ภาคผนวกที่ 4

สรุปเอกสารสอบเทียบอุปกรณ์เครื่องมือ

เอกสารการสอบเทียบเครื่องมือตรวจวัดระดับเสียงในบรรยากาศ

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT
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NSC-TISI-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.

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

ELECTRICAL AND ELECTRONICS INSTITUTE
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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 Weighting	Measured value (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

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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

ELECTRICAL AND ELECTRONICS INSTITUTE
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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
LAE	200	109.9	-0.1	±1.0
	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

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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 - -

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NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: CP20250051EA
Operation No.: CP2025020038

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	ACO
Model/Type:	6236 (Meter), 7052NR (Microphone), - (Preamplifier)
Serial No.:	222186 (Meter), 84150 (Microphone), - (Preamplifier)
ID No.:	NS 03 016
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 Kunhakom

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

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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.: CP20250051EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: ACO
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)
Serial No.: 222186 (Meter), 84150 (Microphone), - (Preamplifier)
ID No.: NS-03-016
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	UB903B	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.: CP20250051EA

Calibration Report

Function : 2. Self-generated Noise
2.1 Microphone Installed

Measured value (dB)
21.3

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	20.6
C-weighting	43.3
Z-weighting	44.8

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	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.3	±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	-0.1	-0.2	0.1	±2.0
125	0.0	-0.2	0.3	±1.5
250	0.0	-0.1	0.4	±1.5
500	0.1	-0.1	0.4	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.5	±2.0
4000	-0.3	-0.3	0.4	±3.0
8000	-0.5	-0.4	0.2	±5.0

Certificate No.: CP20250051EA

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	94.1	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	93.9	-0.1	±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

Certificate No.: CP20250051EA

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	69.1	0.1	±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	44.0	0.0	±1.1
39.0	39.2	0.2	±1.1
34.0	34.7	0.7	±1.1
33.0	34.0	1.0	±1.1
32.0	33.3	1.3	±1.1
31.0	32.7	1.7	±1.1
30.0	32.1	2.1	±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	93.9	-0.1	±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	25.6	0.6	±1.1
20-90	25.0	25.6	0.6	±1.1
20-100	25.0	25.8	0.8	±1.1
20-110	25.0	25.8	0.8	±1.1
30-120	35.0	35.0	0.0	±1.1
40-130	45.0	44.9	-0.1	±1.1

ELECTRICAL AND ELECTRONICS INSTITUTE
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Certificate No.: CP20250051EA

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	89.9	-0.1	+1.0 ; -5.0
LAE	200	109.9	-0.1	±1.0
	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	124.2	-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

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20250051EA

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 - -

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NSC-TISI-TIS 17025 CALIBRATION 0119

Certificate No.: CP20250052EA
Operation No.: CP2025020039

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	ACO
Model/Type:	6236 (Meter), 7052NR (Microphone), - (Preamplifier)
Serial No.:	222187 (Meter), 84151 (Microphone), - (Preamplifier)
ID No.:	NS-03-017
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 Kunhakom

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

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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.: CP20250052EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: ACO
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)
Serial No.: 222187 (Meter), 84151 (Microphone), - (Preamplifier)
ID No.: NS-03-017
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	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.: CP20250052EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
19.8

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	16.9
C-weighting	24.8
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 (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.1	-0.2	-0.1	±1.5
1000	-0.5	-0.5	-0.5	±1.0
8000	-0.1	0.0	0.3	+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	-0.1	-0.2	-0.1	±2.0
125	-0.1	-0.2	-0.1	±1.5
250	0.1	0.2	0.0	±1.5
500	0.0	-0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.1	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.: CP20250052EA

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	94.1	0.1	±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

Certificate No.: CP20250052EA

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	63.9	-0.1	±1.1
59.0	58.9	-0.1	±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	32.9	-0.1	±1.1
32.0	32.0	0.0	±1.1
31.0	31.1	0.1	±1.1
30.0	30.2	0.2	±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	93.9	-0.1	±1.1
20-110	94.0	93.9	-0.1	±1.1
30-120	94.0	94.0	0.0	±1.1
40-130	94.0	93.9	-0.1	±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	25.4	0.4	±1.1
20-90	25.0	25.3	0.3	±1.1
20-100	25.0	25.4	0.4	±1.1
20-110	25.0	25.4	0.4	±1.1
30-120	35.0	35.0	0.0	±1.1
40-130	45.0	45.1	0.1	±1.1

Certificate No.: CP20250052EA

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
LAE	200	109.9	-0.1	±1.0
	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	125.4	0.0	+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.: CP20250052EA

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 - -

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT
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Tel: +66 2709 4860 Fax: +66 2324 0917

NSC-TISI-TIS 17025
CALIBRATION 0119

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.

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) ℃
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; 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.: 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 Weighting	Measured value (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 (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	±1.5
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 (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (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

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240426EA

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	122.1	0.1	±1.1
123.0	123.1	0.1	±1.1

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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
LAE	200	109.9	-0.1	±1.0
	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

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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 - -

F-CAL-005 Ed.1

SMART TECH CALIBRATION & SERVICES CO., LTD.
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THANYABURI, PATHUM THANI 12110. THAILAND
Tel. +662-114-3148 Email : stcal.md@gmail.com Website : stc-cal.com

ANAB ACCREDITED CALIBRATION LABORATORY AC-3093

Certificate of Calibration

Certificate No. STCR-2501122-5
Work Order No. STCR-2501122

Customer Name	:	CEM Technology Thailand Co., Ltd. 31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210
Equipment Name	:	Sound Level Meter
Manufacturer	:	Aco
Model	:	6236
Serial Number	:	222196
Control Number	:	NS-03-026
Received Date	:	Jan 30, 2025
Calibration Date	:	Jan 31, 2025
Recommended Due Date	:	Jan 31, 2026
Calibration Method	:	Calibration Procedure No. CPE-04-01
Environmental Conditions		
Ambient Temperature	:	(25 ± 2) °C
Ambient Relative Humidity	:	(50 ± 15) %RH
Calibration Place	:	Permanent Calibration Laboratory
Condition as received	:	Normal
Calibration Result	:	See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co., Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Feb 1, 2025 **Approved by :**
Calibrated by : S. Sompoch
(Mr.Chayut Wongleang)
Laboratory Manager

@smarttechcal

Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2501122-5

Standards Equipment Used

Equipment Name	Serial No.	Certificate No.	Due Date	Traceability to
Sound Calibrator	N975185	5523631031354566	Nov 6, 2025	MP-TH

Traceability

This calibration is traceable to the International System of Unit via :
- MP-TH , Micro Precision Calibration Laboratory (Thailand) Co., Ltd.

Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2501122-5

UUC Range : (30 to 130) dB Resolution : 0.1 dB
Results of Calibration: [✓] Without adjustment [ ] With adjustment
Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.9 dB	-	0.19 dB	0.40 dB
	114.07 dB	114.0 dB	-	0.07 dB	0.40 dB
SLOW	94.09 dB	93.9 dB	-	0.19 dB	0.40 dB
	114.07 dB	114.0 dB	-	0.07 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.9 dB	-	0.19 dB	0.40 dB
	114.07 dB	114.0 dB	-	0.07 dB	0.40 dB
SLOW	94.09 dB	94.0 dB	-	0.09 dB	0.40 dB
	114.07 dB	114.0 dB	-	0.07 dB	0.40 dB

STD = Standard
UUC = Unit Under Calibration

- End of Certificate -

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT
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Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280
Tel: +66 2709 4860 Fax: +66 2324 0917

NSC TISI TIS 17025
CALIBRATION 0119

Certificate No.: CP20240354FA
Operation No.: CP2024090329

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	BSWA TECH
Model/Type:	BSWA 309 (Meter), MP309 (Microphone), MA231T (Preamplifier)
Serial No.:	590102 (Meter), 395600 (Microphone), 590612 (Preamplifier)
ID No.:	NS-04-003
Customer:	C.E.M. Technology (Thailand) Co.,Ltd.
Address:	31/8 Moo 13 T.Rai Khung, A.Sam Phran, Nakorn Phatom 73210
Received Date:	18 September 2024
Calibrated Date:	1 - 2 October 2024
Issued Date:	4 October 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.

Certificate No.: CP20240354EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: BSWA TECH
Model/Type: BSWA 309 (Meter), MP309 (Microphone), MA231T (Preamplifier)
Serial No.: 590102 (Meter), 395600 (Microphone), 590612 (Preamplifier)
ID No.: NS-04-003
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	2787490	AA-1012-23	12 November 2024
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	CB20240035FR 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 :-
- 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.: CP20240354EA

Calibration Report

Function : 2. Self-generated Noise
2.1 Microphone Installed

Measured value (dB)
18.4

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	11.2
C-weighting	15.6
Z-weighting	23.3

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	-0.2	-0.2	-0.2	±1.0
8000	0.5	0.4	0.9	±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	0.0	0.0	±2.0
125	0.0	-0.1	0.0	±1.5
250	0.0	-0.1	-0.1	±1.5
500	-0.1	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.1	0.0	0.1	±2.0
4000	-0.1	0.0	0.0	±3.0
8000	-0.6	-0.5	-0.1	±5.0

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

Certificate No.: CP20240354EA

Calibration Report

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
124.0	124.0	0.0	±1.1
129.0	129.0	0.0	±1.1
134.0	134.0	0.0	±1.1
135.0	135.0	0.0	±1.1

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	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	33.9	-0.1	±1.1

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240354EA

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)
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1
24.0	24.3	0.3	±1.1
23.0	23.4	0.4	±1.1
22.0	22.4	0.4	±1.1
21.0	21.5	0.5	±1.1
20.0	20.7	0.7	±1.1
19.0	19.8	0.8	±1.1
18.0	18.9	0.9	±1.1

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	133.0	0.0	±1.0
	2	116.0	0.0	+1.0 ; -2.5
	0.25	106.9	-0.1	+1.5 ; -5.0
Slow	200	126.6	0.0	±1.0
	2	107.0	0.0	+1.0 ; -5.0
SEL	200	127.0	0.0	±1.0
	2	107.0	0.0	+1.0 ; -2.5
	0.25	97.9	0.1	+1.5 ; 5.0

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	132.4	132.0	-0.4	±3.0
Positive half cycle	131.4	131.1	-0.3	+2.0
Negative half cycle	131.4	131.1	-0.3	+2.0

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
138.3	138.3	0.0	±1.5

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240354EA

Calibration Report

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	136.0	136.0	0.0	±0.3

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 IEC 61672-3:2013 Class 2.
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	:	Suwanit K.
CALIBRATION DATE	:	10-April-25
APPROVED BY	:	Pongpan Cha) BHUDIT 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	**SERIAL NUMBER**	:	090057
ID No.	:	CEM-SI-02			
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.	CERTIFICALTE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.68/0974	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	-8.60	-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 1 E 30061 PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER

MANUFACTURER : ACO

MODEL : TYPE 6226

SERIAL No. : 122024

ID No. : CEM-SI-04

SUBMITTED BY : C.E.M TECHNOLOGY (THAILAND) CO.,LTD.
219/43 MOO 12, PETCHKASEM RD., OMNOI,
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY : Suravit K.

CALIBRATION DATE : 10-April-25

APPROVED BY : Dongporn Ch.
BHUDIT 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 1 E 30061 PAGE : 2 OF 2

Calibration Report

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226 **SERIAL NUMBER** : 122024
ID No. : CEM-SI-04
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.	CERTIFICAITE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR,	1986	01827	EEL.BP.68/0974	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	-8.60	-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 : 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 : Suravit K.

CALIBRATION DATE : 10-April-25

APPROVED BY : Dongporn Ch.
BHUDIT 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 : 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.	CERTIFICAITE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR,	1986	01827	EEL.BP.68/0974	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	-8.60	-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

Trade & Engineering

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	:	25.7	°C
Humidity	:	44.6	%RH

Calibration System

Calibrator Units

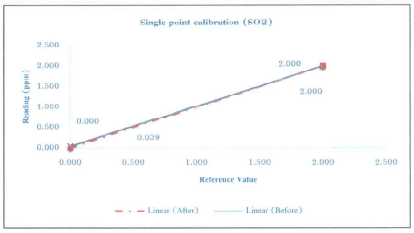
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

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

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
SO2	0.039	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 :
(Mr. Tong Piima)

Trade & Engineering

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	:	23.1	°C
Humidity	:	40.4	%RH

Calibration System

Calibrator Units

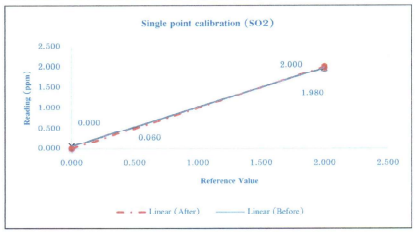
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

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

Calibration Check

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	1.98	2.000	-1.00
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by :
(Mr. Tong Piima)

Trade & Engineering

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.	:	CTL63588-340

Environmental

Temperature	:	24.2	°C
Humidity	:	48.3	%RH

Calibration System

Calibrator Units

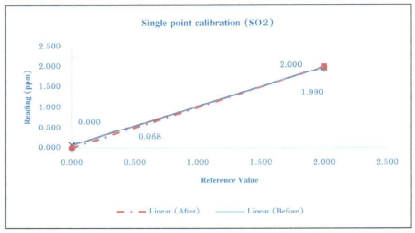
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

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

Calibration Check

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	1.99	2.000	-0.50
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by :
(Mr. Tong Piima)

TOP
Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date : 20-Aug-24 — Certificate No. : 0824-005 — Page : 1/1

Analyzer Instruments

Analyzer Type	:	SO2 Analyzer	Manufacturer	:	Thermo Environmental
Model	:	43C	Serial No.	:	43C-70852-367

Environmental

Temperature	:	26.2	°C
Humidity	:	44.1	%RH

Calibration System

Calibrator Units

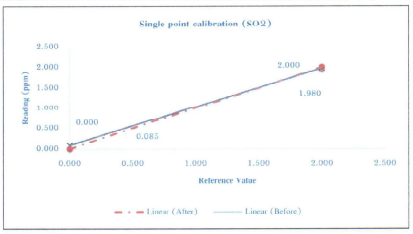
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

NO Conc.	:	2 ppm	Cylinder No.	:	307199
SO2 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						
SO2	0.085	0.000	0.09	1.98	2.000	-1.00
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by : (Mr. Tong Puima)

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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date : 28-Mar-25 — Certificate No. : 0325-005 — Page : 1/1

Analyzer Instruments

Analyzer Type	:	SO2 Analyzer	Manufacturer	:	Thermo Environmental
Model	:	43C	Serial No.	:	69858-364

Environmental

Temperature	:	25.0	°C
Humidity	:	37.6	%RH

Calibration System

Calibrator Units

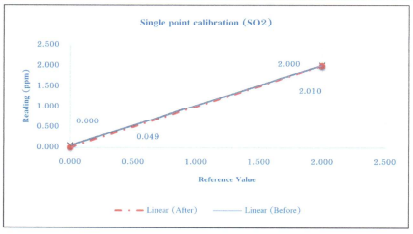
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

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

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
SO2	0.049	0.000	0.05	2.01	2.000	0.50
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by : (Mr. Tong Puima)

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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date : 1-Mar-25 — Certificate No. : 0325-005 — Page : 1/1

Analyzer Instruments

Analyzer Type	:	NO/NO/NOx Analyzer	Manufacturer	:	Thermo Environmental
Model	:	42C	Serial No.	:	58926-320

Environmental

Temperature	:	25.8	°C
Humidity	:	41.9	%RH

Calibration System

Calibrator Units

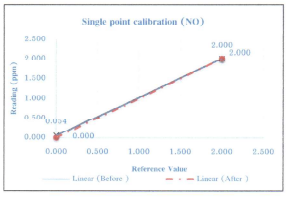
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

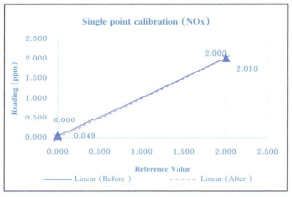
Standard Gas

NO Conc.	:	2 ppm	Cylinder No.	:	307199
SO2	:	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	0.054	0.000	0.05	2.00	2.00	0.00
NOx	0.049	0.000	0.05	2.01	2.00	0.50
After						
NO	0.000	0.000	0.00	2.00	2.00	0.00
NOx	0.000	0.000	0.00	2.00	2.00	0.00





Calibrated by : (Mr. Tong Puima)

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Certificate of Analyzer Performance Testing

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

Analyzer Instruments

Analyzer Type	:	NO/NO/NOx Analyzer	Manufacturer	:	Thermo Environmental
Model	:	42C	Serial No.	:	72454-371

Environmental

Temperature	:	25.1	°C
Humidity	:	48.9	%RH

Calibration System

Calibrator Units

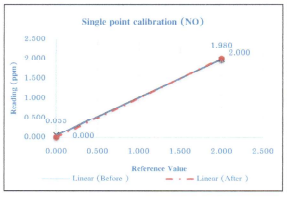
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

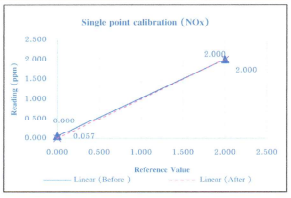
Standard Gas

NO Conc.	:	2 ppm	Cylinder No.	:	307199
SO2	:	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
NOx	0.057	0.000	0.06	2.00	2.00	0.00
After						
NO	0.000	0.000	0.00	2.00	2.00	0.00
NOx	0.000	0.000	0.00	2.00	2.00	0.00





Calibrated by : (Mr. Tong Puima)

Trade & Engineering

Certificate of Analyzer Performance Testing

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

Analyzer Instruments

Analyzer Type	:	NO/NO/NOx Analyzer	Manufacturer	:	Thermo Environmental
Model	:	42C	Serial No.	:	63470-339

Environmental

Temperature	:	26.3	°C
Humidity	:	42.5	%RH

Calibration System

Calibrator Units

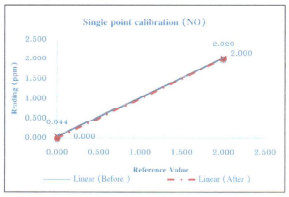
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

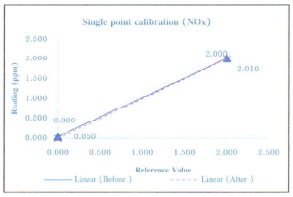
Standard Gas

NO Conc.	:	2	ppm	Cylinder No.	: 307199
SO2	:	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	2.02	2.00	1.00
NOx	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
NOx	0.000	0.000	0.00	2.00	2.00	0.00





Calibrated by : (Mr. Tong Piima)

Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date : 2-Aug-24 — Certificate No. : 0824-002 — Page : 1/1

Analyzer Instruments

Analyzer Type	:	NO/NO/NOx Analyzer	Manufacturer	:	Thermo Environmental
Model	:	42C	Serial No.	:	508011077

Environmental

Temperature	:	25.0	°C
Humidity	:	46.8	%RH

Calibration System

Calibrator Units

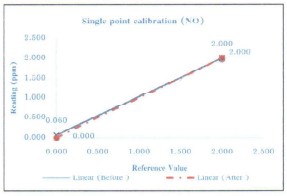
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

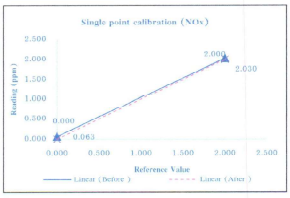
Standard Gas

NO Conc.	:	2	ppm	Cylinder No.	: 307199
SO2	:	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	0.060	0.000	0.06	2.00	2.00	0.00
NOx	0.053	0.000	0.05	2.03	2.00	1.50
After						
NO	0.000	0.000	0.00	2.00	2.00	0.00
NOx	0.000	0.000	0.00	2.00	2.00	0.00





Calibrated by : (Mr. Tong Piima)

Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date : 16-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

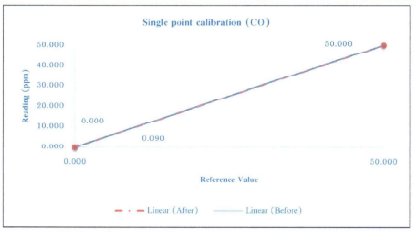
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

NO Conc.	:	2	ppm	Cylinder No.	: 307199
SO2 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	0.090	0.000	0.09	50.1	50.000	0.20
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



Calibrated by : (Mr. Tong Piima)

Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date : 5-Mar-25 — Certificate No. : 0325-001 — Page : 1/1

Analyzer Instruments

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

Environmental

Temperature	:	25.6	°C
Humidity	:	42.3	%RH

Calibration System

Calibrator Units

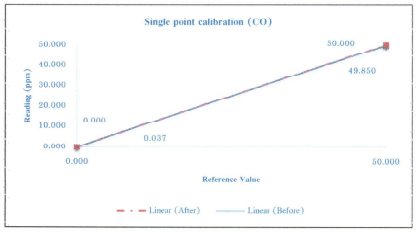
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

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

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 : (Mr. Tong Piima)

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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date : 25-Mar-25 — Certificate No. : 0325-004 — Page : 1/1

Analyzer Instruments

Analyzer Type	:	CO Analyzer	Manufacturer	:	Thermo Environmental
Model	:	48C	Serial No.	:	401304261

Environmental

Temperature	:	20.8	°C
Humidity	:	46.9	%RH

Calibration System

Calibrator Units

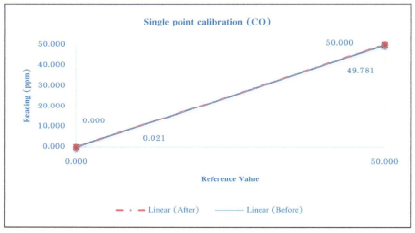
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

NO Conc.	:	2	ppm	Cylinder No.	: 307199
SO2 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	0.021	0.000	0.02	49.781	50.000	-0.44
After						
CO	0.000	0.000	0.00	50.000	50.000	0.00



Calibrated by : (Mr. Tong Puima)

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Trade & Engineering

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	:	51.8	%RH

Calibration System

Calibrator Units

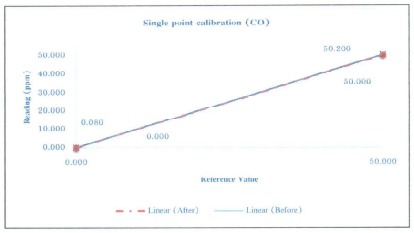
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

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

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 : (Mr. Tong Puima)

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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date : 5-Jun-24 — Certificate No. : 0624-001 — Page : 1/1

Analyzer Instruments

Analyzer Type	:	CO Analyzer	Manufacturer	:	Thermo Environmental
Model	:	48C	Serial No.	:	508011068

Environmental

Temperature	:	25.0	°C
Humidity	:	51.5	%RH

Calibration System

Calibrator Units

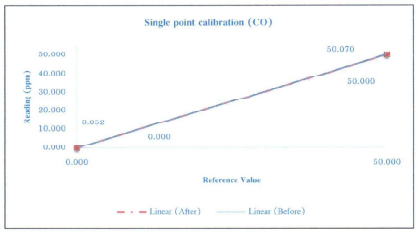
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

NO Conc.	:	2	ppm	Cylinder No.	: 307199
SO2 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	0.052	0.000	0.05	50.1	50.000	0.14
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



Calibrated by : (Mr. Tong Puima)

TOP
Trade & Engineering

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

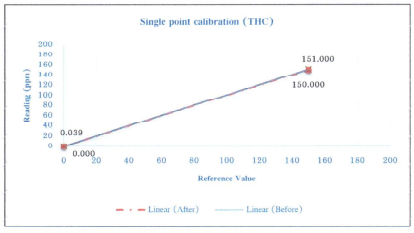
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

Propane Conc.	:	150	ppm	Cylinder No.	: 21W281046
				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 : (Mr. Tong Puima)

Trade & Engineering

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

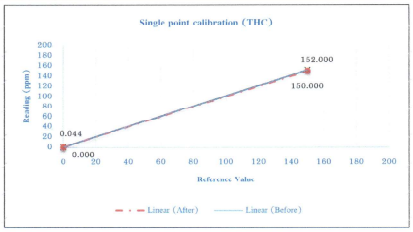
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

Propane Conc.	:	150	ppm	Cylinder No.	: 21W281046
				Expire Date	: 26-Sep-26

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 : (Mr. Tong Piima)

Trade & Engineering

TSP High Volume Sampler
TE-5000 TSP Sampler Verification

Site Information

Location: –	**Site ID:** –	**Date:** 21 Dec 24
Sampler: TE-5000 TSP	**Serial No:** 3262	**Tech:** Tong.P

Site Conditions

Barometric Pressure (in Hg): 27.90	**Corrected Pressure (mm Hg):** 708.7
Temperature (deg F): 75.4	**Temperature (deg K):** 297.3
Average Press. (in Hg): 26.00	**Corrected Average (mm Hg):** 660.4
Average Temp (Deg F): 74.6	**Average Temp: (Deg K):** 296.8

Calibration Orifice

Make: Tisch	**Qstd Slope:** 1.58304
Model: TE-5028A	**Qstd Intercept:** -0.01520
Serial#: 1179	**Calibration Due Date** 10 December 2025

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	8.20	1.759	62.9	60.81
2	6.60	1.579	56.0	54.14
3	5.00	1.375	47.8	46.21
4	4.50	1.305	43.9	42.44
5	3.90	1.216	39.7	38.38

Linear Regression
Slope: 41.1217
Intercept: -11.0896
Corr. Coeff: 0.9983
of Observations: 5

Calculations

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC =I[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)[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): 50.1
Average Flow Calculation m3/min
1.406730656
Average Flow Calculation in cfm
49.67269199
Sample Time (Hrs): 24.0
Total flow in 24 hours m3/min
2025.692144
Total flow in 24 hours cfm
71528.67647

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

Trade & Engineering

TSP High Volume Sampler
TE-5000 TSP Sampler Verification

Site Information

Location: –	**Site ID:** –	**Date:** 21 Dec 24
Sampler: TE-5000 TSP	**Serial No:** 3263	**Tech:** Tong.P

Site Conditions

Barometric Pressure (in Hg): 27.80	**Corrected Pressure (mm Hg):** 706.1
Temperature (deg F): 76.0	**Temperature (deg K):** 297.6
Average Press. (in Hg): 26.30	**Corrected Average (mm Hg):** 668.0
Average Temp (Deg F): 75.0	**Average Temp: (Deg K):** 297.0

Calibration Orifice

Make: Tisch	**Qstd Slope:** 1.58304
Model: TE-5028A	**Qstd Intercept:** -0.01520
Serial#: 1179	**Calibration Due Date** 10 December 2025

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	6.10	1.514	60.8	58.65
2	4.30	1.273	54.3	52.38
3	3.20	1.100	47.2	45.53
4	2.40	0.954	44.0	42.44
5	2.00	0.871	39.5	38.10

Linear Regression
Slope: 31.4134
Intercept: 11.5313
Corr. Coeff: 0.9947
of Observations: 5

Calculations

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC =I[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)[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): 49.2
Average Flow Calculation m3/min
1.102476438
Average Flow Calculation in cfm
38.92925225
Sample Time (Hrs): 24.0
Total flow in 24 hours m3/min
1587.566071
Total flow in 24 hours cfm
56058.12323

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

Trade & Engineering

TSP High Volume Sampler
TE-5000 TSP Sampler Verification

Site Information

Location: –	**Site ID:** –	**Date:** 20 Dec 24
Sampler: TE-5000 TSP	**Serial No:** 3264	**Tech:** Tong.P

Site Conditions

Barometric Pressure (in Hg): 27.30	**Corrected Pressure (mm Hg):** 693.4
Temperature (deg F): 75.2	**Temperature (deg K):** 297.2
Average Press. (in Hg): 26.20	**Corrected Average (mm Hg):** 665.5
Average Temp (Deg F): 74.3	**Average Temp: (Deg K):** 296.7

Calibration Orifice

Make: Tisch	**Qstd Slope:** 1.58304
Model: TE-5028A	**Qstd Intercept:** -0.01520
Serial#: 1179	**Calibration Due Date** 10 December 2025

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	6.60	1.562	62.3	59.59
2	5.10	1.374	55.8	53.38
3	4.20	1.248	48.3	46.20
4	3.10	1.074	44.7	42.76
5	2.70	1.002	40.0	38.26

Linear Regression
Slope: 37.1602
Intercept: 1.5130
Corr. Coeff: 0.9903
of Observations: 5

Calculations

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC =I[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)[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): 50.2
Average Flow Calculation m3/min
1.226776562
Average Flow Calculation in cfm
43.31838087
Sample Time (Hrs): 24.0
Total flow in 24 hours m3/min
1766.55825
Total flow in 24 hours cfm
62378.46845

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

Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location: - **Site ID:** - **Date:** 23 December 2024
Sampler: TE-6070 PM10 **Serial No:** 1629 **Tech:** Tong P.

Site Conditions

Barometric Pressure (in Hg): 28.90 **Corrected Pressure (mm Hg):** 734.1
Temperature (deg F): 75.5 **Temperature (deg K):** 297.2
Average Press. (in Hg): 28.00 **Corrected Average (mm Hg):** 711.2
Average Temp. (deg F): 75.5 **Average Temp. (deg K):** 297.2

Calibration Orifice

Make: Tisch Environmental, Inc. **Qstd Slope:** 1.58407
Model: TE-5028A **Qstd Intercept:** -0.01510
Serial#: 1179 **Calibration Due Date:** 22 Oct 25

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)
1	7.90	1.138	60.2	38.30
2	6.50	1.034	55.3	35.19
3	5.10	0.917	49.4	31.43
4	4.30	0.842	43.0	27.36
5	3.10	0.717	38.0	24.18

Linear Regression
Slope 34.6406
Intercept -0.9094
Corr. Coeff 0.9947
SFR 1.095
SSP 58.18

of Observations: 5

Calculations

Qa = 1/m(Sqrt((H2O)(Ta/Pa))-b)
IC = I(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)(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): 49.2
Average Flow over Sample (m3/min)
0.943968028
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min)
1359.31396
Total flow over sample (CFM)
47997.37592

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

Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location: - **Site ID:** - **Date:** 23 December 2024
Sampler: TE-6070 PM10 **Serial No:** 1313 **Tech:** Tong P.

Site Conditions

Barometric Pressure (in Hg): 28.20 **Corrected Pressure (mm Hg):** 716.3
Temperature (deg F): 76.1 **Temperature (deg K):** 297.5
Average Press. (in Hg): 27.30 **Corrected Average (mm Hg):** 693.4
Average Temp. (deg F): 75.3 **Average Temp. (deg K):** 297.1

Calibration Orifice

Make: Tisch Environmental, Inc. **Qstd Slope:** 1.58407
Model: TE-5028A **Qstd Intercept:** -0.01510
Serial#: 1179 **Calibration Due Date:** 22 Oct 25

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)
1	8.70	1.210	60.2	38.80
2	7.20	1.101	55.3	35.64
3	6.10	1.014	49.9	32.16
4	5.30	0.946	44.8	28.87
5	3.80	0.803	39.0	25.13

Linear Regression
Slope 34.7912
Intercept -3.1851
Corr. Coeff 0.9950
SFR 1.096
SSP 54.20

of Observations: 5

Calculations

Qa = 1/m(Sqrt((H2O)(Ta/Pa))-b)
IC = I(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)(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): 49.8
Average Flow over Sample (m3/min)
1.029172473
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min)
1482.008362
Total flow over sample (CFM)
52329.71525

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

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)
1	9.40	1.287	60.0	39.47
2	7.80	1.173	57.3	37.69
3	6.50	1.072	52.9	34.80
4	5.80	1.037	50.3	33.09
5	5.05	1.006	45.7	30.06

Linear Regression
Slope 30.7100
Intercept 0.7813
Corr. Coeff 0.9489
SFR 1.116
SSP 53.31

of Observations: 5

Calculations

Qa = 1/m(Sqrt((H2O)(Ta/Pa))-b)
IC = I(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)(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 us

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)
1	9.45	1.290	61.1	40.18
2	7.85	1.177	57.7	37.94
3	6.55	1.076	53.4	35.12
4	5.85	1.037	51.2	33.67
5	5.10	1.006	46.8	30.78

Linear Regression
Slope 30.4605
Intercept 1.5124
Corr. Coeff 0.9651
SFR 1.118
SSP 54.10

of Observations: 5

Calculations

Qa = 1/m(Sqrt((H2O)(Ta/Pa))-b)
IC = I(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)(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 us

Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location:	-	**Site ID:**	-
Sampler:	TE-6070 PM10	**Serial No:**	3310
Date:	27 September 2024		
Tech:	Tong P.		

Site Conditions

Barometric Pressure (in Hg):	27.20	**Corrected Pressure (mm Hg):**	690.9
Temperature (deg F):	75.6	**Temperature (deg K):**	297.2
Average Press. (in Hg):	26.69	**Corrected Average (mm Hg):**	677.9
Average Temp. (deg F):	76.1	**Average Temp. (deg K):**	297.5

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)
1	9.40	1.283	60.8	39.88
2	7.65	1.159	56.7	37.19
3	6.35	1.056	53.2	34.89
4	5.70	1.037	50.9	33.39
5	5.00	1.006	47.8	31.35

Linear Regression

Slope	28.3708
Intercept	3.8982
Corr. Coeff	0.9700
SFR	1.108
SSP	53.86
# of Observations:	5

Calculations

Qa = 1/m(Sqrt((H2O)(Ta/Pa))-b)
IC = I(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)(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):	53.9
Average Flow over Sample (m3/min)	1.120681202
Enter Total Time (Hrs)	24.0
Total flow over sample (m3/min)	1613.780931
Total flow over sample (CFM)	56982.60468

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

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

เอกสารการสอบเทียบเครื่องมือตรวจวัดความสั่นสะเทือน

สถาบันไฟฟ้าและอิเล็กทรอนิกส์
ELECTRICAL AND ELECTRONICS INSTITUTE

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT
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Tel: +66 2709 4860 Fax: +66 2324 0917

Certificate No.: CP20240388EA
Operation No.: CP2024100354

Certificate of Calibration

Equipment:	Vibration Meter
Manufacturer:	Instantel
Model/Type:	Micromate
Serial No.:	UM14163
ID No.:	VB-01-001
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 October 2024
Calibrated Date:	7 - 15 November 2024
Issued Date:	20 November 2024
Calibrated by:	Ms. Juntaporn Kunhakom

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

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ELECTRICAL AND ELECTRONICS INSTITUTE

FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240388EA

Calibration Report

Equipment:	Vibration Meter
Manufacturer:	Instantel
Model:	Micromate
Serial No.:	UM14163
ID No.:	VB-01-001
Ambient Temperature:	(23 ± 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	2708237	AV-0040-24	19-Sep-2025
2) Measuring Amplifier	2525	2685967	AV-0034-24	7-Aug-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.: CP20240388EA

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	10.004	9.758	-0.246	1.50	Longitudinal (L)
5.0	10.000	10.004	9.805	-0.199	1.50	
6.3	10.000	10.011	9.953	-0.058	1.60	
8.0	10.000	10.006	9.718	-0.288	1.50	
10.0	10.000	10.002	9.710	-0.292	1.50	
12.5	10.000	10.006	9.734	-0.272	1.50	
16.0	10.000	9.997	9.813	-0.184	1.50	
	20.000	19.997	19.517	-0.480	1.50	
	30.000	29.995	29.210	-0.785	1.50	
	50.000	49.992	48.732	-1.260	1.50	
20.0	10.000	10.001	9.805	-0.196	1.50	
25.0	10.000	9.997	9.837	-0.160	1.50	
31.5	10.000	10.004	9.907	-0.097	1.50	
40.0	10.000	10.004	9.955	-0.049	1.50	
52.0	10.000	10.004	10.041	0.037	1.50	
63.0	10.000	10.008	10.270	0.262	1.50	
80.0	10.000	9.991	10.467	0.476	1.50	

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240388EA

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	9.852	-0.145	1.50	Transverse (T)
5.0	10.000	9.998	9.915	-0.083	1.60	
6.3	10.000	9.996	10.183	0.187	1.50	
8.0	10.000	9.990	10.053	0.063	1.60	
10.0	10.000	10.007	9.953	-0.054	1.60	
12.5	10.000	10.008	9.950	-0.058	1.60	
16.0	10.000	10.003	9.945	-0.058	1.60	
	20.000	19.983	19.917	-0.066	1.60	
	30.000	29.970	29.762	-0.208	1.50	
	50.000	49.992	49.671	-0.321	1.50	
20.0	10.000	10.007	9.954	-0.053	1.60	
25.0	10.000	10.003	9.947	-0.056	1.60	
31.5	10.000	9.998	9.939	-0.059	1.60	
40.0	10.000	9.997	10.034	0.037	1.50	
52.0	10.000	9.996	10.114	0.118	1.50	
63.0	10.000	10.001	10.262	0.261	1.50	
80.0	10.000	10.003	10.491	0.488	1.50	

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240388EA

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	10.004	9.923	-0.081	1.50	Vertical (V)
5.0	10.000	10.010	10.183	0.173	1.50	
6.3	10.000	9.983	10.420	0.437	1.50	
8.0	10.000	10.006	10.286	0.280	1.50	
10.0	10.000	9.984	10.207	0.223	1.50	
12.5	10.000	9.987	10.160	0.173	1.50	
16.0	10.000	10.003	10.191	0.188	1.50	
	20.000	20.011	20.402	0.390	1.60	
	30.000	29.995	30.589	0.594	1.50	
	50.000	49.992	51.011	1.019	1.50	
20.0	10.000	10.011	10.215	0.204	1.50	
25.0	10.000	9.983	10.120	0.137	1.50	
31.5	10.000	9.983	10.047	0.064	1.60	
40.0	10.000	9.990	10.081	0.091	1.50	
52.0	10.000	9.998	10.294	0.296	1.50	
63.0	10.000	10.010	10.404	0.394	1.50	
80.0	10.000	10.004	10.696	0.692	1.50	

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

- - End of Report - -

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

Certificate No.: CP20250099EA
Operation No.: CP2025030090

Certificate of Calibration

Equipment:	Vibration Meter
Manufacturer:	Instantel
Model/Type:	Micromate
Serial No.:	UM15904
ID No.:	VB-01-002
Customer:	C.E.M. Technology (Thailand) Co.,Ltd.
Address:	31/8 Moo 13 T.Rai Khung, A.Sam Phran, Nakorn Phatom 73210
Received Date:	7 March 2025
Calibrated Date:	14 - 18 March 2025
Issued Date:	19 March 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.: CP20250099EA

Calibration Report

Equipment: Vibration Meter
Manufacturer: Instantel
Model: Micromate
Serial No.: UM15904
ID No.: VB-01-002
Ambient Temperature: (23 ± 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	2708237	AV-0040-24	19-Sep-2025
2) Measuring Amplifier	2525	2685967	AV-0034-24	7-Aug-2025
3) LAN XI Analyzer	3160-A-042	3060-106135	CQ20240016EA	1-Dec-2025
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.: CP20250099EA

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	10.001	10.357	0.356	1.50	Longitudinal (L)
5.0	10.000	9.998	10.246	0.248	1.50	
6.3	10.000	10.000	10.372	0.372	1.50	
8.0	10.000	9.998	10.144	0.146	1.50	
10.0	10.000	10.008	10.089	0.081	1.50	
12.5	10.000	10.008	9.955	-0.053	1.60	
16.0	10.000	9.996	10.057	0.061	1.60	
	20.000	19.997	19.943	0.054	1.60	
	30.000	29.970	29.864	-0.106	1.50	
	50.000	49.992	49.695	-0.297	1.50	
20.0	10.000	9.993	10.057	0.064	1.60	
25.0	10.000	9.998	10.077	0.079	1.50	
31.5	10.000	9.996	10.073	0.077	1.50	
40.0	10.000	9.996	10.120	0.124	1.50	
52.0	10.000	10.008	10.238	0.230	1.50	
63.0	10.000	9.991	10.388	0.397	1.50	
80.0	10.000	9.994	10.593	0.599	1.50	

Certificate No.: CP20250099EA

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	10.104	0.101	1.50	Transverse (T)
5.0	10.000	9.996	10.069	0.073	1.60	
6.3	10.000	10.006	10.136	0.130	1.60	
8.0	10.000	10.011	9.957	-0.054	1.60	
10.0	10.000	10.008	9.953	-0.055	1.60	
12.5	10.000	9.998	9.939	-0.059	1.60	
16.0	10.000	10.000	9.915	-0.085	1.50	
	20.000	19.997	19.807	-0.190	1.50	
	30.000	29.995	29.738	-0.257	1.50	
	50.000	49.992	49.553	-0.439	1.50	
20.0	10.000	10.010	9.955	-0.055	1.60	
25.0	10.000	10.006	9.947	-0.059	1.60	
31.5	10.000	9.993	10.045	0.052	1.70	
40.0	10.000	10.003	10.059	0.056	1.50	
52.0	10.000	10.006	10.152	0.146	1.50	
63.0	10.000	10.001	10.309	0.308	1.50	
80.0	10.000	9.998	10.472	0.474	1.50	

Certificate No.: CP20250099EA

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	10.006	9.663	-0.343	1.50	Vertical (V)
5.0	10.000	9.997	9.632	-0.365	1.50	
6.3	10.000	9.998	9.813	-0.185	1.50	
8.0	10.000	10.010	9.766	-0.244	1.50	
10.0	10.000	9.996	9.851	-0.145	1.60	
12.5	10.000	10.000	9.923	-0.077	1.50	
16.0	10.000	9.997	10.059	0.062	1.60	
	20.000	19.997	20.060	0.063	1.60	
	30.000	29.995	30.061	0.066	1.60	
	50.000	49.992	50.215	0.223	1.50	
20.0	10.000	10.004	10.175	0.171	1.50	
25.0	10.000	10.001	10.183	0.182	1.50	
31.5	10.000	10.008	10.175	0.167	1.50	
40.0	10.000	9.997	10.294	0.297	1.50	
52.0	10.000	9.998	10.617	0.619	1.50	
63.0	10.000	10.013	10.672	0.659	1.50	
80.0	10.000	10.006	10.940	0.934	1.50	

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

- - End of Report - -

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT
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Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280
Tel: +66 2709 4860 Fax: +66 2324 0917

Certificate No.: CP20240325EA
Operation No.: CP2024080270

Certificate of Calibration

Equipment:	Vibration Meter
Manufacturer:	Instantel
Model/Type:	Micromate
Serial No.:	UM20454
ID No.:	VB-01-008
Customer:	C.E.M. Technology (Thailand) Co.,Ltd.
Address:	31/8 Moo 13 T.Rai Khung, A.Sam Phran, Nakorn Phatom 73210
Received Date:	2 August 2024
Calibrated Date:	28 - 29 August 2024
Issued Date:	2 September 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.

Certificate No.: CP20240325EA

Calibration Report

Equipment: Vibration Meter
Manufacturer: Instantel
Model: Micromate
Serial No.: UM20454
ID No.: VB-01-008
Ambient Temperature: (23 ± 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	3050-A-060	3050-110127	CQ20230024EA	5-Nov-2024
4) PULSE Multi-analyzer system	3160-A-042	3060-106135	CQ20230025EA	5-Nov-2024
5) 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)

Certificate No.: CP20240325EA

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	10.546	0.540	1.50	Longitudinal (L)
5.0	10.000	9.998	10.585	0.587	1.50	
6.3	10.000	9.998	10.806	0.808	1.50	
8.0	10.000	10.008	10.499	0.491	1.50	
10.0	10.000	9.998	10.483	0.485	1.50	
12.5	10.000	10.020	10.467	0.447	1.50	
16.0	10.000	10.004	10.309	0.305	1.50	
	20.000	19.997	20.706	0.709	1.50	
	30.000	30.010	31.031	1.021	1.50	
	50.000	49.992	51.484	1.492	1.50	
20.0	10.000	10.003	10.428	0.425	1.50	
25.0	10.000	10.007	10.420	0.413	1.50	
31.5	10.000	10.013	10.380	0.367	1.50	
40.0	10.000	10.001	10.341	0.340	1.50	
50.0	10.000	10.013	10.428	0.415	1.50	
52.0	10.000	10.001	10.502	0.501	1.50	
63.0	10.000	9.991	10.546	0.555	1.50	
80.0	10.000	9.998	10.522	0.524	1.50	

Certificate No.: CP20240325EA

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	10.428	0.425	1.50	Transverse (T)
5.0	10.000	10.001	10.483	0.482	1.50	
6.3	10.000	10.020	10.885	0.865	1.50	
8.0	10.000	9.987	10.530	0.543	1.50	
10.0	10.000	9.997	10.609	0.612	1.50	
12.5	10.000	10.000	10.530	0.530	1.50	
16.0	10.000	10.001	10.372	0.371	1.50	
	20.000	19.997	20.769	0.772	1.50	
	30.000	29.995	31.133	1.138	1.50	
	50.000	49.992	51.721	1.729	1.50	
20.0	10.000	10.003	10.420	0.417	1.50	
25.0	10.000	10.013	10.380	0.367	1.50	
31.5	10.000	9.994	10.309	0.315	1.50	
40.0	10.000	10.003	10.254	0.251	1.50	
50.0	10.000	10.006	10.349	0.343	1.50	
52.0	10.000	9.996	10.412	0.416	1.50	
63.0	10.000	10.006	10.467	0.461	1.50	
80.0	10.000	9.987	10.459	0.472	1.50	

ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240325EA

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	10.008	9.742	-0.266	1.50	Vertical (V)
5.0	10.000	10.020	9.710	-0.310	1.50	
6.3	10.000	10.008	9.931	-0.077	1.50	
8.0	10.000	10.003	9.632	-0.371	1.50	
10.0	10.000	10.000	9.703	-0.297	1.50	
12.5	10.000	10.001	9.710	-0.291	1.50	
16.0	10.000	10.003	9.758	-0.245	1.50	
	20.000	19.997	19.705	-0.292	1.50	
	30.000	29.995	29.549	-0.446	1.50	
	50.000	49.978	49.127	-0.851	1.50	
20.0	10.000	10.008	9.860	-0.148	1.50	
25.0	10.000	9.997	9.513	-0.484	1.50	
31.5	10.000	9.995	9.915	-0.080	1.50	
40.0	10.000	9.993	10.041	0.048	1.50	
50.0	10.000	9.993	10.207	0.214	1.50	
52.0	10.000	9.984	10.246	0.262	1.50	
63.0	10.000	9.983	10.404	0.421	1.50	
80.0	10.000	10.025	10.720	0.695	1.50	

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

-- End of Report --

F-CAL-005 Ed.1

เอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำ

THAI CALIBRATION SERVICES CO., LTD.
19/8 Moo 9 Soi Raiking 30 Puttamonton 5 Rd., Sampran, Nakornpatom 73210
Tel. 0-3439-7682-5 Fax: 0-3439-7687
www.thaical.com E-mail : sale@thaicalibration.com, lab@thaicalibration.com

NSC-TISI-TIS 17025 CALIBRATION 0189

CALIBRATION CERTIFICATE

Certificate No.S2505043S

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-I
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 :	ห้องเครื่องชั่ง		

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^3)
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., NSC-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.

THAI CALIBRATION SERVICES CO., LTD.
19/8 Moo 9 Soi Raiking 30 Puttamonton 5 Rd., Sampran, Nakornpatom 73210
Tel. 0-3439-7682-5 Fax: 0-3439-7687
www.thaical.com E-mail : sale@thaicalibration.com, lab@thaicalibration.com

NSC-TISI-TIS 17025 CALIBRATION 0189

CALIBRATION CERTIFICATE

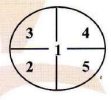
Certificate No.S2505043S

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	0.15	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--

CAL
Calibratech Co.,Ltd.
7/106-7 Moo 2, Sukhapruchasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120
Tel.(02) 964 6211 Fax.(02) 964-5155, e mail : calibratech_cal@yahoo.com, calibratech_cal@hotmail.com

NSC-TIS1-TIS17025
CALIBRATION 0030

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 : Permpon 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 :
(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
Calibratech Co.,Ltd.
7/106-7 Moo 2, Sukhapruchasan 3 Rd., Bangpood, 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)	UUC Reading (mV)	Correction (mV)	Uncertainty (± mV)
4, 7, 10	177.4800	4	4.00	177.4	0.1	0.12
	0.0000	7	7.00	0.0	0.0	0.086
	-177.4800	10	10.00	-177.4	-0.1	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 measurment was based on a standard uncertainty multiplied by a coverage factor k = 2 , providing a level of confidence of approximately 95%

- o0o -

CAL-F0031-03

CAL
Calibratech Co.,Ltd.
7/106-7 Moo 2, Sukhapruchasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech_cal@yahoo.com, calibratech_cal@hotmail.com

NSC-TIS1-TIS17025
CALIBRATION 0030

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%

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CAL-F0031-03

CAL
Calibratech Co.,Ltd.
7/106-7 Moo 2, Sukhapruchasan 3 Rd., Bangpood, 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. : 68-400089-1 **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

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%

- o0o -

CAL-F0031-03

CAL
Calibratech Co.,Ltd.
7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech..cal@yahoo.com, calibratech.cal@hotmail.com

NSC-TISI-TIS17025
CALIBRATION 0030

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%
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Calibratech Co.,Ltd.
7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, 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. : 68-400089-1 **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

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%

-o0o-

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

NSC-TISI-TIS17025
CALIBRATION 0030

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-03-002

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 : 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
Calibratech Co.,Ltd.
7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, 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. : 68-430004-2 **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
141.3	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%

-o0o-

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 Thailand

Environment Condition:

Temperature:	28 °C	±	1.0	°C
Humidity:	61 %RH	±	5.0	%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

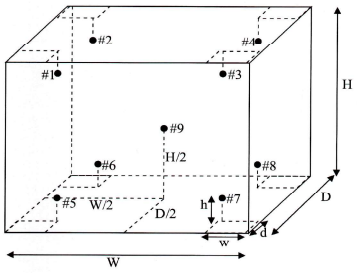
(Mr. Udon Srichana)
Authorized signatory

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.

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



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.

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

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)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.0	104.29	104.01	104.34	104.23	104.43	104.19	103.78	104.21	104.47	0.41

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

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2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
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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)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180.0	xxx	180.0	180.20	179.54	180.39	180.09	180.62	179.97	179.53	180.27	180.57	0.48

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

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DKSH Technology Limited
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2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
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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.

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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	0.43	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

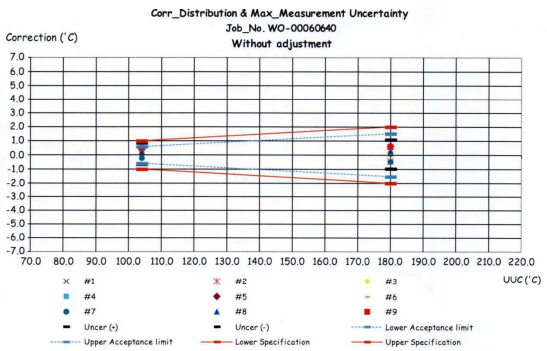
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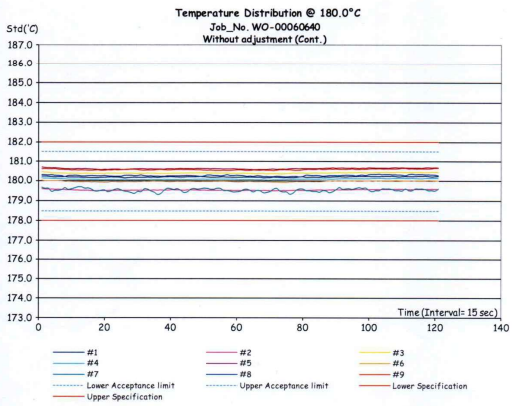
The End of Statements of Conformity

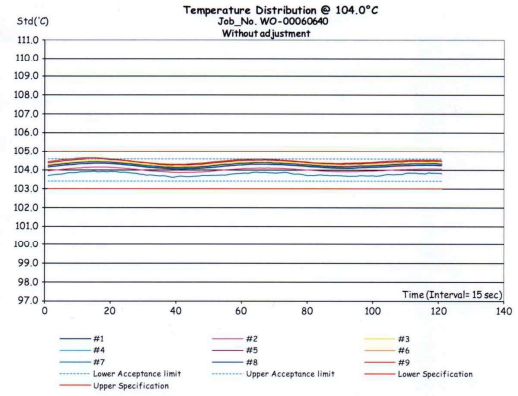
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DKSH Technology Limited
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CAL-FM-C31-10: 12 Sep 2022







DKSH

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00060640

ชนิดเครื่องมือ: Hot Air Oven รุ่น: UF 55

หมายเลขเครื่อง: B219.0142 (WW-05-002)

ตรวจสอบ (รับ) 10 Feb 2025 ปกติ	ไม่ปกติ	รายการตรวจเช็ค	ตรวจสอบ (ส่ง) 10 Feb 2025 ปกติ	ไม่ปกติ	หมายเหตุ
		General			
☑	☐	1. สายไฟ	☑	☐	
☑	☐	2. การทำงาน Main Switch	☑	☐	
☑	☐	3. การทำงาน Selector Key	☑	☐	
☑	☐	4. การแสดงผล Display	☑	☐	
☑	☐	5. การทำงาน พัดลม	☑	☐	
☑	☐	6. สภาพ Lever of Ventilation valve	☑	☐	
☑	☐	7. สภาพ Lever door open / close	☑	☐	
☑	☐	8. สภาพ Door seal	☑	☐	
☑	☐	9. การทำงานของระบบ Safety	☑	☐	
☐	☐	10. การทำงานของระบบทำความเย็น	☐	☐	ไม่มี
☐	☐	11. การทำงานของระบบทำความชื้น	☐	☐	ไม่มี
☑	☐	12. สภาพตัวเครื่อง	☑	☐	
☑	☐	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	☑	☐	

ข้อแนะนำ :

Mr. Tweewong Thaithiang

Service Engineer

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

DKSH

Certificate of Calibration

Equipment:	Cooled Incubator	Certificate No.:	C31250348
Model:	KB 240	Issued Date:	10 February 2025
Serial No.(or ID):	20180000012164 (WW-16-001)	Job No.:	WO-00060640
Manufacturer:	Binder	Page:	1 of 3
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	3		

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

Environment Condition:

Temperature:	22 °C	±	1.0	°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

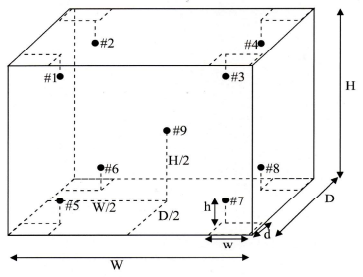
This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

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.

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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.

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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

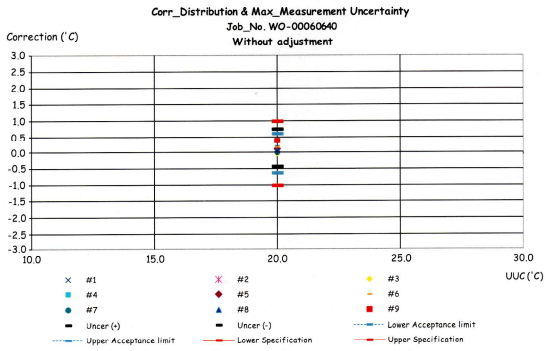
Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	20.14	0.14	0.33	1.0	Pass
#2	20.14	0.14	0.34	1.0	Pass
#3	19.96	-0.04	0.38	1.0	Pass
#4	20.14	0.14	0.35	1.0	Pass
#5	20.11	0.11	0.33	1.0	Pass
#6	20.17	0.17	0.34	1.0	Pass
#7	20.00	0.00	0.37	1.0	Pass
#8	20.06	0.06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

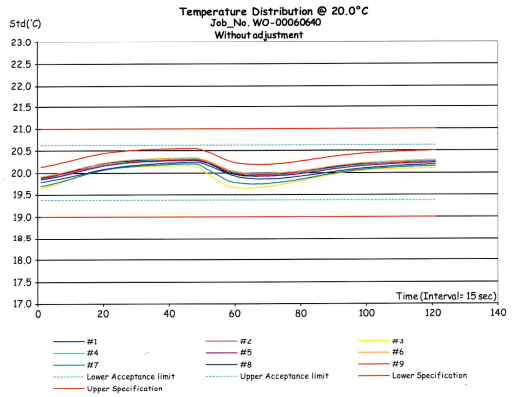
Correction* = Measured Temperature - Desired Temperature

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

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ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00060640

ชนิดเครื่องมือ: Cooled Incubator รุ่น: KB 240

หมายเลขเครื่อง: 20180000012164 (WW-16-001)

ตรวจสอบ (รับ) 10 Feb 2025		รายการตรวจเช็ค	ตรวจสอบ (ส่ง) 10 Feb 2025		หมายเหตุ
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
☑	☐	1. สายไฟ	☑	☐	
☑	☐	2. การทำงาน Main Switch	☑	☐	
☑	☐	3. การทำงาน Selector Key	☑	☐	
☑	☐	4. การแสดงผล Display	☑	☐	
☑	☐	5. การทำงาน พัดลม	☑	☐	
☐	☐	6. สภาพ Lever of Ventilation valve	☐	☐	ไม่มี
☑	☐	7. สภาพ Lever door open / close	☑	☐	
☑	☐	8. สภาพ Door seal	☑	☐	
☑	☐	9. การทำงานของระบบ Safety	☑	☐	
☑	☐	10. การทำงานของระบบทำความเย็น	☑	☐	
☐	☐	11. การทำงานของระบบทำความชื้น	☐	☐	ไม่มี
☑	☐	12. สภาพตัวเครื่อง	☑	☐	
☑	☐	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	☑	☐	

ข้อแนะนำ : _____

_____

Mr. Tweewong Thaithiang

Service Engineer

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
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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)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
20.0	20.0	20.0	20.14	20.14	19.96	20.14	20.11	20.17	20.00	20.06	20.38	0.38

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

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การดูแลบำรุงรักษาเชิงป้องกัน

Preventive Maintenance

Gerhardt
Analytical Systems

DKSH

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โทร 0 2 639 7000 E-Mail : marketing.tec.th@dksh.com
Website : www.dksh.co.th/technology/scientific-thailand

เงื่อนไขการให้บริการ Preventive Maintenance

บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้บริการตามขอบข่ายของการบริการ เฉพาะ ในวันและเวลา ราชการ หากมีความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักขัตฤกษ์) บริษัทฯ จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

ขอบข่ายการบริการ

- ตรวจสอบสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายการผลการตรวจสอบเครื่องมือ

หมายเหตุ

- ราคานี้ไม่รวมถึงค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้รับบริการอยู่นอกเขตพื้นที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง เป็นต้น
- บริษัท ฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงราคา โดยไม่แจ้งให้ทราบล่วงหน้า

ช่องทางการติดต่อ

DKSH Technology Limited (บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด)
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เลขประจำตัวผู้เสียภาษี 010-555-001-4547 (สำนักงานใหญ่)

LINE: @dkshscientific

Call center 0 2 639 7000

DKSH Scientific

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marketing.tec.th@dksh.com

@dkshscientific

Preventive Maintenance Contract

จำนวนในการทำสัญญาบริการ ...1...ครั้งต่อปี

ครั้งที่ ..1.. วันที่ 14/05/2025.....

รายละเอียดผู้รับบริการ

หน่วยงาน	บริษัท ซี.อี.เอ็ม เทคโนโลยี (ไทยแลนด์) จำกัด		
ที่อยู่	219/43 หมู่12 ถนนเพชรเกษม ตำบลอ้อมน้อย อำเภอกระทุ่มแบน จังหวัดสมุทรสาคร 74130		
โทรศัพท์	0869054664	แฟกซ์	-

ผู้ติดต่อ

ชื่อ - นามสกุล	คุณศิริพาพร พิบพา				
ตำแหน่ง	เจ้าหน้าที่ห้องปฏิบัติการ				
โทรศัพท์	0869054664	เบอร์ต่อ	-	แฟกซ์	-
E-mail	lab.cemtech1@gmail.com				

รายละเอียดผู้ให้บริการ

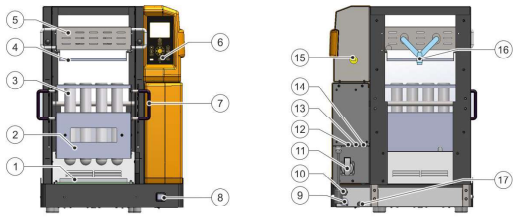
บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่)			
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โทรศัพท์ 0 2 693 7000 Email: Jirayut.js@dksh.com			
เจ้าหน้าที่ประสานงาน : คุณจิรายุทธ สเลอาด			
เจ้าหน้าที่ผู้ให้บริการ	นายจิรายุทธ สเลอาด		
ตำแหน่ง	Specialist,TechnicalService.		
โทรศัพท์	0938138736	แฟกซ์	-
E-mail	Jirayut.js@dksh.com		

ลงนามผู้รับบริการ		ลงนามผู้ให้บริการ	Jirayut Salee-Ard
ตัวบรรจง	(.....)	ตัวบรรจง	(นายจิรายุทธ สเลอาด)
ตำแหน่ง		ตำแหน่ง	Specialist,TechnicalService.
วันที่ / ประทับตราบริษัท		วันที่ / ประทับตราบริษัท	14/05/2025

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

Part 3: ตรวจเช็คสภาพเครื่อง

Front and rear view of KT-L version



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

Part 4: ละเอียดและรายงานผลการให้บริการ Preventive Maintenance

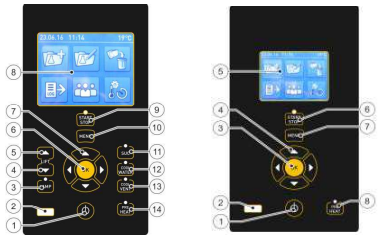
4.1 ตรวจเช็คระบบไฟฟ้า

	Pass	Fai	N/A	Remark
ไฟ 220 V50 Hz	☑	☐	☐	.....
กระแสไฟฟ้าตามพิกัดเครื่อง	☑	☐	☐	.....

4.2 ตรวจสอบสภาพอุปกรณ์ภายนอก

	Pass	Fail	N/A	Remark
สายไฟของเครื่อง	☑	☐	☐	.....
ท่อแก้วรวมไอกรด	☑	☐	☐	.....
สายยางต่อกับท่อแก้วรวมไอกรด	☑	☐	☐	.....
สภาพของ Aluminum block	☑	☐	☐	เรื่องมสภาพ
การขึ้นลงของ Lift	☐	☐	☑	.....
Light	☐	☐	☑	.....
Current Switch	☑	☐	☐	.....
Thermostat	☑	☐	☐	.....

4.3ตรวจเช็คระบบการทำงาน



☐ KT-L ☑ KT

	Pass	Fail	N/A	Remark
Switch controller on or off.	☑	☐	☐	.....
USB port	☑	☐	☐	.....
LAMP button	☐	☐	☑	.....
LIFT down button	☐	☐	☑	.....
LIFT up button	☐	☐	☑	.....
OK button	☑	☐	☐	.....
Navigation buttons	☑	☐	☐	.....
Display	☑	☐	☐	.....
START/STOP button	☑	☐	☐	.....
MENU button	☑	☐	☐	.....
SUC button	☐	☐	☑	.....
COOLWATER button (optional)	☐	☐	☑	.....
COOL VENT button (optional)	☐	☐	☑	.....
PRE HEAT button	☑	☐	☐	.....
การขึ้นของอุณหภูมิมากกว่า10องศาต่อนาทีที่250องศา	☑	☐	☐	.....
การทำงานของตัวป้องกันอุณหภูมิสูงเกิน	☑	☐	☐	.....
การทำงานของระบบควบคุมอุณหภูมิ	☑	☐	☐	.....

การบำรุงรักษาทั่วไป (Basic maintenance)

1. การย่อยตัวอย่างเกิดการเดือดที่รุนแรงอันเนื่องจากตัวอย่างนั้นสามารถป้องกันได้โดยแนะนำให้ย่อยด้วยการตั้งการเพิ่มอุณหภูมิเป็นระดับเช่น ย่อยที่ระดับอุณหภูมิ 250 C ครบเวลา 15 นาทีจึงเปลี่ยนเป็นอุณหภูมิ 380 C เพื่อป้องกันการล้นออกมา

2. เมื่อใช้เสร็จไม่ควรปล่อยให้ Tube เย็นกับตัวเครื่อง

3. ต้องนำฉากลองไอกรดใส่ทุกครั้งหลังจากใช้งานเสร็จ เพื่อป้องกันการหยดของไอกรดที่จะหยดลงมาที่ตัวเครื่อง

4. ทำความสะอาดตัวหลุมย่อยด้วยน้ำหรือผ้าชุบน้ำในกรณีที่มีคราบกรดหยดลงมาติดอยู่ในหลุม

เพื่อป้องกันไม่ให้คราบดังกล่าวไปกัดการแผ่อุณหภูมิ

การดูแลบำรุงรักษาเชิงป้องกัน

Preventive Maintenance

Gerhardt Analytical Systems

DKSH

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด

ฝ่ายบริการหลังการขาย

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Website : www.dksh.co.th/technology/scientific-thailand

เงื่อนไขการให้บริการ Preventive Maintenance

บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้บริการตามขอบข่ายของการบริการ เฉพาะ ในวันและเวลา ราชการ หาก มีความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักขัตฤกษ์) บริษัท ฯ จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

ขอบข่ายการบริการ

- ตรวจสอบสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายการผลการตรวจสอบเครื่องมือ

หมายเหตุ

- ราคานี้ไม่รวมถึงค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้รับบริการอยู่นอกเขตพื้นที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่า เดินทาง เป็นต้น
- บริษัท ฯ 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

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@dkshscientific

Preventive Maintenance Contract

จำนวนในการทำสัญญาบริการ ...1...ครั้งต่อปี
ครั้งที่ ..1.. วันที่ 14/05/2025.....

รายละเอียดผู้รับบริการ

หน่วยงาน	บริษัท ซี.อี.เอ็ม เทคโนโลยี (ไทยแลนด์) จำกัด		
ที่อยู่	219/43 หมู่12 ถนนเพชรเกษม ตำบลอ้อมน้อย อำเภอกระทุ่มแบน จังหวัดสมุทรสาคร 74130		
โทรศัพท์	0869054664	แฟกซ์	-

ผู้ติดต่อ

ชื่อ - นามสกุล	คุณศิริพาพร พิมพา				
ตำแหน่ง	เจ้าหน้าที่ห้องปฏิบัติการ				
โทรศัพท์	0869054664	เบอร์ต่อ	-	แฟกซ์	-
E-mail	lab.cemtech1@gmail.com				

รายละเอียดผู้ให้บริการ

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่)			
เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260			
โทรศัพท์ 0 2 693 7000 Email: Jirayut.js@dksh.com			
เจ้าหน้าที่ประสานงาน : คุณจิรายุฒ สเลอาด			
เจ้าหน้าที่ผู้ให้บริการ	นายจิรายุฒ สเลอาด		
ตำแหน่ง	Specialist,TechnicalService.		
โทรศัพท์	0938138736	แฟกซ์	-
E-mail	Jirayut.js@dksh.com		

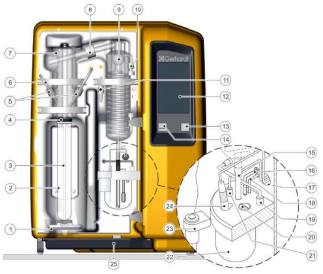
ลงนามผู้รับบริการ		ลงนามผู้ให้บริการ	Jirayut Salayard
ตัวบรรจง	(.....)	ตัวบรรจง	(นาย จิรายุฒ สเลอาด)
ตำแหน่ง		ตำแหน่ง	Specialist,TechnicalService.
วันที่ / ประทับตราบริษัท		วันที่ / ประทับตราบริษัท	14/05/2025

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

Operational Qualification (OQ)

ตรวจสอบสภาพเครื่อง

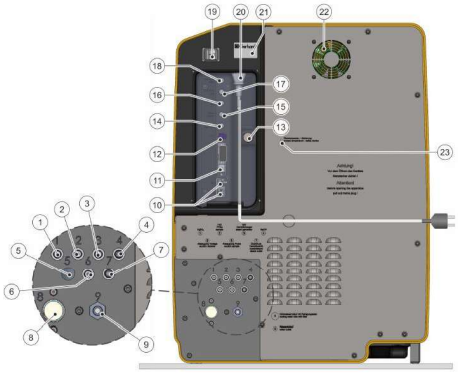
FRONT



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

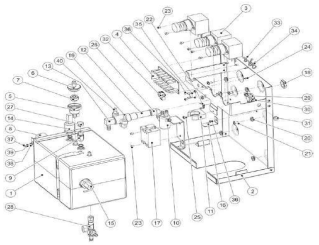
** only VAP 450

REAR



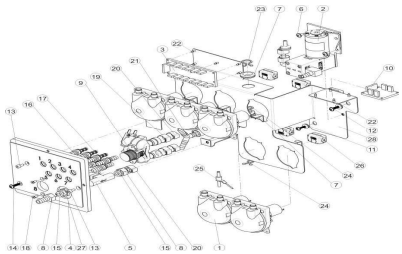
No		PASS	FAIL	N/A
1	Tube connection for sample H3BO3 supply	☐	☐	☑
2	Tube connection for sample H2O supply	☐	☐	☑
3	Tube connection for steam generator H2O supply	☑	☐	☐
4	Tube connection for NaOH supply	☑	☐	☐
5	Tube connection for receiver glass extraction	☑	☐	☐
6	Tube connection for sample waste extraction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

Inside Steam generator



No		PASS	FAIL	N/A
1	Steam generator	☑	☐	☐
2	Steam generator traverse	☑	☐	☐
3	Pinch valve	☑	☐	☐
4	Circuit board distributor	☑	☐	☐
5	Valve tubing connection	☑	☐	☐
6	Housing safety valve	☑	☐	☐
7	Safety valve SKT	☑	☐	☐
8	Excess temperature protection , steam generator	☑	☐	☐
9	Safety valve G 1/8 0,5 bar	☑	☐	☐
10	Ventilation glass pinch valve VAPODEST	☑	☐	☐
11	Hose clamp for ventilation clamp	☑	☐	☐
12	Distributor PP	☑	☐	☐
13	Angle connection PP	☑	☐	☐
14	Pressure transmitter	☑	☐	☐
15	Level switch	☑	☐	☐
16	Fixing bracket steam generator	☑	☐	☐
17	Relay HT+	☑	☐	☐
18	VA Hexagon nut ⅛"	☑	☐	☐
19	Angle connection 1/8"	☑	☐	☐
20	Bushing nipple 6-10-14	☑	☐	☐
21	VA Lens head screw M5 X 10	☑	☐	☐
22	Grounding connection , 2-pole	☑	☐	☐
23	VA Lens head screw M4 X 6	☑	☐	☐
24	Spacer bolt 5 mm	☑	☐	☐
25	VA Lens head screw M4 X 10	☑	☐	☐
26	Tubing connection	☑	☐	☐
27	Hose clamp 14.5 mm	☑	☐	☐
28	Module ball valve with nozzles	☑	☐	☐
29	Cross manifold with spout	☑	☐	☐
30	Seal copper G 1/8	☑	☐	☐
31	Locking screw 1/8''	☑	☐	☐
32	Pin strip	☑	☐	☐
33	Bundle clamp 12 H 4500	☑	☐	☐
34	Bundle clamp 12 H 4502	☑	☐	☐
35	Temperature switch 80°C	☑	☐	☐
36	VA Lens head screw M3 X 6	☑	☐	☐
37	VA Hexagon nut M4	☑	☐	☐
38	Lins head screw M4 X 8	☑	☐	☐
39	VA Spring washer	☑	☐	☐
40	Angle connection , reduced , 1/8" PP	☑	☐	☐

Module Pump holder VAP200 - 450 V3



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

Control panel



No		PASS	FAIL
1	Title bar	☑	☐
2	Status bar	☑	☐
3	Navigation button	☑	☐
4	Smart switch with multiple functions	☑	☐
5	USB interface	☑	☐

รายละเอียดการตรวจสอบ

ขั้นตอนการบริการ

ตรวจสอบระบบไฟฟ้า (Electrical Test)

- ความต้านทานทางไฟฟ้าของเครื่องกับกราวด์
- 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

รายงานผลการให้บริการ

1. TECHNICAL DATA	Pass	Fail	N/A	Remark
Main Supply 220 volt + 10% 50 Hz with ground	☑	☐	☐	……..
Norminal current	☑	☐	☐	……8a…..
1.1 COOLING WATER BATH	Pass	Fail	N/A	Remark
Temperature 15-20 °C	☑	☐	☐	……..
Cooling Water Outlet	☑	☐	☐	……..
Control Temperature	☑	☐	☐	……..
1.2 OPTICAL TEST VAP200	Pass	Fail	N/A	Remark
Screw cap GL14	☑	☐	☐	……..
Screw cap GL18	☑	☐	☐	……..
Screw cap GL32	☑	☐	☐	……..
Distillation Head	☑	☐	☐	……..
Condensor	☑	☐	☐	ปลายcondensor.เป
Viton Cone	☐	☑	☐	เสื่อมสภาพ
Ventilation Valve BV	☑	☐	☐	……..
Micro Switch Sample	☑	☐	☐	……..
Agitator motor for propeller	☐	☐	☑	……..
2. SYSTEM COOLING WATER INLET	Pass	Fail	N/A	Remark
Cooling Water Inlet	☑	☐	☐	……..
Cooling Water Outlet	☑	☐	☐	……..
Flow control valve	☑	☐	☐	……..
3.SYSTEM CONTROL	Pass	Fail	N/A	Remark
Display	☑	☐	☐	……..
Program	☑	☐	☐	……..
Adding NaOH	☑	☐	☐	……..
Adding H2O	☐	☐	☑	……..
Adding H3BO3	☐	☐	☑	……..
Suction Sample	☐	☐	☑	……..
Suction Reciver	☐	☐	☑	.....
4.SYSTEM DISTILLATION	Pass	Fail	N/A	Remark
Boiler	☑	☐	☐	……..
Level Sensor	☑	☐	☐	……..
Novopren	☐	☑	☐	เสื่อมสภาพ
Solenoid Valve Shut-Off	☑	☐	☐	……..
Solenoid Valve Steam	☑	☐	☐	……..
Solenoid Valve soft steam	☑	☐	☐	……..
Ventilation Valve Premount	☑	☐	☐	……..
Excess Pressure Detector	☑	☐	☐	……..
Heating Element	☑	☐	☐	……..

5. PUMP	Pass	Fail	N/A	Remark
Pump H_2O Steam	☑	☐	☐	……..
- Non-Return Valve	-	-	-	……..
Pump H_2O Sample	☐	☐	☑	……..
- Non-Return Valve	-	-	-	……..
Pump NaOH	☑	☐	☐	……..
- Non-Ruturn Valve	☑	☐	☐	……..
Pump H3BO3	☐	☐	☑	……..
- Non-Ruturn Valve	☐	☐	☑	……..
Pump suction	☐	☐	☑	……..
Pump suction receiver	☐	☐	☑	……..

6. The Following Program Run :	Pass	Fail	N/A	Remark
Addition H2O 0-999 ml.	☐	☐	☑	……
Addition NaOH 0-999 ml.	☑	☐	☐	……
Addition H3BO3 0-999 ml.	☐	☐	☑	……
Reaction Time 0-108 min	☑	☐	☐	……
Distillation Time 0-108 min	☑	☐	☐	……
Steam Capacity 10%-100%	☑	☐	☐	……
Suction Sampe	☐	☐	☑	……
Suction Receiver	☐	☐	☑	……

7. Measured pumps **Remark**

Pump NaOH Volume : 13.33 ml ……..

Remark : ปลาย condensor เสื่อมสภาพ,viton cone เสื่อม,novoprean เสื่อม

ข้อมูลสนับสนุนด้านเทคนิค (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_2O 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 soiling, approx. 10 ml of sulphuric acid can 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	■ Open water tap. ■ Check coolant pressure. ■ Check coolant tube. Program continues automatically once error has been fixed.
'Sample tube missing'	Sample tube missing.	■ Insert sample tube. Continue program or restart.
'Distillation room protective door open'	Protection door not closed	■ Close protection door. Program continues automatically once error has been fixed.
'Reagent storage/ waste'	One or more storage tanks are empty	■ Fill storage tank. ■ Check correct seating of the universal sensors. The running program can be continued after rectification of the error.
	The sample waste tank is full.	■ Empty sample waste tank. ■ Check correct seating of the universal sensors. The running program can be continued after rectification of the error.

Analytical errors

Fault description	Cause	Remedy
Analysis results too high	The chemicals used are contaminated with nitrogen compounds.	■ Detailed checking of the chemicals. ■ Determination of a blank value. ■ Replace the chemicals if necessary.
	Violent reaction in the digestion tube, sodium hydroxide drops get into the receiver.	■ Increase of the water addition amount.
	Glass bridge of the condenser is broken or worn out, sodium hydroxide drops get into the receiver.	■ Replacement of the glass condenser.
	Glass cleaning agents in the digestion tube.	■ Clean digestion tube in advance with distilled water.
	Entrainment of ammonia from the previous sample.	■ Increase distillation time. ■ Check whether the sample was previously sufficiently alkalised.
Analysis result too low or no result	Incomplete distillation; distillation time too short.	■ No quantitative expulsion of the ammonia content. ■ The distillation amount should be 100 ml.
	Ammonia escapes at leaking places.	■ Soiled or defective Viton plugs; clean or replace. ■ Check seals (GL screw connections) on the distribution head; replace if necessary. ■ Check valve at the condenser is gummed up; clean or replace. ■ Digestion tube is damaged at the neck extension. ■ Distribution head glass leaks; replace.
	Addition amount of the sodium hydroxide too little; no ammonia development.	■ Check the constant flow rate of the NaOH pump (see Technical Data).
	Too low boric acid amount in the receiver; escaping ammonia is not completely bonded.	■ Increase of the boric acid amount.
	Tube not completely immersed in the acid receiver.	■ Increase of the acid amount.
	Formation of stable ammonia compounds which are not destroyed with sodium hydroxide.	■ This problem only occurs with catalysts containing mercury. Sodium sulphate solution destroys these compounds.

CAL

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

NSC-TISI-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 : 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%

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7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, 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. : 68-430004-1 **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%

- end -

CAL
Calibratech Co.,Ltd.
7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech..cal@yahoo.com, calibratech..cal@hotmail.com

NSC-TISI-TIS17025
CALIBRATION 0030

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 & 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 cerificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co.,Ltd.

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

Certificate of Calibration

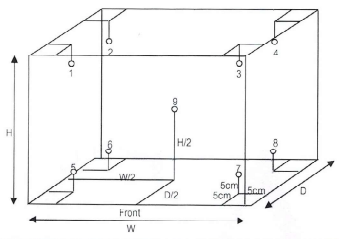
Certificate No. : 68-400172-1

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^3

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%

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