
5.0	10.000	9.994	10.369	0.355	1.50	
6.3	10.000	10.017	10.530	0.513	1.50	
8.0	10.000	9.997	9.947	-0.050	1.50	
10.0	10.000	10.011	10.112	0.101	1.50	
12.5	10.000	9.998	10.231	0.233	1.50	
16.0	10.000	10.000	10.128	0.128	1.50	
	20.000	19.997	20.343	0.346	1.50	
	30.000	29.995	30.479	0.404	1.50	
	50.000	49.978	50.798	0.820	1.50	
20.0	10.000	10.004	10.428	0.424	1.50	
25.0	10.000	9.997	10.333	0.336	1.50	
31.5	10.000	9.997	10.388	0.391	1.50	
40.0	10.000	9.998	10.491	0.493	1.50	
50.0	10.000	10.000	10.610	0.610	1.50	
52.0	10.000	9.991	10.816	0.825	1.50	
63.0	10.000	10.010	10.855	0.845	1.50	
80.0	10.000	9.997	11.145	1.148	1.50	

Remark  
1. UUC: Unit Under Calibration  
2. The coverage factor  $k = 2.00$

-- End of Report --

เอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำ





## CALIBRATION CERTIFICATE

Certificate No.S2505043S

page 1 of 2

**Customer :** C.E.M. TECHNOLOGY (THAILAND) CO., LTD.  
219/43 Moo 12, Petchkasem Rd., Omnoi,  
Krathumban, Samutsakorn 74130

**Equipment :** Non-automatic weighing instrument (Electronic instrument)  
**Manufacturer :** Sartorius **Order No. :** 68S1799-1  
**Model :** QUINTIX224-1S **Ambient temperature :** (23.9 ± 1.0) °C  
**Accuracy class :** **Relative humidity :** (38.9 ± 5.0) %  
**Capacity :** 220000 mg **Received date :** 30-Apr-2025  
**Resolution :** 0.1 mg **Date of calibration :** 30-Apr-2025  
**Serial No. :** 0035009070 **Date of issue :** 03-May-2025  
**ID No. :** CI-01-002 **Condition of the balance :** Good working conditions  
**Place of calibration :** กรุงเทพมหานคร

### Calibration method

This instrument was calibrated according to the EURAMET Calibration Guide No. 18.

### Condition of reference standard weight

Instrument	Nominal value	Serial No.	Certificate No.	Due-date	Density (kg/m <sup>3</sup> )
1. Standard weight set	1 mg to 2 kg	15885-15849	M2410001S	5-Oct-2025	7950

### Traceability of the reference standard weight

This certificate is traceable to SI unit through Mass Calibration Laboratory Thai Calibration Services Co., Ltd., NSG-ONSC accredited no. Calibration 0189.

Calibrated By : Aekhasak Silarut  
Technician

Approved Signatory :   
Somwang Wongduang

This calibration certificate may not be reproduced other than in full,  
except with the prior written approval of the head of TCS calibration laboratory.

TCS-F-138 Issue 01/Rev.01/12 Jun 2023

NO. 3113



## CALIBRATION CERTIFICATE

Certificate No.S2505043S

page 2 of 2

### The repeatability of indication

Nominal Value (mg)	Standard Deviation of reading (mg)	Maximum difference between successive reading (mg)	n
200000	0.04	0.1	5

### The effect of eccentric application of a load on the indication (test load : 100000 mg)

Position	Balance Reading (mg)
Point 1	99999.8
Point 2	99999.8
Point 3	99999.8
Point 4	99999.6
Point 5	99999.6
Eccentric Value	0.2



### The error of indication

Nominal Value (mg)	Value of Reference Standard Weight (mg)	Balance Reading (mg)	Correction (mg)	Uncertainty (±) (mg)	k
Unload	0.0	0.0	0.0	0.14	2.21
100	100.0	100.0	0.0	0.14	2.21
200	200.0	200.1	-0.1	0.14	2.21
500	500.0	500.0	0.0	0.14	2.20
1000	1000.0	1000.0	0.0	0.14	2.20
2000	2000.0	2000.0	0.0	0.14	2.20
5000	5000.0	5000.1	-0.1	0.14	2.18
10000	10000.0	10000.0	0.0	0.14	2.16
20000	20000.0	20000.0	0.0	0.13	2.13
50000	50000.0	50000.0	0.0	0.16	2.08
100000	100000.0	99999.8	+0.2	0.21	2.00
200000	200000.2	199999.7	+0.5	0.34	2.00

Remark : Without adjustment

### Uncertainty of measurement

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor (k), which for a normal distribution corresponds to a coverage probability of approximately 95% (confidence level).

This report will certify of the calibrated equipment only.

--End--

TCS-F-138 Issue 01/Rev.01/12 Jun 2023

NO. 3114

CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhaphrasanan 3 Rd., Banggood, Pakkred, Nonthaburi 11120  
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com



## Certificate of Calibration

**Certificate No. :** 68-420017-1 **Page : 1 of 2**  
**Submitted by :** C.E.M Technology (Thailand) Co., Ltd.  
219/43 Moo.12 Petchkasem Rd, Omnoi, Krathumban, Samutsakorn 74130 (Head Office)  
**Equipment :** pH Meter with electrode  
pH meter  
**Manufacturer :** Thermo Scientific **Model :** VERSA STAR PRO  
**Range :** N/A pH **Resolution :** 0.01 pH  
**Serial No. :** 12260 **ID No. :** WW-03-001  
**Electrode**  
**Model :** 9156BNWP **Serial No. :** VV1-15843  
**ID No. :** WW-03-001  
**Environment :** On site calibration was carried out at the Laboratory.  
C.E.M Technology (Thailand) Co., Ltd.  
**Ambient Temperature :** (26.0 to 27.0) °C  
**Relative Humidity :** (45 to 50) %  
**Date of Received :** 11 February 2025  
**Date of Calibration :** 11 February 2025  
**Date of Issue :** 17 February 2025  
**Calibrated by :** Permpoon Chanpu

**Calibration Method :** In-house method CAL-M4201 direct measurement by using standard voltage calibrator and using certified reference material (CRM)

**Reference Standard Instruments :** This certification is traceable to the International System of Units

1. Multiproduct Calibrator

ID No.	Cert. No.	Due Date	Traceability
400005	SG E 00307/66	23 Aug 2025	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61293328	1027612	15 Sep 2026	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.987	61297593	1027614	15 Sep 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.010	61306165	1027613	15 Sep 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :   
( Permpoon Chanpu )  
Supervisor

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 Calibratech Co.,Ltd.



CAL-F0031-03

CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhaphrasanan 3 Rd., Banggood, Pakkred, Nonthaburi 11120  
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

## Certificate of Calibration

**Certificate No. :** 68-420017-1 **Page : 2 of 2**

### Result of Calibration :

**UUC Condition As-Received :** Good

**Function :** Electrical measurement

pH meter

Performing standard curve by Multiproduct Calibrator at pH (4,7,10)

Adjustment Curve at nominal pH	Applied Voltage (mV)	Nominal Value (pH)	UUC Reading (pH)	Correction (mV)	Uncertainty (± mV)
4, 7, 10	177.4800	4	4.00	177.4	0.12
	0.0000	7	7.00	0.0	0.086
	-177.4800	10	10.00	-177.4	0.12

**Function :** pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

Adjustment Curve at nominal pH	Standard Buffer (pH)	UUC Reading (pH)	Correction (pH)	Uncertainty (± pH)
4, 7, 10	4.008	4.01	0.00	0.0097
	6.987	7.00	-0.01	0.011
	10.010	10.01	0.00	0.014

**Remark**

UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.

This 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%

- o/0 -



CAL-F0031-03

## Certificate of Calibration

**Certificate No. :** 68-400089-1 **Page : 1 of 2**

**Submitted by :** C.E.M Technology (Thailand) Co.,Ltd.  
219/43 Moo.12 Petchkasem Rd, Omnoi, Krathumban, Samutsakorn 74130 (Head Office)

**Equipment :** Temperature Indicator with Thermistor Probe  
Temperature Indicator  
Manufacturer : Thermo Scientific Model : VERSA STAR PRO  
Range : N/A °C Resolution : 0.1 °C  
Serial No. : 12260 ID No. : WW-03-001  
Thermistor probe  
Model : N/A Sheath Material : Stainless  
Diameter : 6.5 mm. Length : 120 mm.  
Serial No. : PT1-18812 ID No. : WW-03-001

**Environment :** On site calibration was carried out at the Laboratory,  
C.E.M Technology (Thailand) Co., Ltd.  
Ambient Temperature : (26.0 to 27.0) °C  
Relative Humidity : (45 to 50) %  
Line Voltage : (224.5 to 226.0) VAC

**Date of Received :** 11 February 2025  
**Date of Calibration :** 11 February 2025  
**Date of Issue :** 17 February 2025  
**Calibrated by :** Permpon Chanpu

**Calibration Method :** This instrument was calibrated by In-house method comparison technique CAL-M4003  
by compared with PRT in the dry-well calibrator at the constant controlled temperature.  
The temperature scale used was based on ITS-90

**Reference Standard Instruments :** This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400002	TT-0095-24	01 Jul 2026	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400033	24F633	21 Feb 2026	National Institute of Metrology Thailand (NIMT)

Approved by : 

( Permpon Chanpu )

Supervisor

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 Calibratech Co.,Ltd.



CAL-F0031-03

## Certificate of Calibration

**Certificate No. :** 68-400089-1 **Page : 1 of 2**

**Submitted by :** C.E.M Technology (Thailand) Co.,Ltd.  
219/43 Moo.12 Petchkasem Rd, Omnoi, Krathumban, Samutsakorn 74130 (Head Office)

**Equipment :** Temperature Indicator with Thermistor Probe  
Temperature Indicator  
Manufacturer : Thermo Scientific Model : VERSA STAR PRO  
Range : N/A °C Resolution : 0.1 °C  
Serial No. : 12260 ID No. : WW-03-001  
Thermistor probe  
Model : N/A Sheath Material : Stainless  
Diameter : 6.5 mm. Length : 120 mm.  
Serial No. : PT1-18812 ID No. : WW-03-001

**Environment :** On site calibration was carried out at the Laboratory,  
C.E.M Technology (Thailand) Co., Ltd.  
Ambient Temperature : (26.0 to 27.0) °C  
Relative Humidity : (45 to 50) %  
Line Voltage : (224.5 to 226.0) VAC

**Date of Received :** 11 February 2025  
**Date of Calibration :** 11 February 2025  
**Date of Issue :** 17 February 2025  
**Calibrated by :** Permpon Chanpu

**Calibration Method :** This instrument was calibrated by In-house method comparison technique CAL-M4003  
by compared with PRT in the dry-well calibrator at the constant controlled temperature.  
The temperature scale used was based on ITS-90


**Reference Standard Instruments :** This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400002	TT-0095-24	01 Jul 2026	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400033	24E633	21 Feb 2026	National Institute of Metrology Thailand (NIMT)

Approved by : 

( Permpon Chanpu )

Supervisor

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 Calibratech Co.,Ltd.



CAL-F0031-03

## Certificate of Calibration

**Certificate No. :** 68-400089-1 **Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement

Immersion Depth ( mm. )	Standard Reading ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ± °C )
130	25.004	25.1	-0.1	0.19

Remarks

UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.

This 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%

- c00 -

CAL-F0031-03

## Certificate of Calibration

**Certificate No. :** 68-400089-1 **Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement

Immersion Depth ( mm. )	Standard Reading ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ± °C )
130	25.004	25.1	-0.1	0.19

Remarks

UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.

This 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%

- c00 -

CAL-F0031-03



## Certificate of Calibration

Certificate No. : 68 430004 2 Page : 1 of 2

Submitted by : C.E.M Technology (Thailand) Co., Ltd.  
219/43 Moo.12 Petchkasem Rd. Omnoi, Krathumban, Samutsakorn 74130 (Head Office)Equipment : Digital Conductivity meter with probe  
Manufacturer : Apera Model : PC 910  
Serial No. : PC910X1220811001 ID No. : WW-03-002  
Electrode  
Model : N/A Serial No. : N/A  
ID No. : WW-03-002Environment : On site calibration was carried out at the Laboratory.  
C.E.M Technology (Thailand) Co., Ltd.

Ambient Temperature (26.0 to 27.0) °C

Relative Humidity (45 to 50) %

Date of Received : 11 February 2025

Date of Calibration : 11 February 2025


Date of Issue : 17 February 2025

Calibrated by : Permpon Chanpu

Calibration Method : In-house method CAL-M4301 direct measurement by conductivity buffer solution

Reference Standard Instruments : This certification is traceable to the International System of Units  
Standard Buffer Solution

Material	Lot No.	Exp. Date	Traceability
84 µS/cm	0300	01 June 2027	National Institute of Standards and Technology (NIST), U.S.A., S.R.M.
1413 µS/cm	970986	25 April 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
12.88 mS/cm	970987	25 April 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :   
(Permpon Chanpu)  
Supervisor

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 Calibratech Co.,Ltd.



CAL-F0031-03

## Certificate of Calibration

Certificate No. : 68-430004 2 Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Conductivity measurement

Before Adjustment

Standard Conductivity Solution	UUC Reading	Correction	Uncertainty ( ± )	Unit
84*	81.9	2.1	1.1	µS/cm
1413	1444	-31	9.0	µS/cm
12.88	12.41	0.47	0.082	mS/cm

After Adjustment : at 25.000, 84, 147, 1413 µS/cm 12.880, 80, 111.80 mS/cm

Standard Conductivity Solution	UUC Reading	Correction	Uncertainty ( ± )	Unit
84*	84.0	0.0	1.1	µS/cm
1413	1413	0	9.0	µS/cm
12.88	12.88	0.00	0.082	mS/cm

Remark

UUC : Unit Under Calibration

\* This parameter are out of accreditation's scope.

This result of calibration was found accurate as shown on date and place of calibration only.

This 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%

CAL-F0031-03

## Certificate of Calibration

Equipment:	Hot Air Oven	Certificate No.:	C31250347
Model:	UF 55	Issued Date:	10 February 2025
Serial No.(or ID):	B219.0142 ( WW-05-002 )	Job No.:	WO-00060640
Manufacturer:	Memmert	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	2		

Customer : C.E.M Technology (Thailand) Co., Ltd.  
219/43 Moo 12 Petchkasem Road,  
Omnoi Krathum Baen, Samut Sakhon 74130 ThailandEnvironment Condition: Temperature: 28 °C ± 1.0 °C  
Humidity: 61 %RH ± 5.3 %RH  
Voltage: 230 VAC ± 1.5 VACCalibration Place: C.E.M Technology (Thailand) Co., Ltd. ( Laboratory Room )  
219/43 Moo 12 Petchkasem Road,  
Omnoi Krathum Baen, Samut Sakhon 74130 Thailand

Calibration By: Mr. Twoowong Thaitiang

Calibration Date: 10 February 2025

The Method used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10240018(Mr. Twoowong Thaitiang)  
Person in charge(Mr. Udon Srichana)  
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).

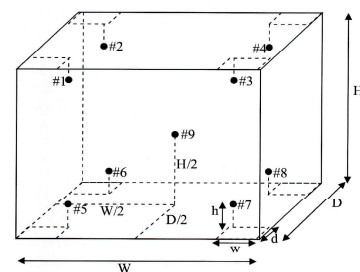
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok, Phraekhlong 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022

Certificate No.: C31250347 Page: 2 of 4



## Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber: W = 40 (cm) D = 33 (cm) H = 40 (cm)

Standard Locations (#1, #2, #3, #4): w = 5 (cm) d = 5 (cm) h = 5 (cm)

Standard Locations (#5, #6, #7, #8): w = 5 (cm) d = 5 (cm) h = 5 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	101	102	103	104	105	106	107	108	109

## Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.**Measured Temperature:** The average reading of standards at any positions or location.**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok, Phraekhlong 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022

# Calibration Results:

## Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	104.29	0.29	0.40
#2	104.01	0.01	0.40
#3	104.34	0.34	0.40
#4	104.23	0.23	0.39
#5	104.43	0.43	0.40
#6	104.19	0.19	0.40
#7	103.78	-0.22	0.40
#8	104.21	0.21	0.40
#9	104.47	0.47	0.41

## Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
104.0	104.0	104.0	#1	#2	#3	#4	#5	#6	#7	#8	#9	0.41
			104.29	104.01	104.34	104.23	104.43	104.19	103.78	104.21	104.47	

## Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.76	0.18	1.04

Note: \* Maximum uncertainty of the each position

# Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	180.20	0.20	0.43
#2	179.54	-0.46	0.43
#3	180.39	0.39	0.43
#4	180.09	0.09	0.43
#5	180.62	0.62	0.43
#6	179.97	-0.03	0.43
#7	179.53	-0.47	0.48
#8	180.27	0.27	0.43
#9	180.57	0.57	0.43

## Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
180.0	xxx	180.0	#1	#2	#3	#4	#5	#6	#7	#8	#9	0.48
			180.20	179.54	180.39	180.09	180.62	179.97	179.53	180.27	180.57	

## Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.26	0.19	1.39

Note: \* Maximum uncertainty of the each position

The End of Certificate

# Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

## Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule:
- ☐ Choice A Binary Statement for Simple Acceptance Rule ( $w = 0$ ), Specific Risk < 50% PFA.
  - ☒ Choice B Non-binary statement with guard band ( $w = 1$  U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
  - ☐ Choice C Customer defined, Customers may define arbitrary multiple of  $r$  to have applied as guard band ( $w = r$  U).

; PFA - Probability of False Accept

(Mr. Udon Srichana)  
Authorized signatory

## Without adjustment

Desired Temperature : 104.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	104.29	0.29	0.40	1.0	Pass
#2	104.01	0.01	0.40	1.0	Pass
#3	104.34	0.34	0.40	1.0	Pass
#4	104.23	0.23	0.39	1.0	Pass
#5	104.43	0.43	0.40	1.0	Pass
#6	104.19	0.19	0.40	1.0	Pass
#7	103.78	-0.22	0.40	1.0	Pass
#8	104.21	0.21	0.40	1.0	Pass
#9	104.47	0.47	0.41	1.0	Pass

Correction\* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

# Statements of conformity (Cont.)

## Without adjustment (Cont.)

Desired Temperature : 180.0°C Tolerances : 2.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

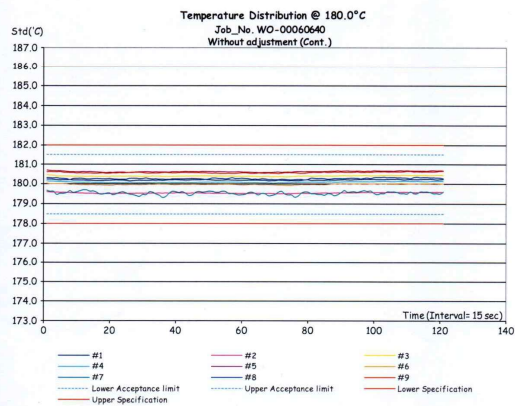
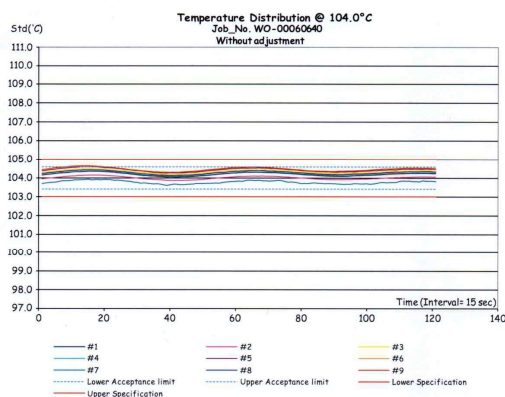
Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	180.20	0.20	0.43	2.0	Pass
#2	179.54	-0.46	0.43	2.0	Pass
#3	180.39	0.39	0.43	2.0	Pass
#4	180.09	0.09	0.43	2.0	Pass
#5	180.62	0.62	0.43	2.0	Pass
#6	179.97	-0.03	0.43	2.0	Pass
#7	179.53	-0.47	0.48	2.0	Pass
#8	180.27	0.27	0.43	2.0	Pass
#9	180.57	0.57	0.43	2.0	Pass

Correction\* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity



**ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ**

ชนิดเครื่องมือ: Hot Air Oven

ຮຸ້ນ: UF 55

เลขที่ใบงาน: WO-00060640

หมายเลขเครื่อง: B219.0142 ( WW-05-002 )

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
10 Feb 2025			10 Feb 2025		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		<i>General</i>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สวิตช์ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สวิตช์ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สวิตช์ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สวิตช์ตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สถานะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อเสนอแนะ :

Mr. Tweewong Thaithiang  
Service Engineer



# Certificate of Calibration

Equipment:	Cooled Incubator
Model:	KB 240
Serial No.(or ID):	20180000012164 ( WW-16-001 )
Manufacturer:	Binder
Condition:	In Condition
Shelves(pc.):	3

Certificate No.: C31250348  
 Issued Date: 10 February 2025  
 Job No.: WO-00060640  
 Page: 1 of 3  
 Ventilation Valve: Closed

Customer: C.E.M Technology (Thailand) Co., Ltd.  
219/43 Moo 12 Petchkasem Road,  
Omnoi Krathum Baen, Samut Sakhon 74130 Thailand

<b>Environment Condition:</b>	Temperature:	22 °C	±	1.8 °C
	Humidity:	61 %RH	±	5.3 %RH
	Voltage:	230 VAC	±	1.5 VAC

**Calibration Place:** C.E.M Technology (Thailand) Co., Ltd. ( Laboratory Room )  
219/43 Moo 12 Petchkasem Road,  
Omnoi Krathum Baen, Samut Sakhon 74130 Thailand

Calibration By: Mr. Tweewong Thaithiang  
Calibration Date: 10 February 2025

**The Method used:** In house method, CAL-WI-16, base on TLAS-G20

**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10240018

(Mr. Tweewong Thaithiang)  
Person in charge

(Mr. Udon Srichana)  
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.

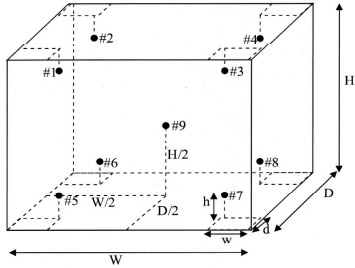
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ( $k=2$ ) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

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.

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด  
DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงบางนาจาก เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangna-Jung, Klongtoey, Bangkok 10260  
Phone: +66 2839 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth – in Asia and Beyond

CAL-EM-C31-10: 12 Sep 2022



## Standard Installation Locations

Volume (Calibration Zone)= 122 (Liters)

Inside chamber: W = 65 (cm) D = 50 (cm) H = 76 (cm)

Standard Locations (#1, #2, #3, #4): w = 7 (cm) d = 5 (cm) h = 8 (cm)

Standard Locations (#5, #6, #7, #8): w = 7 (cm) d = 5 (cm) h = 8 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	201	202	203	204	205	206	207	208	209

## Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.**Measured Temperature:** The average reading of standards at any positions or location.**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
Phone: +66 2839 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022

## Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

## Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule:**
- ☐ Choice A Binary Statement for Simple Acceptance Rule ( $w = 0$ ), Specific Risk < 50% PFA.
  - ☒ Choice B Non-binary statement with guard band ( $w = 1 U$ ), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
  - ☐ Choice C Customer defined, Customers may define arbitrary multiple of  $r$  to have applied as guard band ( $w = r U$ ).
- ; PFA - Probability of False Accept

(Mr. Udon Srichana)  
Authorized signatory

## Without adjustment

Desired temperature: 20.0 °C Tolerances: 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	20.14	0.14	0.33	1.0	Pass
#2	20.14	0.14	0.34	1.0	Pass
#3	19.96	0.04	0.38	1.0	Pass
#4	20.14	0.14	0.35	1.0	Pass
#5	20.11	0.11	0.33	1.0	Pass
#6	20.17	0.17	0.34	1.0	Pass
#7	20.00	0.00	0.37	1.0	Pass
#8	20.06	0.06	0.35	1.0	Pass
#9	20.38	0.38	0.33	1.0	Pass

Correction\* = Measured Temperature - Desired Temperature

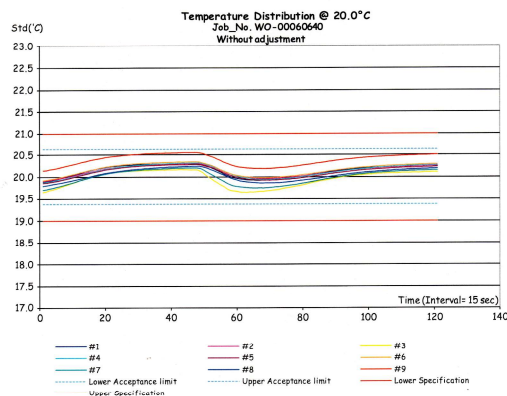
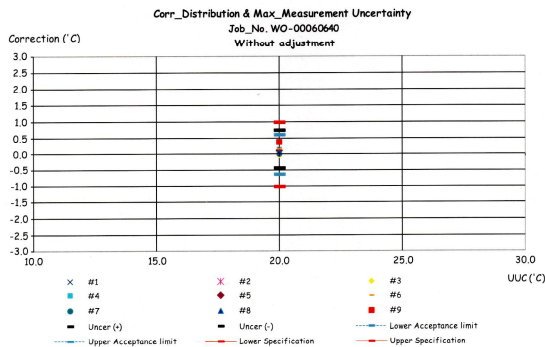
The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

## The End of Statements of Conformity

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
Phone: +66 2839 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022



## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00060640

ชนิดเครื่อง: Cooled Incubator รุ่น: KB 240  
หมายเลขเครื่อง: 2018000012164 (WW-16-001)

ตรวจสอบ (รับ)	รายการตรวจสอบ	ตรวจสอบ (ส่ง)		หมายเหตุ
		10 Feb 2025	10 Feb 2025	
ปกติ	ไม่ปกติ	ปกติ	ไม่ปกติ	
<b>General</b>				
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	

ขอแนะนำ:

Mr. Tiewong Thaihiang  
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
Phone: +66 2839 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - in Asia and Beyond.

### Calibration Results:

#### Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	20.14	0.14	0.33
#2	20.14	0.14	0.34
#3	19.96	-0.04	0.38
#4	20.14	0.14	0.35
#5	20.11	0.11	0.33
#6	20.17	0.17	0.34
#7	20.00	0.00	0.37
#8	20.06	0.06	0.35
#9	20.38	0.38	0.33

#### Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
20.0	20.0	20.0	#1	#2	#3	#4	#5	#6	#7	#8	#9	0.38
			20.14	20.14	19.96	20.14	20.11	20.17	20.00	20.06	20.38	

#### Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20.0	0.57	0.26	0.89

Note: \* Maximum uncertainty of the each position

The End of Certificate

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด  
DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth – in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022

## การดูแลบำรุงรักษาเชิงป้องกัน

### Preventive Maintenance



#### บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด

ฝ่ายบริการหลังการขาย

โทร 0 2 639 7000 E-mail: [service.tec.th@dksh.com](mailto:service.tec.th@dksh.com)

ฝ่ายขายและการตลาด

โทร 0 2 639 7000 E-Mail: [marketing.tec.th@dksh.com](mailto:marketing.tec.th@dksh.com)

Website: [www.dksh.co.th/technology/scientific-thailand](http://www.dksh.co.th/technology/scientific-thailand)

#### เงื่อนไขการให้บริการ Preventive Maintenance

บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้บริการตามข้อข้างของบริการ เฉพาะ ในวันและเวลา ราชการ หากมี  
ความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักชดเชย) บริษัทฯ จะ  
คิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

#### ขอบข่ายบริการ

- ตรวจสอบสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายการผลการตรวจสอบเครื่องมือ

#### หมายเหตุ

- ราคาเป็นารวมถึงค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้รับบริการอยู่นอกเขตพื้นที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง  
เป็นต้น
- บริษัทฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงเวลา โดยไม่แจ้งให้ทราบล่วงหน้า

#### ช่องทางการติดต่อ



DKSH Technology Limited (บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด)

เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260

เลขประจำตัวผู้เสียภาษี 010-555-001-4547 (สำนักงานใหญ่)



LINE: @dkshscientific



Call center 0 2 639 7000



DKSH Scientific



[www.dksh.com/scientific-thailand](http://www.dksh.com/scientific-thailand)



[marketing.tec.th@dksh.com](mailto:marketing.tec.th@dksh.com)



@dkshscientific

Preventive Maintenance Contract

จำนวนใบการทดสอบบริการ ...ครั้งต่อปี  
ครั้งที่ ...วันที่ 14/05/2025.....

รายละเอียดผู้ให้บริการ

หน่วยงาน	บริษัท ซี.เอ็ม.เอ็ม เทคโนโลยี (ไทยแลนด์) จำกัด		
ที่อยู่	219/43 หมู่12 ถนนเพชรเกษม ตำบลหนองปรือ อำเภอบางละมุง จังหวัดชลบุรี 74130		
โทรศัพท์	0869054664	แฟกซ์	-

ผู้ติดต่อ

ชื่อ - นามสกุล	คุณศิริพร ทิมพา				
ตำแหน่ง	เจ้าหน้าที่ห้องปฏิบัติการ				
โทรศัพท์	0869054664	มือถือ	-	แฟกซ์	-
E-mail	lab.cemtech1@gmail.com				

รายละเอียดผู้ให้บริการ

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่) เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260 โทรศัพท์ 0 2 693 7000 Email: <a href="mailto:jirayut.js@dksh.com">jirayut.js@dksh.com</a> เจ้าหน้าที่ประสานงาน : คุณจิรายุทธ สกลอด	
เจ้าหน้าที่ให้บริการ	นายจิรายุทธ สกลอด
ตำแหน่ง	Specialist, Technical Service.
โทรศัพท์	0938138736      แฟกซ์      -
E-mail	<a href="mailto:jirayut.js@dksh.com">jirayut.js@dksh.com</a>

ลงนามผู้ให้บริการ		ลงนามผู้ให้บริการ	<i>Jirayut Saksod</i>
ตัวจริง	(.....)	ตัวจริง	(นาย.จิรายุทธ.สกลอด)
ตำแหน่ง		ตำแหน่ง	Specialist, Technical Service.
วันที่ / ประทับตราบริษัท		วันที่ / ประทับตราบริษัท	14/05/2025

Part 4: อะไหล่และรายการผลการให้บริการ Preventive Maintenance

4.1 ตรวจสอบไฟฟ้า

	Pass	Fail	N/A	Remark
ใช้ไฟ 220 V 50 Hz	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
กระแสไฟฟ้าตามพิกัดเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

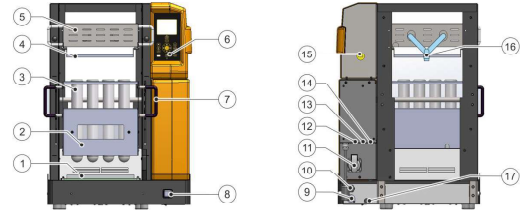
4.2 ตรวจสอบสภาพอุปกรณ์ภายนอก

	Pass	Fail	N/A	Remark
สายไฟของเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
ช่องแฉนวน ใต้ออก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
สายบร่อกับช่องแฉนวนใต้ออก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
สภาพของ Aluminum block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
การเชื่อมต่อของ Lift	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Light	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Current Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Thermostat	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

JOB No: WO-00070598.....MODEL: KT 20s.....S/N: GER5720180118

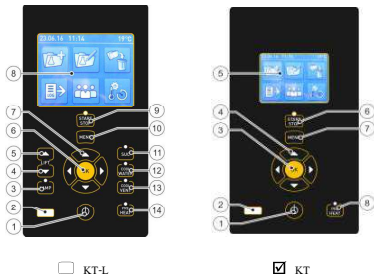
Part 3: ตรวจสอบสภาพเครื่อง

Front and rear view of KT-L version



No.		PASS	Fail	N/A	Remark
1	KJELDATHERM digestion block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	เสื่อมสภาพ
2	Insert rack	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3	Digestion tube	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4	Stainless steel drip tray	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5	Exhaust manifold	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6	Controls module, removable	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7	Handle for insert rack	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8	Mains switch with overcurrent protection function	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9	Connection for lift unit	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10	Mains cable with plug	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11	Power supply for TURBOSOG	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12	Connects controller module to block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13	Connection for fan for cooling samples (optional)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
14	Connection for external cooling water valve (optional)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
15	Connects controller module to block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16	Connection for Iso-Versinic hose (extraction)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17	Excess temperature fuse	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18	Lift	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

4.3 ตรวจสอบการทำงาน



☐ KT-L

☒ KT

	Pass	Fail	N/A	Remark
Switch controller on or off.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
USB port	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
LAMP button	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
LIFT down button	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
LIFT up button	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
OK button	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Navigation buttons	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
START/STOP button	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
MENU button	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
SUC button	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
COOL WATER button (optional)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
COOL VENT button (optional)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
PRE HEAT button	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
การทำงานของอุณหภูมิมากกว่า10องศาต่อครั้งที่250องศา	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
การทำงานของตัวป้องกันอุณหภูมิสูงเกิน	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
การทำงานของระบบควบคุมอุณหภูมิ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

#### การบำรุงรักษาทั่วไป (Basic maintenance)

1. การย่อยตัวอย่างเกิดการเดือดที่รุนแรงขึ้นเนื่องจากตัวอย่างนั้นสามารถป้องกันได้โดยแนะนำให้ย่อยด้วยการตั้งการเพิ่มอุณหภูมิเป็นระดับขั้น ย่อยที่ระดับอุณหภูมิ 250 C ครบเวลา 15 นาทีจึงเปลี่ยนเป็นอุณหภูมิ 380 C เพื่อป้องกันการล้นออกมา
  2. เมื่อใช้เสร็จไม่ควรปล่อยให้ Tube เย็นกับตัวเครื่อง
  3. ต้องนำเอาหลอดไอกรดใส่ทุกครั้งหลังจากใช้งานเสร็จ เพื่อป้องกันการหยดของไอกรดที่จะหยดลงมาที่ตัวเครื่อง
  4. ทำความสะอาดตัวหม้อย่อยด้วยน้ำหรือผ้าชุบน้ำในกรณีที่มีกรดมากรดหยดลงมาติดอยู่ในหม้อ
- เพื่อป้องกันไม่ให้เกิดการดังกล่าวไปกับการแผ่อุณหภูมิ

## การดูแลบำรุงรักษาเชิงป้องกัน

### Preventive Maintenance



บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด

ฝ่ายบริการหลังการขาย

โทร 0 2 639 7000 E-mail: [service.tec.th@dksh.com](mailto:service.tec.th@dksh.com)

ฝ่ายขายและการตลาด

โทร 0 2 639 7000 E-Mail : [marketing.tec.th@dksh.com](mailto:marketing.tec.th@dksh.com)

Website : [www.dksh.co.th/technology/scientific-thailand](http://www.dksh.co.th/technology/scientific-thailand)

#### เงื่อนไขการให้บริการ Preventive Maintenance

บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้บริการตามขอบข่ายของบริการ เฉพาะ ในวันและเวลา ราชการ หากมีความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักชดถรณ์) บริษัทฯ จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

#### ขอบข่ายการบริการ

- ตรวจสอบสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายงานผลการตรวจสอบเครื่องมือ

#### หมายเหตุ

- ราคาไม่รวมถึงค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้รับบริการอยู่นอกเขตพื้นที่ให้บริการ บริษัทฯ จัดเป็นสื่อมูลค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง เป็นต้น
- บริษัทฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงราคา โดยไม่แจ้งให้ทราบล่วงหน้า

#### ช่องทางการติดต่อ



DKSH Technology Limited (บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด)  
เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260  
เลขประจำตัวผู้เสียภาษี 010-555-001-4547 (สำนักงานใหญ่)



LINE: @dkshscientific



Call center 0 2 639 7000



DKSH Scientific



[www.dksh.com/scientific-thailand](http://www.dksh.com/scientific-thailand)



[marketing.tec.th@dksh.com](mailto:marketing.tec.th@dksh.com)



@dkshscientific



## Preventive Maintenance Contract

จำนวนใบการที่สัญญาบริการ ...1...ครั้งต่อปี

ครั้งที่ 1, วันที่ 14/05/2025.....

### รายละเอียดผู้รับบริการ

หน่วยงาน	บริษัท ซี.ดี.เอ็ม เทคโนโลยี (ไทยแลนด์) จำกัด		
ที่อยู่	219/43 หมู่12 ถนนเพชรเกษม ตำบลจันทน์น้อย อำเภอจตุรพักตรพิมาน จังหวัดสุรินทร์ 74130		
โทรศัพท์	0869054664	แฟกซ์	-

### ผู้ติดต่อ

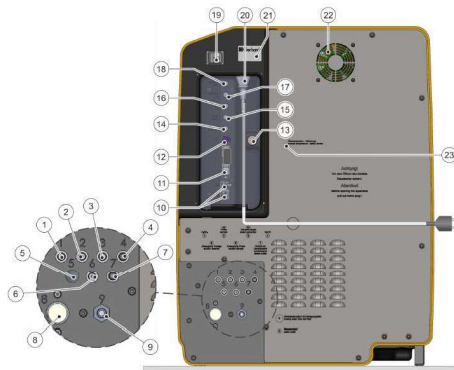
ชื่อ - นามสกุล	คุณศิริพร พิมพ์				
ตำแหน่ง	เจ้าหน้าที่ห้องปฏิบัติการ				
โทรศัพท์	0869054664	เบอร์โทร	-	แฟกซ์	-
E-mail	lab.cemtech1@gmail.com				

### รายละเอียดผู้ให้บริการ

บริษัท ดีเอสเอส เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่)	
เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260	
โทรศัพท์ 0 2 693 7000 Email: Jirayut.js@dksh.com	
เจ้าหน้าที่ประจำสถาน : คุณจิรายุ สดกอด	
เจ้าหน้าที่ผู้ให้บริการ	นายจิรายุ สดกอด
ตำแหน่ง	Specialist, Technical Service.
โทรศัพท์	0938138736
E-mail	Jirayut.js@dksh.com

ลงนามผู้รับบริการ		ลงนามผู้ให้บริการ	<i>Jirayut Sadek-Ad</i>
ตัวบรรจง	(.....)	ตัวบรรจง	(นาย จิรายุ สดกอด)
ตำแหน่ง		ตำแหน่ง	Specialist, Technical Service.
วันที่ / ประทับตราบริษัท		วันที่ / ประทับตราบริษัท	14/05/2025

## REAR



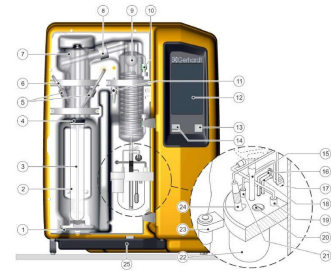
No		PASS	FAIL	N/A
1	Tube connection for sample H3BO3 supply	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Tube connection for sample H2O supply	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Tube connection for steam generator H2O supply	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Tube connection for NaOH supply	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Tube connection for receiver glass extraction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Tube connection for sample waste extraction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Tube connection, overpressure steam outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Connection for cooling water supply (with cleaning sieve)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Tube connection for cooling water outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	4 X USB interface	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	1 X RS-232 Interface	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	LAN Interface	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Screw cap for Perspex cover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Connection socket for sample waste tank level monitoring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Connection (not used)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
16	Connection socket for H2O tank level monitoring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Connection socket for H3BO3 tank level monitoring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	Connection socket for NaOH tank level monitoring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Overcurrent circuit breaker	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Apparatus socket (mains cable connection)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Rating plate with serial number	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Exhaust air fan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	Excess temperature switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

JOB:YD-00070598.....MODEL:VAP.200.....S/N: GER5200180181

### Operational Qualification (OQ)

ตรวจสอบสภาพเครื่องมือ

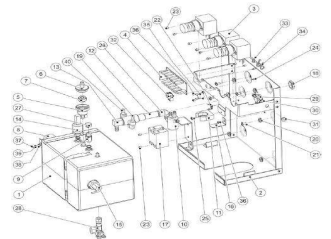
### FRONT



No		PASS	FAIL	N/A
1	Quick clamping device with clamping block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Digestion tube 250/300 ml	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	PTFE steam inlet tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Connection stopper, Viton	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Screw cap GL18	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	PTFE-inlet tubing NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Distribution head made of glass	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Screw cap GL32	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Distillation condenser made of glass	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Screw cap GL14	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Control panel	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Operating Button	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	USB interface (with protective cap)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Silicone tubing 8/10 for distillate discharge **	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
16	Verprene tubing 4/8, receiver suction **	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17	Cable duct for electrode cable + titration tube**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
18	Silicone tubing 4/7, boric acid inlet**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
19	Sensor for level monitoring including connector**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
20	Agitator motor with propeller**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
21	Titration acid inlet tube **	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
22	Receiver glass**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
23	Holder for pH electrode, removable**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
24	pH electrode (combined electrode)**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
25	Drip tray PP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

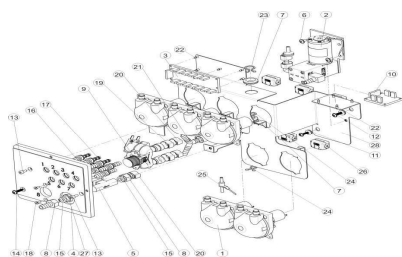
\*\* only VAP 450

## Inside Steam generator



No		PASS	FAIL	N/A
1	Steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Steam generator traverse	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Pinch valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Circuit board distributor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Valve tubing connection	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Housing safety valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Safety valve SKT	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Excess temperature protection, steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Safety valve G 1/8 0.5 bar	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Ventilation glass pinch valve VAPODEST	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Hose clamp for ventilation clamp	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Distributor PP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Angle connection PP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Pressure transmitter	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Level switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Fixing bracket steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Relay HT+	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	VA Hexagon nut 1/2"	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Angle connection 1/8"	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Bushing nipple 6-10-14	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	VA Lens head screw M5 X 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Grounding connection, 2-pole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	VA Lens head screw M4 X 6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	Spacer bolt 5 mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	VA Lens head screw M4 X 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26	Tubing connection	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	Hose clamp 14.5 mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28	Module ball valve with nozzles	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29	Cross manifold with spout	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30	Seal copper G 1/8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31	Locking screw 1/8"	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32	Pin strip	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33	Bundle clamp 12 H 4500	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34	Bundle clamp 12 H 4502	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35	Temperature switch 80°C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36	VA Lens head screw M3 X 6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37	VA Hexagon nut M4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38	Lins head screw M4 X 8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39	VA Spring washer	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40	Angle connection, reduced, 1/8" PP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# Module Pump holder VAP200 - 450 V3



No		PASS	FAIL	N/A
1	Peristaltic pump	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Diaphragm pump NaOH with non-return valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Circuit board	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Tubing connection module	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Flow controller	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Lens head screw M5 x 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Bushing nozzle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Screw in socket	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Magnetic valve 2/2 way	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Circuit board distributor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Bushing nozzle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Screw 5 x 25	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Cylinder screw	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Screw 5 x 20	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Seal EPDM 15 x 4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Tubing connection piece 51x10x6,5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Tubing connection piece 51x10x10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	Screw M4x10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Clamp	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Clamp	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Y-tube connector	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Spacer bolt 5 mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	Bundle clamp	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	Bundle clamp	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	Retrofit earthing pumpv	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26	Snap ferrite	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	Nut G 3/8"	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28	Pump holder plate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## รายละเอียดการตรวจสอบ

### ขั้นตอนการบริการ

#### ตรวจสอบระบบไฟฟ้า (Electrical Test)

- ความต้านทานทางไฟฟ้าของเครื่องจักรวาร์ด
- กระแสไฟฟ้าที่ใช้งาน

#### ตรวจสอบสภาพเครื่อง (Optical Test)

- Main cable
- Electric wiring
- Pumps
- Distribution Head
- Condensor
- Steam generator
- Tubing
- Viton cone

#### ตรวจสอบ Function การทำงาน (The FunctionTest)

- ระบบสร้างและควบคุมความดันของ Steam
- ระบบการเติมน้ำเข้า Sample Tube
- ระบบการเติม Na OH
- ระบบการเติม H3BO3

## Control panel



No		PASS	FAIL
1	Title bar	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Status bar	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Navigation button	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Smart switch with multiple functions	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	USB interface	<input checked="" type="checkbox"/>	<input type="checkbox"/>

## รายงานผลการให้บริการ

### 1. TECHNICAL DATA

	Pass	Fail	N/A	Remark
Main Supply 220 volt + 10% 50 Hz with ground	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Normal current	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....Sa.....

	Pass	Fail	N/A	Remark
1.1 COOLING WATER BATH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Temperature 15-20 °C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Cooling Water Outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Control Temperature	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

	Pass	Fail	N/A	Remark
1.2 OPTICAL TEST VAP200	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Screw cap GL14	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Screw cap GL18	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Screw cap GL32	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Distillation Head	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Condensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Viton Cone	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	.....
Ventilation Valve BV	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Micro Switch Sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Agitator motor for propeller	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....

### 2. SYSTEM COOLING WATER INLET

	Pass	Fail	N/A	Remark
Cooling Water Inlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Cooling Water Outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Flow control valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

### 3.SYSTEM CONTROL

	Pass	Fail	N/A	Remark
Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Program	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Adding NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Adding H2O	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Adding H3BO3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Suction Sample	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Suction Receiver	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....

### 4.SYSTEM DISTILLATION

	Pass	Fail	N/A	Remark
Boiler	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Level Sensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Novopren	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	.....
Solenoid Valve Shut-Off	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Solenoid Valve Steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Solenoid Valve soft steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Ventilation Valve Premount	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Excess Pressure Detector	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Heating Element	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

5. PUMP	Pass	Fail	N/A	Remark
Pump H <sub>2</sub> O Steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
- Non-Return Valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Pump H <sub>2</sub> O Sample	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
- Non-Return Valve	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Pump NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
- Non-Return Valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Pump H <sub>3</sub> BO <sub>3</sub>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
- Non-Return Valve	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Pump suction	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Pump suction receiver	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
6. The Following Program Run :	Pass	Fail	N/A	Remark
Addition H <sub>2</sub> O 0-999 ml.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Addition NaOH 0-999 ml.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Addition H <sub>3</sub> BO <sub>3</sub> 0-999 ml.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Reaction Time 0-108 min	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Distillation Time 0-108 min	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Steam Capacity 10%-100%	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Suction Sampe	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Suction Receiver	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
7. Measured pumps				Remark
Pump NaOH	Volume : ..13.33.....ml			.....

Remark : .....ปลาย condensor เลื่อนมากจน viton cone เลื่อนจนออกแรงได้หมด  
.....

## ข้อมูลกับสนับสนุนด้านเทคนิค (General Technical Support)

### การบำรุงรักษาทั่วไป (Basic maintenance)

#### Cleaning program

Glass parts and tubes must be rinsed daily before starting analysis in order to prevent clogging by crystallising chemicals. The following settings are recommended for this:

parameters	Value
H <sub>2</sub> O addition	150 ml
NaOH addition	0 ml
Distillation time	7 min
Steam power	100 %
Reaction time	0 s
Suction sample	30 s

→ Insert a digestion tube (without sample) and start the program.

→ All liquid carrying parts are cleaned. In the case of strong esters, approx. 10 ml of isopropanol must also be added to the digestion tube.

#### General error message

Fault description	Cause	Remedy
'Cooling water flow volume too low'	Cooling water pressure under 1 bar	<ul style="list-style-type: none"> <li>Open water tap.</li> <li>Check coolant pressure.</li> <li>Check coolant tube.</li> </ul> Program continues automatically once error has been fixed.
'Sample tube missing'	Sample tube missing	<ul style="list-style-type: none"> <li>Insert sample tube.</li> </ul> Continue program or restart.
'Distillation room protective door open'	Protection door not closed	<ul style="list-style-type: none"> <li>Close protection door.</li> </ul> Program continues automatically once error has been fixed.
'Reagent storage/waste'	One or more storage tanks are empty	<ul style="list-style-type: none"> <li>Fill storage tank.</li> <li>Check correct sealing of the universal sensors.</li> </ul> The running program can be continued after rectification of the error.
	The sample waste tank is full	<ul style="list-style-type: none"> <li>Empty sample waste tank.</li> <li>Check correct sealing of the universal sensors.</li> </ul> The running program can be continued after rectification of the error.

#### Analytical errors

Fault description	Cause	Remedy
Analyte results too high	The chemicals used are contaminated with nitrogen compounds.  Violent reaction in the digestion tube, sodium hydroxide drops get into the receiver.  Glass bridge of the condenser is broken or torn out, sodium hydroxide drops get into the receiver.  Glass cleaning agents in the digestion tube.  Entrapment of ammonia from the previous sample.	<ul style="list-style-type: none"> <li>Detailed checking of the chemicals.</li> <li>Determination of a blank value.</li> <li>Replace the chemicals if necessary.</li> <li>Increase of the water addition amount.</li> <li>Replacement of the glass condenser.</li> <li>Clean digestion tube in advance with distilled water.</li> <li>Increase distillation time.</li> <li>Check whether the sample was previously sufficiently alkalinised.</li> </ul>
Analyte result too low or no result	Incomplete distillation; distillation time too short.  Ammonia escapes at leaking places.  Addition amount of the sodium hydroxide too little; no ammonia development.  Too low boric acid amount in the receiver; escaping ammonia is not completely bonded.  Tube not completely immersed in the acid receiver.  Formation of stable ammonia compounds which are not destroyed with sodium hydroxide.	<ul style="list-style-type: none"> <li>No quantitative evaporation of the ammonia content.</li> <li>The distillation amount should be 100 ml.</li> <li>Solited or defective Viton plugs; clean or replace.</li> <li>Check seals (GL screw connections) on the distribution head; replace if necessary.</li> <li>Check valve at the condenser is gummed up; clean or replace.</li> <li>Digestion tube is damaged at the neck extension.</li> <li>Distribution head glass leaks; replace.</li> <li>Check the constant flow rate of the NaOH pump (see Technical Data).</li> <li>Increase of the boric acid amount.</li> <li>Increase of the acid amount.</li> <li>This problem only occurs with catalysts containing mercury. Sodium sulphate solution destroys these compounds.</li> </ul>

# CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhaphachan 3 Rd., Bangpoo, Pakkred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com



NSG-TIS1-TIS17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 68-430004-1 **Page : 1 of 2**

**Submitted by :** C.E.M Technology (Thailand) Co.,Ltd.  
219/43 Moo.12 Petchkasem Rd, Omnoi, Krathumban, Samutsakorn 74130 (Head Office)

**Equipment :** Digital Conductivity meter (Pocket)  
Manufacturer : XS Instruments Model : PC 5  
Serial No. : GB 0706/024 ID No. : WW-23-001

**Environment :** On site calibration was carried out at the Laboratory.  
C.E.M Technology (Thailand) Co., Ltd.  
Ambient Temperature (26.0 to 27.0) °C  
Relative Humidity (45 to 50) %

**Date of Received :** 11 February 2025

**Date of Calibration :** 11 February 2025

**Date of Issue :** 1 / February 2025

**Calibrated by :** Permpoon Changu

**Calibration Method :** In-house method CAL-M4301 direct measurement by conductivity buffer solution

**Reference Standard Instruments :** This certification is traceable to the International System of Units

Standard Buffer Solution

Material	Lot No.	Exp. Date	Traceability
84 µS/cm	0300	01 June 2027	National Institute of Standards and Technology (NIST), U.S.A., S.R.M.
1413 µS/cm	970986	25 April 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
12.88 mS/cm	970987	25 April 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :

( Permpoon Changu )

Supervisor

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 Calibratech Co.,Ltd.

CAL-F0031-03





## Certificate of Calibration

Certificate No. : 68-430004-1

Page : 2 of 2

## Result of Calibration :

UUC Condition As-Received : Good

Function : Conductivity measurement

Before Adjustment

Standard Conductivity Solution	UUC Reading	Correction	Uncertainty ( ± )	Unit
84*	79.7	4.3	1.1	µS/cm
1413	1602	-189	9.0	µS/cm
12.88	12.81	0.07	0.082	mS/cm

After Adjustment : at 84, 1413 µS/cm 12.880 mS/cm

Standard Conductivity Solution	UUC Reading	Correction	Uncertainty ( ± )	Unit
84*	84.0	0.0	1.1	µS/cm
1413	1413	0	9.0	µS/cm
12.88	12.88	0.00	0.082	mS/cm

Remark

UUC : Unit Under Calibration

\* This parameter are out of accreditation's scope.

This result of calibration was found accurate as shown on date and place of calibration only.

This 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%

- (0.0) -



CAL-F0031-03

## Certificate of Calibration

Certificate No. : 68-400172-1

Page : 1 of 2

Submitted by : C.E.M Technology (Thailand) Co., Ltd.

219/43 Moo.12 Petchkasem Rd, Omnoi, Krathumban, Samutsakorn 74130 (Head Office)

Equipment : Temperature controlled enclosure (Refrigerator)

Manufacturer : Samchai

Model : LD2 DC 70

Range : N/A °C

Resolution : 1 °C

Serial No. : 85545

ID No. : N/A

Environment : On site calibration was carried out at the Laboratory,

C.E.M Technology (Thailand) Co., Ltd.

Ambient Temperature : (27.0 to 28.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (223.0 to 225.0) V

Date of Received : 21 March 2025

Date of Calibration : 21 March 2025

Date of Issue : 22 March 2025

Calibrated by : Permpon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS 90

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Digital Thermometer with RTD Probe

ID No. Cert. No. Due Date Traceability

400046 &amp; 400047 68-400007-2 29 Jul 2025 National Institute of Metrology Thailand (NIMT)

Approved by :

( Permpon Chanpu )

Supervisor

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 Calibratech Co.,Ltd.



CAL-F0031-03

## Certificate of Calibration

Certificate No. : 68-400172-1

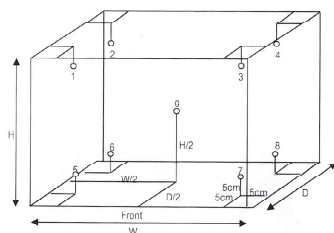
Page : 2 of 2

## Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber  
 W = 1.13 m  
 D = 0.51 m  
 H = 1.34 m  
 Capacity = 0.77 m<sup>3</sup>

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
4	4	4	5.13	4.85	3.25	3.11	4.43	4.77	2.75	2.77	4.01	0.73

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
4	4	4	1.29	0.08	2.55

Remark: The uncertainty is not combine uniformity of the air chamber

This result of calibration was found accurate as shown on date and place of calibration only.

This 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%

- (0.0) -



CAL-F0031-03