ภาคผนวกที่ 4

สรุปเอกสารสอบเทียบอุปกรณ์เครื่องมือ

เอกสารการสอบเทียบเครื่องมือตรวจวัดระดับเสียงในบรรยากาศ

สถาบันไฟฟ้าและอิเล็กทรอนิกส์
ELECTRICAL AND ELECTRONICS INSTITUTE

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

NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: CP20260134EA
Operation No.: CP2026030079

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	ACO
Model/Type:	6236 (Meter), 7052NR (Microphone), - (Preamplifier)
Serial No.:	222185 (Meter), 84161 (Microphone), - (Preamplifier)
ID No.:	NS-03-015
Customer:	C.E.M. Technology (Thailand) Co.,Ltd.
Address:	31/8 Moo 13 T.Rai Khung, A.Sam Phran, Nakorn Phatom 73210
Received Date:	12 March 2026
Calibrated Date:	20 - 21 April 2026
Issued Date:	24 April 2026
Calibrated by:	Ms. Juntaporn Kunhakom

Approved by: [redacted]

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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.: CP20260134EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: ACO
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)
Serial No.: 222185 (Meter), 84161 (Microphone), - (Preamplifier)
ID No.: NS-03-015
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-1011-25	24 June 2026
2)	Arbitrary Function Generator	AFG2021	C010063	CK20250037EA	25 June 2026
3)	Programmable Attenuator	PA5	2913	EF-0026-25	9 June 2026
4)	6.5 Digit precision multimeter	8846A	9609027	CB20250141EA	20 August 2026
5)	Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P260022 CD20250221EA	18 March 2027 8 August 2026
6)	Performance Audio Analyzer	U8903B	MY56510003	CB20260043EA CK20250065EA	10 March 2027 23 September 2026

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).; ILAC Policy, Item 2 (1) No.ILAC-P10:07/2020.
   Reference standards instrument for Electrical function
   - National Institute of Metrology (Thailand)
   - Electrical and Electronics Institute; NSC Accredited Calibration No.0119
   - IRPC Metrology Center, IRPC Public Co., Ltd.; NSC Accredited Calibration No.0204.

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.: CP20260134EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
20.2

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	17.1
C-weighting	24.4
Z-weighting	32.8

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

Certificate No.: CP20260134EA

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

Certificate No.: CP20260134EA

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	59.0	0.0	±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	31.2	0.2	±1.1
30.0	30.3	0.3	±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	25.1	0.1	±1.1
20-90	25.0	25.2	0.2	±1.1
20-100	25.0	25.4	0.4	±1.1
20-110	25.0	25.3	0.3	±1.1
30-120	35.0	35.0	0.0	±1.1
40-130	45.0	45.0	0.0	±1.1

Certificate No.: CP20260134EA

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	109.4	-0.2	±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	125.7	0.3	±3.0
Positive half cycle	124.4	124.2	-0.2	±2.0
Negative half cycle	124.4	124.2	-0.2	±2.0

Function : 11. Overload indication

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

Function : 12. High-Level Stability

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

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

Certificate No.: CP20260134EA

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 - -

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

NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: CP20260112EA
Operation No.: CP2026020049

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:	12 March 2026
Calibrated Date:	19 - 24 March 2026
Issued Date:	25 March 2026
Calibrated by:	Ms. Juntaporn Kunhakom

Approved b [redacted]

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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.: CP20260112EA

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-1011-25	24 June 2026
2)	Arbitrary Function Generator	AFG2021	C010063	CK20250037EA	25 June 2026
3)	Programmable Attenuator	PA5	2913	EF-0026-25	9 June 2026
4)	6.5 Digit precision multimeter	8846A	9609027	CB20250141EA	20 August 2026
5)	Pressure humidity and Temperature Transmitter	PTU301	F0640003	CL1-P250034 CD20250096EA	10 April 2026 29 March 2026
6)	Performance Audio Analyzer	U8903B	MY56510003	CB20260043EA CK20250065EA	10 March 2027 23 September 2026

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).; ILAC Policy, Item 2 (1) No.ILAC-P10:07/2020.

   Reference standards instrument for Electrical function
   - National Institute of Metrology (Thailand)
   - Electrical and Electronics Institute; NSC Accredited Calibration No.0119
   - IRPC Metrology Center, IRPC Public Co., Ltd.; NSC Accredited Calibration No.0204.

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.: CP20260112EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
22.7

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	18.6
C-weighting	40.7
Z-weighting	42.1

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	0.3	0.2	0.2	±1.5
1000	-0.2	-0.2	-0.2	±1.0
8000	0.5	0.6	0.7	±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	-0.2	-0.2	0.0	±2.0
125	0.1	-0.2	0.1	±1.5
250	0.0	-0.1	0.0	±1.5
500	0.0	-0.1	0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	-0.1	0.1	±2.0
4000	-0.3	-0.3	0.0	±3.0
8000	-0.4	-0.5	-0.1	±5.0

Certificate No.: CP20260112EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

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

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	120.0	0.0	±1.1
121.0	121.0	0.0	±1.1

Certificate No.: CP20260112EA

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	59.0	0.0	±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	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
33.0	33.2	0.2	±1.1
32.0	32.3	0.3	±1.1
31.0	31.5	0.5	±1.1
30.0	30.7	0.7	±1.1
29.0	29.8	0.8	±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	25.8	0.8	±1.1
20-90	25.0	26.0	1.0	±1.1
20-100	25.0	26.0	1.0	±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	45.2	0.2	±1.1

Certificate No.: CP20260112EA

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	116.1	0.1	±1.0
	2	99.0	0.0	+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	110.0	0.0	±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.: CP20260112EA

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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ELECTRICAL AND ELECTRONICS INSTITUTE

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

NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: CP20260142EA
Operation No.: CP2026040100

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	ACO
Model/Type:	6236 (Meter), 7052NR (Microphone), - (Preamplifier)
Serial No.:	222195 (Meter), 84163 (Microphone), - (Preamplifier)
ID No.:	NS-03-025
Customer:	C.E.M. Technology (Thailand) Co.,Ltd.
Address:	31/8 Moo 13 T.Rai Khung, A.Sam Phran, Nakorn Phatom 73210
Received Date:	23 April 2026
Calibrated Date:	5 - 6 May 2026
Issued Date:	8 May 2026
Calibrated by:	Ms. Juntaporn Kunhakom

Approved [redacted]

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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.: CP20260142EA

Calibration Report

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

Method of Calibration :-

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-1011-25	24 June 2026
2)	Arbitrary Function Generator	AFG2021	C010063	CK20250037EA	25 June 2026
3)	Programmable Attenuator	PA5	2913	EF-0026-25	9 June 2026
4)	6.5 Digit precision multimeter	8846A	9609027	CB20250141EA	20 August 2026
5)	Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P260022 CD20250221EA	18 March 2027 8 August 2026
6)	Performance Audio Analyzer	U8903B	MY56510003	CB20260043EA CK20250065EA	10 March 2027 23 September 2026

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).; ILAC Policy, Item 2 (1) No.ILAC-P10:07/2020.
   Reference standards instrument for Electrical function
   - National Institute of Metrology (Thailand)
   - Electrical and Electronics Institute; NSC Accredited Calibration No.0119
   - IRPC Metrology Center, IRPC Public Co., Ltd.; NSC Accredited Calibration No.0204.

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.: CP20260142EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
18.3

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	15.8
C-weighting	23.6
Z-weighting	31.1

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	0.0	-0.2	-0.1	±1.5
1000	-0.1	0.0	-0.1	±1.0
8000	-1.1	-1.1	-0.8	±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	0.0	0.0	±2.0
125	0.1	-0.1	0.0	±1.5
250	0.1	0.0	0.0	±1.5
500	0.1	0.0	0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.1	-0.1	0.0	±2.0
4000	-0.2	-0.3	-0.1	±3.0
8000	-0.5	-0.4	-0.2	±5.0

Certificate No.: CP20260142EA

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

Certificate No.: CP20260142EA

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	59.0	0.0	±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	38.7	-0.3	±1.1
34.0	33.7	-0.3	±1.1
33.0	32.7	-0.3	±1.1
32.0	31.8	-0.2	±1.1
31.0	30.9	-0.1	±1.1
30.0	30.1	0.1	±1.1

Function : 8. Level Linearity including level range control

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

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

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

Range	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
20-80	25.0	25.3	0.3	±1.1
20-90	25.0	25.3	0.3	±1.1
20-100	25.0	25.3	0.3	±1.1
20-110	25.0	25.2	0.2	±1.1
30-120	35.0	35.0	0.0	±1.1
40-130	45.0	45.1	0.1	±1.1

Certificate No.: CP20260142EA

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	125.2	-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

Certificate No.: CP20260142EA

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 - -

สถาบันไฟฟ้าและอิเล็กทรอนิกส์
ELECTRICAL AND ELECTRONICS INSTITUTE

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

ilac-MRA

NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: CP20250138EA
Operation No.: CP2025040133

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	ACO
Model/Type:	6236 (Meter), 7052NR (Microphone), - (Preamplifier)
Serial No.:	222195 (Meter), 84163 (Microphone), - (Preamplifier)
ID No.:	NS-03-025
Customer:	C.E.M. Technology (Thailand) Co.,Ltd.
Address:	31/8 Moo 13 T.Rai Khung, A.Sam Phran, Nakorn Phatom 73210
Received Date:	21 April 2025
Calibrated Date:	28 - 29 April 2025
Issued Date:	30 April 2025
Calibrated by:	Ms. Juntaporn Kunhakom

Approved by: [redacted]

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Certificate No.: CP20250138EA

Calibration Report

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

Method of Calibration :-

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-P250028 CD20240180EA	23 March 2026 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.: CP20250138EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
18.7

2.2 Microphone replaced by the electrical input signal device

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

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

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.2	-0.1	0.2	±1.5
1000	-0.1	-0.1	-0.2	±1.0
8000	-1.6	-1.5	-0.8	±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	-0.1	-0.1	±2.0
125	0.0	-0.1	-0.1	±1.5
250	0.0	0.0	0.0	±1.5
500	0.1	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	-0.4	-0.3	-0.1	±3.0
8000	-0.3	-0.4	-0.2	±5.0

Certificate No.: CP20250138EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
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	108.9	-0.1	±1.1
114.0	113.9	-0.1	±1.1
119.0	119.0	0.0	±1.1
120.0	120.0	0.0	±1.1
121.0	121.0	0.0	±1.1

Certificate No.: CP20250138EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	68.9	-0.1	±1.1
64.0	63.8	-0.2	±1.1
59.0	58.8	-0.2	±1.1
54.0	53.8	-0.2	±1.1
49.0	48.8	-0.2	±1.1
44.0	43.8	-0.2	±1.1
39.0	38.8	-0.2	±1.1
34.0	33.8	-0.2	±1.1
33.0	32.8	-0.2	±1.1
32.0	31.8	-0.2	±1.1
31.0	31.0	0.0	±1.1
30.0	30.1	0.1	±1.1

Function : 8. Level Linearity including level range control

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

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

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

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

Certificate No.: CP20250138EA

Calibration Report

Function : 9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	116.0	0.0	±1.0
	2	98.9	-0.1	+1.0 ; -2.5
	0.25	89.9	-0.1	+1.5 ; -5.0
Slow	200	109.5	-0.1	±1.0
	2	89.8	-0.2	+1.0 ; -5.0
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	124.3	-0.1	±2.0
Negative half cycle	124.4	124.2	-0.2	±2.0

Function : 11. Overload indication

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

Function : 12. High-Level Stability

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

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

Certificate No.: CP20250138EA

Calibration Report

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (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 - -

สถาบันไฟฟ้าและอิเล็กทรอนิกส์
ELECTRICAL AND ELECTRONICS INSTITUTE

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

NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: CP20250263EA
Operation No.: CP2025090257

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	BSWA TECH
Model/Type:	BSWA 309 (Meter), MP309 (Microphone), MA231T (Preamplifier)
Serial No.:	590101 (Meter), 395615 (Microphone), 590614 (Preamplifier)
ID No.:	NS-04-002
Customer:	C.E.M. Technology (Thailand) Co.,Ltd.
Address:	31/8 Moo 13, T.Rai Khing, A.Sam Phran, Nakhon Pathom 73210
Received Date:	10 September 2025
Calibrated Date:	23 - 25 September 2025
Issued Date:	26 September 2025
Calibrated by:	Ms. Juntaporn Kunhakom

Approved by: [redacted]

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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.: CP20250263EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: BSWA TECH
Model/Type: BSWA 309 (Meter), MP309 (Microphone), MA231T (Preamplifier)
Serial No.: 590101 (Meter), 395615 (Microphone), 590614 (Preamplifier)
ID No.: NS-04-002
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa
Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

	Instrument	Model	Serial No.	Cert. No.	Due Date
1)	Standard microphone	4180	2661000	AA-1011-25	24 June 2026
2)	Arbitrary Function Generator	AFG2021	C010063	CK20250037EA	25 June 2026
3)	Programmable Attenuator	PA5	2755	EF-0035-24	28 October 2025
4)	6.5 Digit precision multimeter	8846A	9610014	CB20240215EA	26 November 2025
5)	Pressure humidity and Temperature Transmitter	PTU301	F0640003	CL1-P250034 CD20250096EA	10 April 2026 29 March 2026
6)	Performance Audio Analyzer	U8903B	MY56510003	CB20250030EA CK20250065EA	13 February 2026 23 September 2026

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).; ILAC Policy, Item 2 (1) No.ILAC-P10:07/2020.
   Reference standards instrument for Electrical function
   - National Institute of Metrology (Thailand)
   - Electrical and Electronics Institute; NSC Accredited Calibration No.0119
   - IRPC Metrology Center, IRPC Public Co., Ltd.; NSC Accredited Calibration No.0204.

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.: CP20250263EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
18.6

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	12.0
C-weighting	15.0
Z-weighting	22.8

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	0.4	0.3	0.3	±1.5
1000	-0.1	-0.1	-0.1	±1.0
8000	-1.0	-1.1	-0.6	±5.0

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	-0.1	0.0	±2.0
125	0.0	-0.1	0.0	±1.5
250	0.0	-0.1	0.0	±1.5
500	0.0	-0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.1	±2.0
4000	-0.1	-0.1	-0.1	±3.0
8000	-0.6	-0.5	0.0	±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.: CP20250263EA

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

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	34.0	0.0	±1.1

Certificate No.: CP20250263EA

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	29.1	0.1	±1.1
28.0	28.1	0.1	±1.1
27.0	27.1	0.1	±1.1
26.0	26.2	0.2	±1.1
25.0	25.2	0.2	±1.1
24.0	24.3	0.3	±1.1
23.0	23.4	0.4	±1.1
22.0	22.5	0.5	±1.1
21.0	21.6	0.6	±1.1
20.0	20.8	0.8	±1.1
19.0	20.0	1.0	±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	131.0	0.0	±1.0
	2	114.0	0.0	+1.0 ; -2.5
	0.25	104.9	-0.1	+1.5 ; -5.0
Slow	200	124.6	0.0	±1.0
	2	105.0	0.0	+1.0 ; -5.0
SEL	200	125.0	0.0	±1.0
	2	105.0	0.0	+1.0 ; -2.5
	0.25	95.9	-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	130.4	130.0	-0.4	±3.0
Positive half cycle	129.4	129.2	-0.2	±2.0
Negative half cycle	129.4	129.2	-0.2	±2.0

Function : 10. Overload indication

Measured value (dB)		Deviated value	Acceptance limits
Positive one-half cycle	Negative one-half cycle	(dB)	(dB)
137.5	137.4	-0.1	±1.5

Certificate No.: CP20250263EA

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	134.0	134.0	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 IEC61672-3:2013 Class 2.
4. The coverage factor k = 2.00

- - End of Report - -

สถาบันไฟฟ้าและอิเล็กทรอนิกส์
ELECTRICAL AND ELECTRONICS INSTITUTE

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

ilac-MRA

NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: CP20250264EA
Operation No.: CP2025090258

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 Khing, A.Sam Phran, Nakhon Pathom 73210
Received Date:	10 September 2025
Calibrated Date:	23 - 25 September 2025
Issued Date:	26 September 2025
Calibrated by:	Ms. Juntaporn Kunhakom

Approved by [redacted]

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.: CP20250264EA

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	2661000	AA-1011-25	24 June 2026
2)	Arbitrary Function Generator	AFG2021	C010063	CK20250037EA	25 June 2026
3)	Programmable Attenuator	PA5	2755	EF-0035-24	28 October 2025
4)	6.5 Digit precision multimeter	8846A	9610014	CB20240215EA	26 November 2025
5)	Pressure humidity and Temperature Transmitter	PTU301	F0640003	CL1-P250034 CD20250096EA	10 April 2026 29 March 2026
6)	Performance Audio Analyzer	U8903B	MY56510003	CB20250030EA CK20250065EA	13 February 2026 23 September 2026

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).; ILAC Policy, Item 2 (1) No.ILAC-P10:07/2020.

   Reference standards instrument for Electrical function
   - National Institute of Metrology (Thailand)
   - Electrical and Electronics Institute; NSC Accredited Calibration No.0119
   - IRPC Metrology Center, IRPC Public Co., Ltd.; NSC Accredited Calibration No.0204.

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.: CP20250264EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
18.9

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	13.3
C-weighting	18.9
Z-weighting	26.7

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	0.0	-0.1	0.0	±1.5
1000	0.1	0.1	0.1	±1.0
8000	0.5	0.5	1.0	±5.0

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.0	0.0	±2.0
125	0.0	-0.1	0.0	±1.5
250	0.0	-0.1	0.0	±1.5
500	0.0	-0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	-0.1	±2.0
4000	-0.1	-0.1	0.0	±3.0
8000	-0.6	-0.5	0.0	±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.: CP20250264EA

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
136.0	136.0	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	34.0	0.0	±1.1

Certificate No.: CP20250264EA

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	29.1	0.1	±1.1
28.0	28.1	0.1	±1.1
27.0	27.1	0.1	±1.1
26.0	26.2	0.2	±1.1
25.0	25.3	0.3	±1.1
24.0	24.4	0.4	±1.1
23.0	23.5	0.5	±1.1
22.0	22.6	0.6	±1.1
21.0	21.8	0.8	±1.1
20.0	21.0	1.0	±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	132.1	-0.3	±3.0
Positive half cycle	131.4	131.2	-0.2	±2.0
Negative half cycle	131.4	131.2	-0.2	±2.0

Function : 10. Overload indication

Measured value (dB)		Deviated value	Acceptance limits
Positive one-half cycle	Negative one-half cycle	(dB)	(dB)
138.8	138.8	0.0	±1.5

Certificate No.: CP20250264EA

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 IEC61672-3:2013 Class 2.
4. The coverage factor k = 2.00

- - End of Report - -

SMART TECH CALIBRATION & SERVICES CO., LTD.
14/506 MOO 3, RANGSIT-NAKHON NAYOK ROAD, LAM PHAK KUT,
THANYABURI, PATHUM THANI 12110, THAILAND
Tel. +662-114-3148 Email : stcal.md@gmail.com Website : stc-cal.com

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY AC-3093

Certificate of Calibration

Certificate No. STCR-2510216-11
Work Order No. STCR-2510216

Customer Name	:	CEM Technology Thailand Co., Ltd. 31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210
Equipment Name	:	Sound Level Meter
Manufacturer	:	Pulsar
Model	:	44
Serial Number	:	PN2366
Control Number	:	NS-08-005
Received Date	:	Oct 30, 2025
Calibration Date	:	Oct 31, 2025
Recommended Due Date	:	Oct 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 : Nov 9, 2025 **Approved by :** [redacted]

Calibrated by : Y. Perapon

@smarttechcal

Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2510216-11

Standards Equipment Used

Equipment Name	Serial No.	Certificate No.	Due Date	Traceability to
Sound Calibrator	N975185	5523631032296324	Oct 31, 2026	MP-TH

Traceability

This calibration is traceable to the International System of Unit via :

- MP-TH : Micro Precision Calibration Laboratory (Thailand) Co., Ltd.

STC TM

Calibration Report

Smart Tech Calibration & Services Co., Ltd.

UUC Range : (20 to 140) 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	94.07 dB	93.0 dB	93.9 dB	0.17 dB	0.40 dB
	114.06 dB	113.0 dB	113.9 dB	0.16 dB	0.40 dB
SLOW	94.07 dB	93.0 dB	93.9 dB	0.17 dB	0.40 dB
	114.06 dB	113.0 dB	113.9 dB	0.16 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -

STC TM

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ELECTRICAL AND ELECTRONICS INSTITUTE

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

NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: CP20260087EA
Operation No.: CP2026020050

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	SCARLET TECH
Model/Type:	ST11D (Meter), AWA14425 (Microphone), - (Preamplifier)
Serial No.:	820891 (Meter), 60237 (Microphone), - (Preamplifier)
ID No.:	NS-12-002
Customer:	C.E.M. Technology (Thailand) Co.,Ltd.
Address:	31/8 Moo 13 T.Rai Khung, A.Sam Phran, Nakorn Phatom 73210
Received Date:	9 February 2026
Calibrated Date:	10 - 11 March 2026
Issued Date:	13 March 2026
Calibrated by:	Ms. Juntaporn Kunhakom

Approved by: [redacted]

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.: CP20260087EA

Calibration Report

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

Method of Calibration :-

IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

	Instrument	Model	Serial No.	Cert. No.	Due Date
1)	Standard microphone	4180	2661000	AA-1011-25	24 June 2026
2)	Arbitrary Function Generator	AFG2021	C010063	CK20250037EA	25 June 2026
3)	Programmable Attenuator	PA5	2913	EF-0026-25	9 June 2026
4)	6.5 Digit precision multimeter	8846A	9609027	CB20250141EA	20 August 2026
5)	Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P250028 CD20250221EA	23 March 2026 8 August 2026
6)	Pressure humidity and Temperature Transmitter	PTU301	F0640003	CL1-P250034 CD20250096EA	10 April 2026 29 March 2026
7)	Performance Audio Analyzer	U8903B	MY56510003	CB20260043EA CK20250065EA	10 March 2027 23 September 2026

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).; ILAC Policy, Item 2 (1) No.ILAC-P10:07/2020.
   Reference standards instrument for Electrical function
   - National Institute of Metrology (Thailand)
   - Electrical and Electronics Institute; NSC Accredited Calibration No.0119
   - IRPC Metrology Center, IRPC Public Co., Ltd.; NSC Accredited Calibration No.0204.

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.: CP20260087EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
15.5

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	5.8
C-weighting	6.9
Z-weighting	13.0

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	0.2	0.2	±1.0
1000	0.1	0.1	0.1	±0.7
8000	-0.9	-1.6	-1.5	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

Certificate No.: CP20260087EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

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

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

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

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8

Certificate No.: CP20260087EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	33.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8
28.0	27.8	-0.2	±0.8
27.0	26.8	-0.2	±0.8
26.0	25.8	-0.2	±0.8
25.0	24.7	-0.3	±0.8
24.0	23.7	-0.3	±0.8
23.0	22.7	-0.3	±0.8
22.0	21.6	-0.4	±0.8
21.0	20.5	-0.5	±0.8
20.0	19.4	-0.6	±0.8
19.0	18.3	-0.7	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	119.0	0.0	+1.0 ; -1.5
	0.25	109.7	-0.3	+1.0 ; -3.0
Slow	200	129.6	0.0	±0.5
	2	110.0	0.0	+1.0 ; -3.0
SEL	200	130.1	0.1	±0.5
	2	110.1	0.1	+1.0 ; -1.5
	0.25	101.0	0.0	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.9	-0.5	±2.0
Positive half cycle	134.4	134.1	-0.3	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0

Certificate No.: CP20260087EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
142.4	142.4	0.0	±1.5

Function : 11. High-Level Stability

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

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

Uncertainty of measurement

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

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

- - End of Report - -

สถาบันไฟฟ้าและอิเล็กทรอนิกส์
ELECTRICAL AND ELECTRONICS INSTITUTE

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

ilac-MRA

NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: CP20250053EA
Operation No.: CP2025020040

Certificate of Calibration

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

Approved by: [redacted]

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Certificate No.: CP20250053EA

Calibration Report

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

Method of Calibration :-

IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

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

2. This result of calibration was found accurate as shown on date and place of calibration only.
3. This certification is traceable to the international system of unit maintained at :-
   Reference standards instrument for Acoustic function
   - National Institute of Metrology (Thailand)
   - Electrical and Electronics Institute; NSC Accredited Calibration No.0119

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

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

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

Certificate No.: CP20250053EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
15.5

2.2 Microphone replaced by the electrical input signal device

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

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

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

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

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

Certificate No.: CP20250053EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

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

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

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

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8

Certificate No.: CP20250053EA

Calibration Report

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

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	33.8	-0.2	±0.8
29.0	28.8	-0.2	±0.8
28.0	27.8	-0.2	±0.8
27.0	26.8	-0.2	±0.8
26.0	25.8	-0.2	±0.8
25.0	24.7	-0.3	±0.8
24.0	23.7	-0.3	±0.8
23.0	22.7	-0.3	±0.8
22.0	21.5	-0.5	±0.8
21.0	20.5	-0.5	±0.8
20.0	19.3	-0.7	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.9	-0.1	+1.0 ; -1.5
	0.25	109.8	-0.2	+1.0 ; -3.0
Slow	200	129.6	0.0	±0.5
	2	109.9	-0.1	+1.0 ; -3.0
SEL	200	130.0	0.0	±0.5
	2	110.0	0.0	+1.0 ; -1.5
	0.25	100.9	-0.1	+1.0 ; -3.0

Function : 9. Peak C sound level

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

Certificate No.: CP20250053EA

Calibration Report

Function : 10. Overload indication

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

Function : 11. High-Level Stability

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

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

Uncertainty of measurement

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

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

- - End of Report - -

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ELECTRICAL AND ELECTRONICS INSTITUTE

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

NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: CP20260088EA
Operation No.: CP2026020051

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	SCARLET TECH
Model/Type:	ST11D (Meter), AWA14425 (Microphone), - (Preamplifier)
Serial No.:	820892 (Meter), 57258 (Microphone), - (Preamplifier)
ID No.:	NS-12-003
Customer:	C.E.M. Technology (Thailand) Co.,Ltd.
Address:	31/8 Moo 13 T.Rai Khung, A.Sam Phran, Nakorn Phatom 73210
Received Date:	9 February 2026
Calibrated Date:	10 - 11 March 2026
Issued Date:	13 March 2026
Calibrated by:	Ms. Juntaporn Kunhakom

Approved by [redacted]

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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.: CP20260088EA

Calibration Report

Equipment:	Sound Level Meter
Manufacturer:	SCARLET TECH
Model/Type:	ST11D (Meter), AWA14425 (Microphone), - (Preamplifier)
Serial No.:	820892 (Meter), 57258 (Microphone), - (Preamplifier)
ID No.:	NS-12-003
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	2661000	AA-1011-25	24 June 2026
2)	Arbitrary Function Generator	AFG2021	C010063	CK20250037EA	25 June 2026
3)	Programmable Attenuator	PA5	2913	EF-0026-25	9 June 2026
4)	6.5 Digit precision multimeter	8846A	9609027	CB20250141EA	20 August 2026
5)	Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P250028 CD20250221EA	23 March 2026 8 August 2026
6)	Pressure humidity and Temperature Transmitter	PTU301	F0640003	CL1-P250034 CD20250096EA	10 April 2026 29 March 2026
7)	Performance Audio Analyzer	U8903B	MY56510003	CB20260043EA CK20250065EA	10 March 2027 23 September 2026

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).; ILAC Policy, Item 2 (1) No.ILAC-P10:07/2020.
   Reference standards instrument for Electrical function
   - National Institute of Metrology (Thailand)
   - Electrical and Electronics Institute; NSC Accredited Calibration No.0119
   - IRPC Metrology Center, IRPC Public Co., Ltd.; NSC Accredited Calibration No.0204.

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.: CP20260088EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
15.3

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	7.4
C-weighting	7.7
Z-weighting	14.6

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	0.3	0.1	0.1	±1.0
1000	-0.1	-0.1	-0.1	±0.7
8000	-1.0	-1.0	-1.0	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	-0.1	0.0	±1.0
125	0.0	-0.1	0.0	±1.0
250	0.0	-0.2	0.0	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	-0.1	0.0	±1.0
4000	0.1	0.0	0.0	±1.0
8000	-0.1	-0.1	-0.1	+1.5; -2.5
16000	-5.3	-5.3	0.0	+2.5; -16.0

Certificate No.: CP20260088EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

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

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

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

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8

Certificate No.: CP20260088EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	33.8	-0.2	±0.8
29.0	28.8	-0.2	±0.8
28.0	27.8	-0.2	±0.8
27.0	26.8	-0.2	±0.8
26.0	25.8	-0.2	±0.8
25.0	24.7	-0.3	±0.8
24.0	23.7	-0.3	±0.8
23.0	22.7	-0.3	±0.8
22.0	21.6	-0.4	±0.8
21.0	20.5	-0.5	±0.8
20.0	19.4	-0.6	±0.8
19.0	18.3	-0.7	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	119.0	0.0	+1.0 ; -1.5
	0.25	109.6	-0.4	+1.0 ; -3.0
Slow	200	129.6	0.0	±0.5
	2	110.0	0.0	+1.0 ; -3.0
SEL	200	130.1	0.1	±0.5
	2	110.1	0.1	+1.0 ; -1.5
	0.25	101.0	0.0	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	135.0	-0.4	±2.0
Positive half cycle	134.4	134.2	-0.2	±1.0
Negative half cycle	134.4	134.2	-0.2	±1.0

Certificate No.: CP20260088EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
142.5	142.8	0.3	±1.5

Function : 11. High-Level Stability

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

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

Uncertainty of measurement

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

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

- - End of Report - -

สถาบันไฟฟ้าและอิเล็กทรอนิกส์
ELECTRICAL AND ELECTRONICS INSTITUTE

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

NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: CP20260090EA
Operation No.: CP2026020053

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	SCARLET TECH
Model/Type:	ST11D (Meter), AWA14425 (Microphone), - (Preamplifier)
Serial No.:	821487 (Meter), 52240 (Microphone), - (Preamplifier)
ID No.:	NS-12-005
Customer:	C.E.M. Technology (Thailand) Co.,Ltd.
Address:	31/8 Moo 13 T.Rai Khung, A.Sam Phran, Nakorn Phatom 73210
Received Date:	9 February 2026
Calibrated Date:	11 - 12 March 2026
Issued Date:	13 March 2026
Calibrated by:	Ms. Juntaporn Kunhakom

Approved by: [redacted]

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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.: CP20260090EA

Calibration Report

Equipment:	Sound Level Meter
Manufacturer:	SCARLET TECH
Model/Type:	ST11D (Meter), AWA14425 (Microphone), - (Preamplifier)
Serial No.:	821487 (Meter), 52240 (Microphone), - (Preamplifier)
ID No.:	NS-12-005
Ambient Temperature:	(23 ± 2) °C
Relative Humidity:	(50 ± 15) %
Pressure:	(101.3 ± 1.5) kPa

Method of Calibration :-

IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

	Instrument	Model	Serial No.	Cert. No.	Due Date
1)	Standard microphone	4180	2661000	AA-1011-25	24 June 2026
2)	Arbitrary Function Generator	AFG2021	C010063	CK20250037EA	25 June 2026
3)	Programmable Attenuator	PA5	2913	EF-0026-25	9 June 2026
4)	6.5 Digit precision multimeter	8846A	9609027	CB20250141EA	20 August 2026
5)	Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P250028 CD20250221EA	23 March 2026 8 August 2026
6)	Pressure humidity and Temperature Transmitter	PTU301	F0640003	CL1-P250034 CD20250096EA	10 April 2026 29 March 2026
7)	Performance Audio Analyzer	U8903B	MY56510003	CB20260043EA CK20250065EA	10 March 2027 23 September 2026

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).; ILAC Policy, Item 2 (1) No.ILAC-P10:07/2020.
   Reference standards instrument for Electrical function
   - National Institute of Metrology (Thailand)
   - Electrical and Electronics Institute; NSC Accredited Calibration No.0119
   - IRPC Metrology Center, IRPC Public Co., Ltd.; NSC Accredited Calibration No.0204.

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.: CP20260090EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
16.2

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	9.2
C-weighting	9.3
Z-weighting	16.9

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	0.2	0.2	±1.0
1000	0.0	0.0	0.0	±0.7
8000	-1.0	-0.9	-1.0	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.1	0.1	0.1	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.1	0.3	±1.0
4000	0.1	0.0	0.0	±1.0
8000	-0.1	0.0	0.1	+1.5; -2.5
16000	-5.2	-5.2	-0.1	+2.5; -16.0

Certificate No.: CP20260090EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

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

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

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

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8

Certificate No.: CP20260090EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	33.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8
28.0	27.8	-0.2	±0.8
27.0	26.8	-0.2	±0.8
26.0	25.8	-0.2	±0.8
25.0	24.8	-0.2	±0.8
24.0	23.8	-0.2	±0.8
23.0	22.8	-0.2	±0.8
22.0	21.8	-0.2	±0.8
21.0	20.7	-0.3	±0.8
20.0	19.6	-0.4	±0.8
19.0	18.5	-0.5	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0 ; -1.5
	0.25	109.8	-0.2	+1.0 ; -3.0
Slow	200	129.6	0.0	±0.5
	2	110.0	0.0	+1.0 ; -3.0
SEL	200	130.0	0.0	±0.5
	2	110.0	0.0	+1.0 ; -1.5
	0.25	100.9	-0.1	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	135.0	-0.4	±2.0
Positive half cycle	134.4	134.1	-0.3	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0

Certificate No.: CP20260090EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
143.5	143.5	0.0	±1.5

Function : 11. High-Level Stability

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

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

Uncertainty of measurement

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

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

- - End of Report - -

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

NSC-TISI-TIS 17025
CALIBRATION 0119

Certificate No.: CP20250255EA
Operation No.: CP2025080248

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	SCARLET TECH
Model/Type:	ST11D (Meter), AWA14425 (Microphone), - (Preamplifier)
Serial No.:	821488 (Meter), 55133 (Microphone), - (Preamplifier)
ID No.:	NS-12-006
Customer:	C.E.M. Technology (Thailand) Co.,Ltd.
Address:	31/8 Moo 13, T.Rai Khing, A.Sam Phran, Nakhon Pathom 73210
Received Date:	26 August 2025
Calibrated Date:	2 - 3 September 2025
Issued Date:	4 September 2025
Calibrated by:	Ms. Juntaporn Kunhakom

Approved by [redacted]

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.: CP20250255EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: SCARLET TECH
Model/Type: ST11D (Meter), AWA14425 (Microphone), - (Preamplifier)
Serial No.: 821488 (Meter), 55133 (Microphone), - (Preamplifier)
ID No.: NS-12-006
Ambient Temperature: (23 ± 2) ºC
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa
Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

	Instrument	Model	Serial No.	Cert. No.	Due Date
1)	Standard microphone	4180	2661000	AA-1011-25	24 June 2026
2)	Arbitrary Function Generator	AFG2021	C010063	CK20250037EA	25 June 2026
3)	Programmable Attenuator	PA5	2755	EF-0035-24	28 October 2025
4)	6.5 Digit precision multimeter	8846A	9610014	CB20240215EA	26 November 2025
5)	Pressure humidity and Temperature Transmitter	PTU301	F0640003	CL1-P250034 CD20250096EA	10 April 2026 29 March 2026
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)
   Reference standards instrument for Electrical function
   - National Institute of Metrology (Thailand)
   - Electrical and Electronics Institute; NSC Accredited Calibration No.0119
   - IRPC Metrology Center, IRPC Public Co., Ltd.; NSC Accredited Calibration No.0204.

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.: CP20250255EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
15.9

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	8.0
C-weighting	10.0
Z-weighting	16.0

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	0.6	0.6	0.5	±1.0
1000	-0.1	-0.1	-0.1	±0.7
8000	-0.3	-0.2	-0.3	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

Certificate No.: CP20250255EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

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

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

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

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8

Certificate No.: CP20250255EA

Calibration Report

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

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	33.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8
28.0	27.9	-0.1	±0.8
27.0	26.9	-0.1	±0.8
26.0	25.8	-0.2	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	135.9	-0.1	±0.5
	2	118.7	-0.3	+1.0 ; -1.5
	0.25	109.7	-0.3	+1.0 ; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0 ; -3.0
SEL	200	130.0	0.0	±0.5
	2	110.0	0.0	+1.0 ; -1.5
	0.25	100.8	-0.2	+1.0 ; -3.0

Function : 9. Peak C sound level

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

Certificate No.: CP20250255EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
142.9	143.3	0.4	±1.5

Function : 11. High-Level Stability

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

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

Uncertainty of measurement

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

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

- - End of Report - -

SCARLET | TECH

Calibration Laboratory
3519

CERTIFICATE OF CALIBRATION

NO. 20250104123

Name of Product:	Sound Level Meter
Model:	ST-12D
Serial Number:	10351425
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2025-03-04
Due Date:	2026-03-03

Cali [redacted]

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

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-80567

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

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

4. Measuring up limit: 140 dBA

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

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-69.6	-14.3	+0.1	1000	0.0	-0.1	0.0
20	-50.3	-6.2	+0.1	2000	+1.3	-0.1	0.0
31.5	-39.5	-3.0	0.0	4000	+1.0	-0.8	0.0
63	-26.2	-0.8	0.0	8000	-1.2	-3.1	0.0
125	-16.2	-0.2	0.0	12500	-6.0	-7.9	-0.9
250	-8.7	0.0	0.0	16000	-12.0	-13.9	0.0
500	-3.2	0.0	0.0	20000	-23.3	-24.4	0.0

6. Self-generated noise

Microphone replaced by electrical input signal device

10.1 dB(A)	10.4 dB(C)	16.2 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease（dB/s）	33.7
Rate of the S weighting decrease（dB/s）	3.9
Deviation of F&S	0.0

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

Reference sound level 90.0 dB

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

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

Max error at 10dB steps below reference sound level 0.2 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.2 dB

9. Tone burst response（A Weighting）：

Single Toneburst duration /ms	Toneburst response /dB			
	L_{AFmax}-L_A	L_{ASmax}-L_A	L_{AE}-L_A	L_{AeqT}-L_A
500	-0.1	-4.1	-3.0	-7.0
200	-1.0	-7.5	-7.0	-7.0
2	-18.4	-27.1	-27.0	-7.1
0.25	-27.4	/	-36.3	-7.0

10. Peak C sound level （500Hz）：

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

11. Overload indication： Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

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

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.1	0.1
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.9	0.0
L95	75.0	74.9	0.1

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

13. Part of sound exposure: Pass

14. Data logging function: Pass

15. SD card & wave recording function: Pass

Environment conditions:

Air temperature: 23 °C

Relative humidity: 80 %

Static pressure: 102.0 kPa

Reference equipment used in the calibration:

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

Test specifications:

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

References:

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

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Calibration Laboratory
3519

CERTIFICATE OF CALIBRATION

NO. 20250429188

Name of Product:	Sound Level Meter
Model:	ST-21D
Serial Number:	821088
Specification:	Class 2
Conclusion:	Pass
Date of calibration:	2025-05-08
Due Date:	2026-05-07

Calibrated by [redacted]

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

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14421A-000643

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

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

4. Measuring up limit: 138 dBA

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

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
20	-50.4	-6.1	-0.1	**1000**	0.1	0.0	0.1
31.5	-39.5	-3.1	0.0	**2000**	1.3	-0.1	0.0
63	-26.2	-0.8	0.1	**4000**	1.3	-0.6	0.1
125	-16.1	-0.1	0.1	**8000**	-1.1	-3.1	0.1
250	-8.6	0.0	0.0	**12500**	-11.0	-12.9	0.1
500	-3.2	0.1	0.1	**/**	/	/	/

6. Self-generated noise

Microphone replaced by electrical input signal device

25.8 dB(A)	27.5 dB(C)	37.9 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease（dB/s）	35.0
Rate of the S weighting decrease（dB/s）	4.3
Deviation of F&S	-0.1

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

Reference sound level 90.0 dB

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

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

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

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

9. Tone burst response（A Weighting）：

Single Toneburst duration /ms	Toneburst response /dB			
	L_{AFmax}-L_A	L_{ASmax}-L_A	L_{AE}-L_A	L_{AeqT}-L_A
500	0.0	-4.0	-2.9	-6.9
200	-1.0	-16.9	-6.9	-6.9
2	-17.9	-26.9	-26.9	-6.9
0.25	-27.1	/	-36.0	-7.0

10. Peak C sound level （500Hz）：

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

11. Overload indication： Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 123.0 dB

Sweep amplitude: 40 dB

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

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	113.3	113.4	-0.1
L5	121.0	121.0	0.0
L10	119.0	119.0	0.0
L50	103.0	103.0	0.0
L90	87.1	87.0	0.1
L95	85.1	85.0	0.1

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

Environment conditions:

Air temperature: 25 °C

Relative humidity: 50 %

Static pressure: 102.0 kPa

References:

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

SCARLET | TECH

Calibration Laboratory
3519

CERTIFICATE OF CALIBRATION

NO. 20250429190

Name of Product:	Sound Level Meter
Model:	ST-21D
Serial Number:	821090
Specification:	Class 2
Conclusion:	Pass
Date of calibration:	2025-05-08
Due Date:	2026-05-07

Calibra [redacted]

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

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14421A-001016

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

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

4. Measuring up limit: 138 dBA

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

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
20	-50.4	-6.3	-0.2	1000	0.1	0.0	0.1
31.5	-39.4	-3.1	-0.1	2000	1.4	-0.1	0.0
63	-26.2	-0.8	0.0	4000	1.3	-0.6	0.1
125	-16.1	-0.2	0.0	8000	-1.2	-3.2	0.0
250	-8.7	0.0	0.0	12500	-11.0	-13.0	0.0
500	-3.2	0.0	0.0	/	/	/	/

6. Self-generated noise

Microphone replaced by electrical input signal device

27.2 dB(A)	28.7 dB(C)	37.8 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease（dB/s）	35.1
Rate of the S weighting decrease（dB/s）	4.3
Deviation of F&S	-0.1

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

Reference sound level 90.0 dB

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

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

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

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

9. Tone burst response（A Weighting）：

Single Toneburst duration /ms	Toneburst response /dB			
	L_{AFmax}-L_A	L_{ASmax}-L_A	L_{AE}-L_A	L_{AeqT}-L_A
500	0.0	-4.0	-2.9	-6.9
200	-1.0	-16.9	-6.9	-6.9
2	-17.9	-26.9	-26.9	-6.9
0.25	-27.0	/	-36.0	-7.0

10. Peak C sound level （500Hz）：

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

11. Overload indication： Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 123.0 dB

Sweep amplitude: 40 dB

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

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	113.3	113.4	-0.1
L5	121.0	121.0	0.0
L10	119.0	119.0	0.0
L50	103.0	103.0	0.0
L90	87.1	87.0	0.1
L95	85.1	85.0	0.1

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

Environment conditions:

Air temperature: 25 °C

Relative humidity: 50 %

Static pressure: 102.0 kPa

References:

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

เอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพอากาศในบรรยากาศ

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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date	:	29-Jul-25		Certificate No.	: 0725-001
				Page	: 1/1

Analyzer Instruments

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

Environmental

Temperature	:	25.2	°C
Humidity	:	43.3	%RH

Calibration System

Calibrator Units

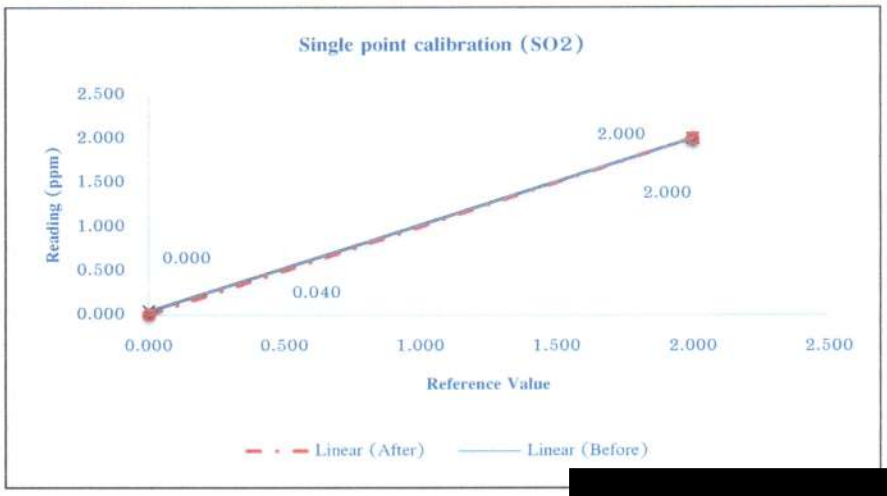
Gas Calibration	:	Thermo Environmental		Zero Air Generator	: API
Model	:	146C		Model	: 701
Serial No.	:	514811458		Serial No.	: 179

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	0.040	0.000	0.04	2.00	2.000	0.00
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date	:	18-Aug-25		Certificate No.	: 0825-003
				Page	: 1/1

Analyzer Instruments

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

Environmental

Temperature	:	26.4	˚C
Humidity	:	45.2	%RH

Calibration System

Calibrator Units

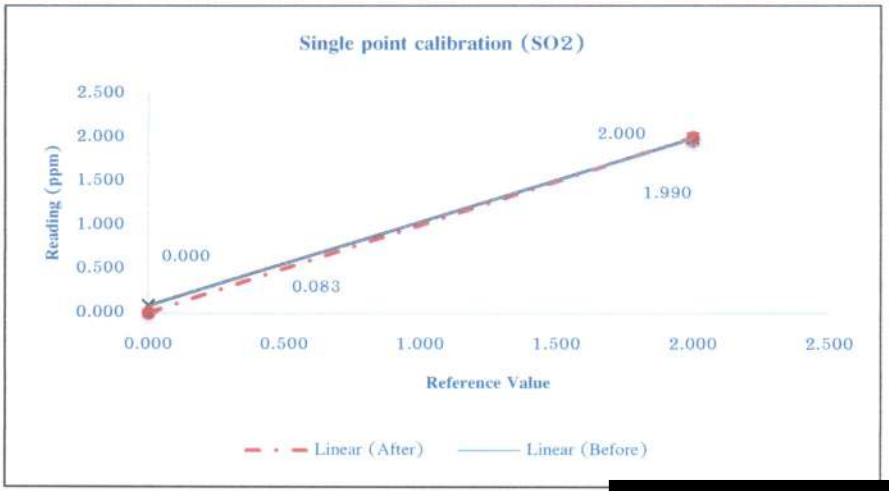
Gas Calibration	:	Thermo Environmental		Zero Air Generator	: API
Model	:	146C		Model	: 701
Serial No.	:	514811458		Serial No.	: 179

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	0.083	0.000	0.08	1.99	2.000	-0.50
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrate

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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date	:	18-Aug-25		Certificate No.	: 0825-004
				Page	: 1/1

Analyzer Instruments

Analyzer Type	:	SO2 Analyzer		Manufacturer	: Thermo Environmental
Model	:	43C		Serial No.	: 43C-77419-385

Environmental

Temperature	:	24.5	˚C
Humidity	:	35.9	%RH

Calibration System

Calibrator Units

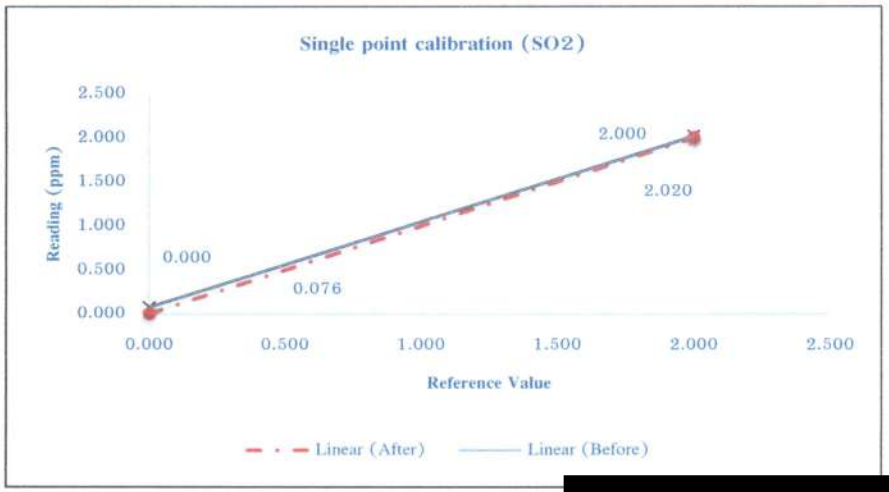
Gas Calibration	:	Thermo Environmental		Zero Air Generator	: API
Model	:	146C		Model	: 701
Serial No.	:	514811458		Serial No.	: 179

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						
SO2	0.076	0.000	0.08	2.02	2.000	1.00
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



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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

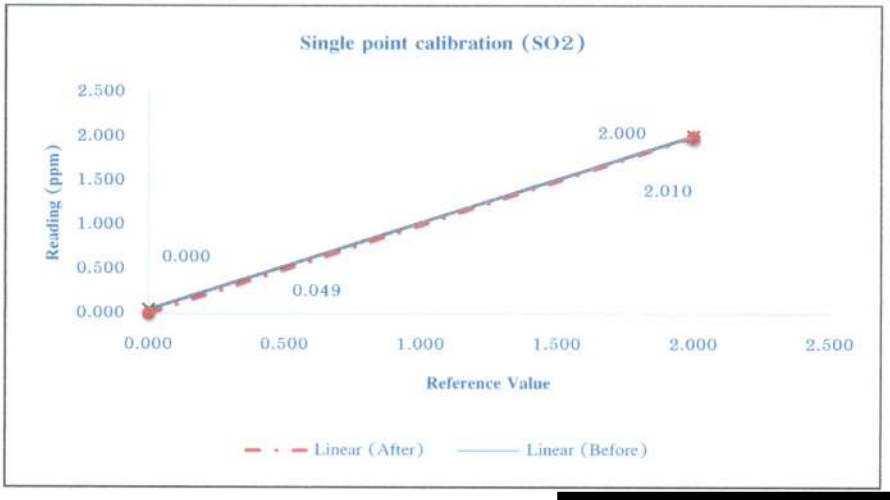
Gas Calibration	:	Thermo Environmental		Zero Air Generator	: API
Model	:	146C		Model	: 701
Serial No.	:	514811458		Serial No.	: 179

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



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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date	:	20-Aug-25		Certificate No.	: 0825-006
				Page	: 1/1

Analyzer Instruments

Analyzer Type	:	NO/NO2/NOx Analyzer	Manufacturer	:	Thermo Environmental
Model	:	42C	Serial No.	:	66193-351

Environmental

Temperature	:	26.3	°C
Humidity	:	45.6	%RH

Calibration System

Calibrator Units

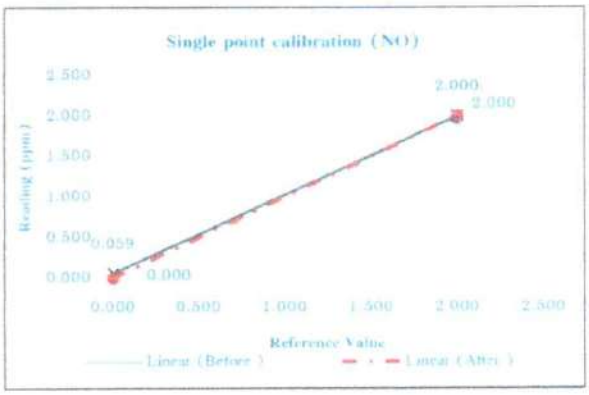
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

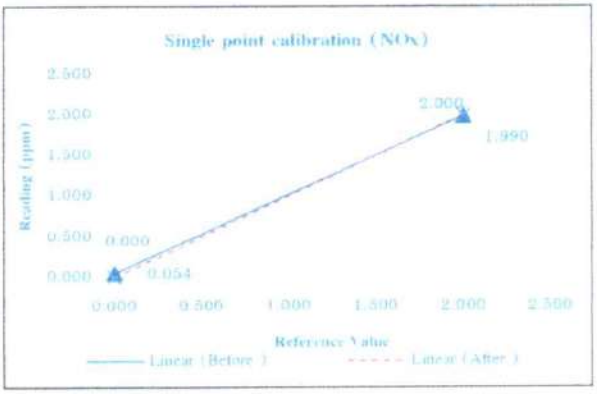
Standard Gas

NO Conc.	:	2	ppm	Cylinder No.	: 307199
SO2	:	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	0.059	0.000	0.06	2.00	2.00	0.00
NOx	0.054	0.000	0.05	1.99	2.00	-0.50
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





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Certificate of Analyzer Performance Testing

Calibrated Date : 1-Mar-25

Certificate No. : 0325-005

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Analyzer Instruments

Analyzer Type : NO/NO2/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

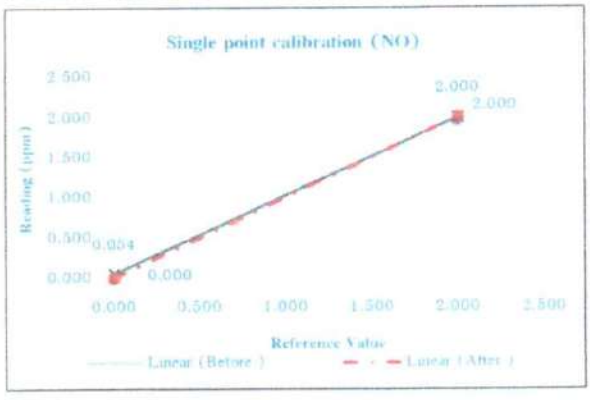
SO2 : 2 ppm

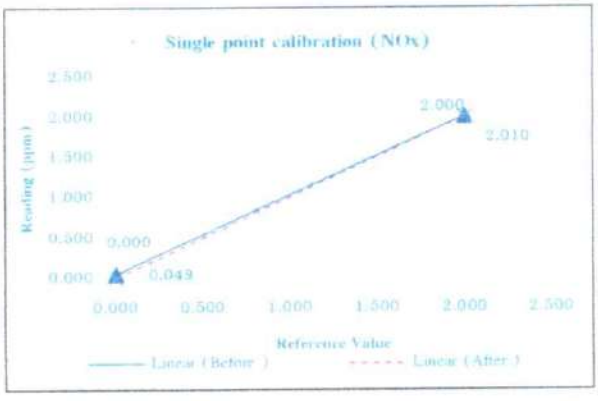
Expire Date : 10-Oct-25

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





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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date : 29-Jul-25

Certificate No. : 0725-002

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Analyzer Instruments

Analyzer Type : NO/NO2/NOx Analyzer

Manufacturer : Thermo Environmental

Model : 42C

Serial No. : 508011077

Environmental

Temperature : 26.1 °C

Humidity : 46.2 %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

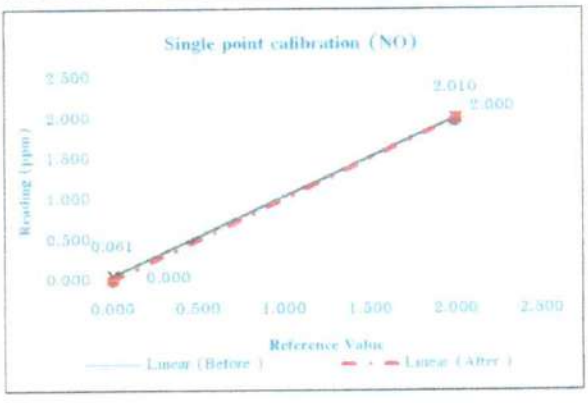
SO2 : 2 ppm

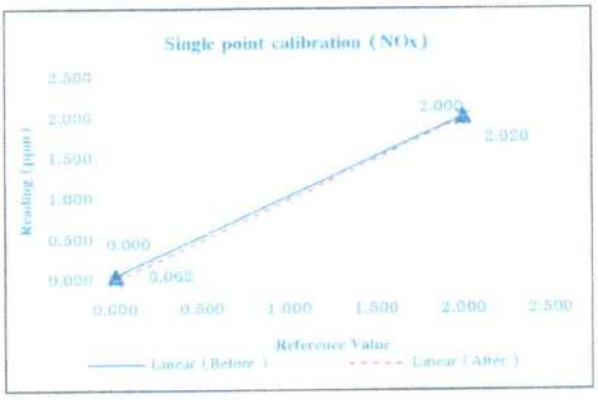
Expire Date : 10-Oct-25

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	0.061	0.000	0.06	2.01	2.00	0.50
NOx	0.062	0.000	0.06	2.02	2.00	1.00
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





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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date	:	1-Aug-25		Certificate No.	: 0825-015
				Page	: 1/1

Analyzer Instruments

Analyzer Type	:	NO/NO2/NOx Analyzer		Manufacturer	: Thermo Environmental
Model	:	42C		Serial No.	: 59406-323

Environmental

Temperature	:	24.8	℃
Humidity	:	45.9	%RH

Calibration System

Calibrator Units

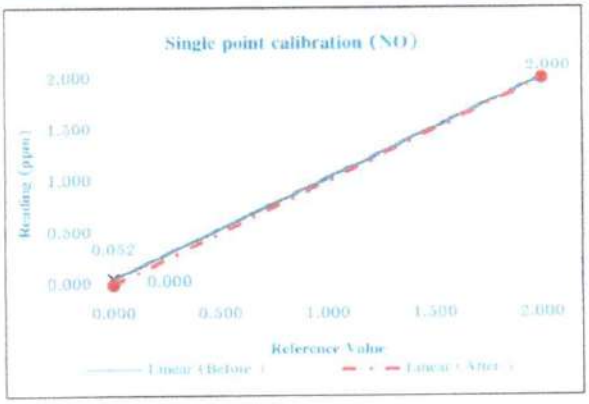
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Model	:	146C		Model	: 701
Serial No.	:	514811458		Serial No.	: 179

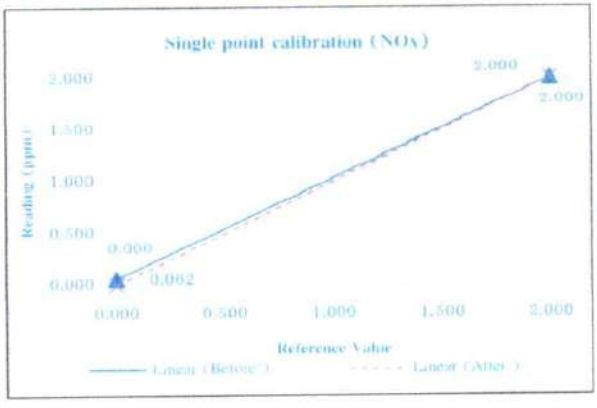
Standard Gas

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	0.052	0.000	0.05	2.01	2.00	0.50
NOx	0.062	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





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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date	:	18-Aug-25		Certificate No.	: 0825-005
				Page	: 1/1

Analyzer Instruments

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

Environmental

Temperature	:	26.5	℃
Humidity	:	36.4	%RH

Calibration System

Calibrator Units

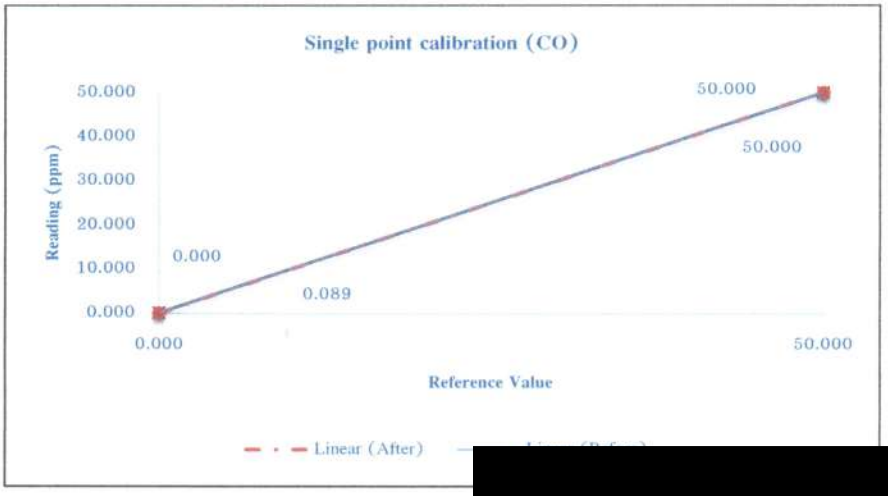
Gas Calibration	:	Thermo Environmental		Zero Air Generator	: API
Model	:	146C		Model	: 701
Serial No.	:	514811458		Serial No.	: 179

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						
CO	0.089	0.000	0.09	50.0	50.000	0.00
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date : 3-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

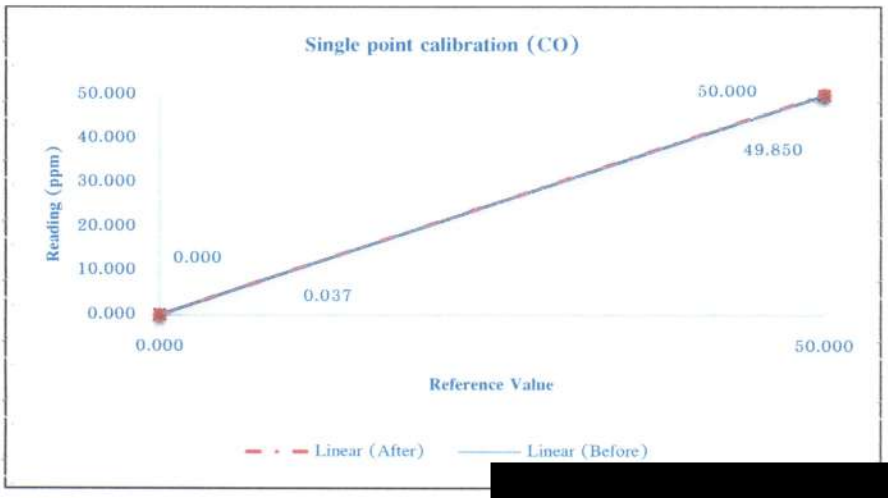
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

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



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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

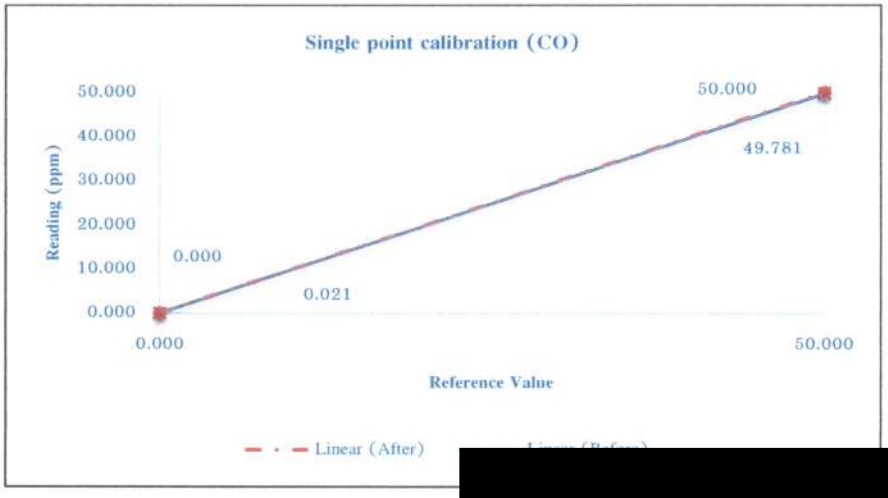
Gas Calibration	:	Thermo Environmental		Zero Air Generator	: API
Model	:	146C		Model	: 701
Serial No.	:	514811458		Serial No.	: 179

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



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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date	:	20-Aug-25		Certificate No.	: 0825-007
				Page	: 1/1

Analyzer Instruments

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

Environmental

Temperature	:	22.4	℃
Humidity	:	40.5	%RH

Calibration System

Calibrator Units

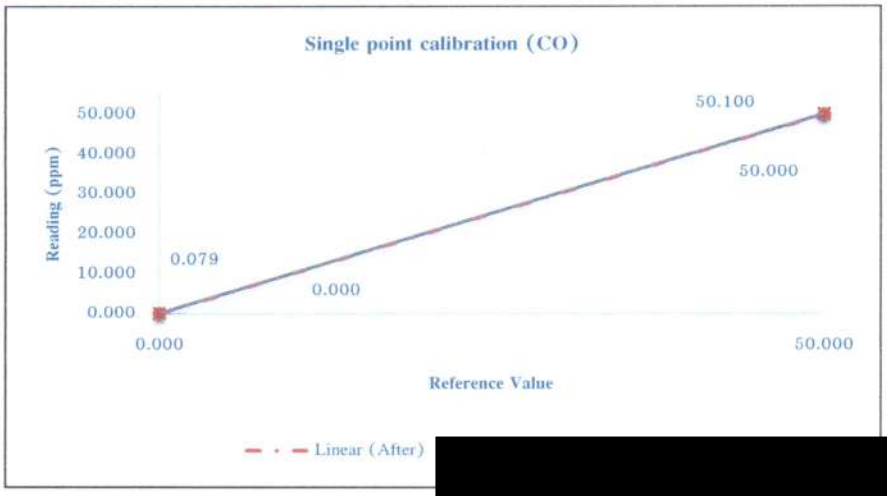
Gas Calibration	:	Thermo Environmental		Zero Air Generator	: API
Model	:	146C		Model	: 701
Serial No.	:	514811458		Serial No.	: 179

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	0.079	0.000	0.08	50.1	50.000	0.20
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



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Certificate of Analyzer Performance Testing

Calibrated Date	:	20-Aug-25		Certificate No.	: 0825-008
				Page	: 1/1

Analyzer Instruments

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

Environmental

Temperature	:	25.7	°C
Humidity	:	38.7	%RH

Calibration System

Calibrator Units

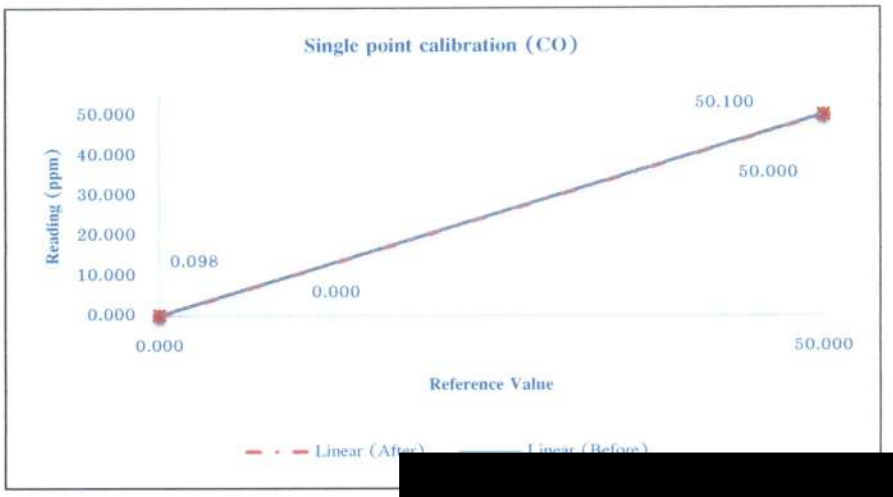
Gas Calibration	:	Thermo Environmental		Zero Air Generator	: API
Model	:	146C		Model	: 701
Serial No.	:	514811458		Serial No.	: 179

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	0.098	0.000	0.10	50.1	50.000	0.20
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date	:	8-Jan-26		Certificate No.	: 0126-001
				Page	: 1/1

Analyzer Instruments

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

Environmental

Temperature	:	25.0	°C
Humidity	:	46.2	%RH

Calibration System

Calibrator Units

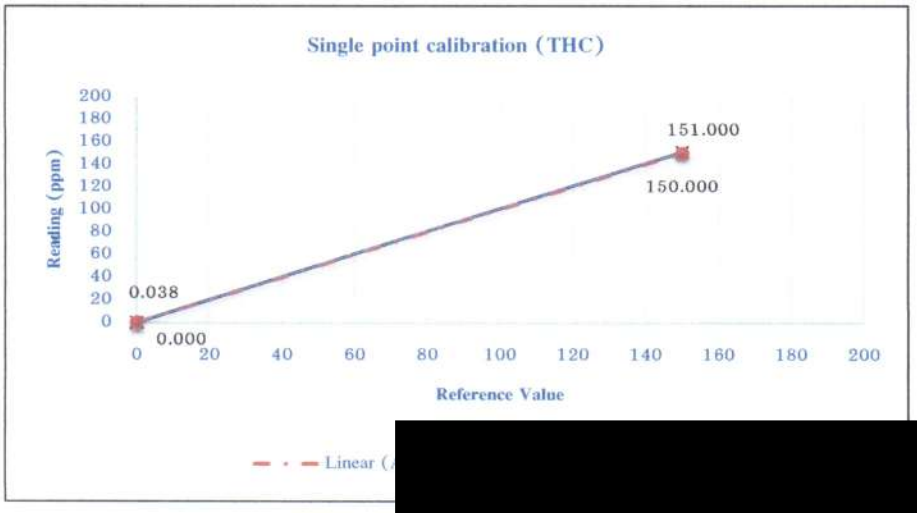
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

Propane Conc.	:	150 ppm	Cylinder No.	:	CGA350
			Expire Date	:	10-Apr-26

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
THC	0.038	0.000	0.038	151	150	0.667
After						
THC	0.000	0.000	0.000	150	150	0.000



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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

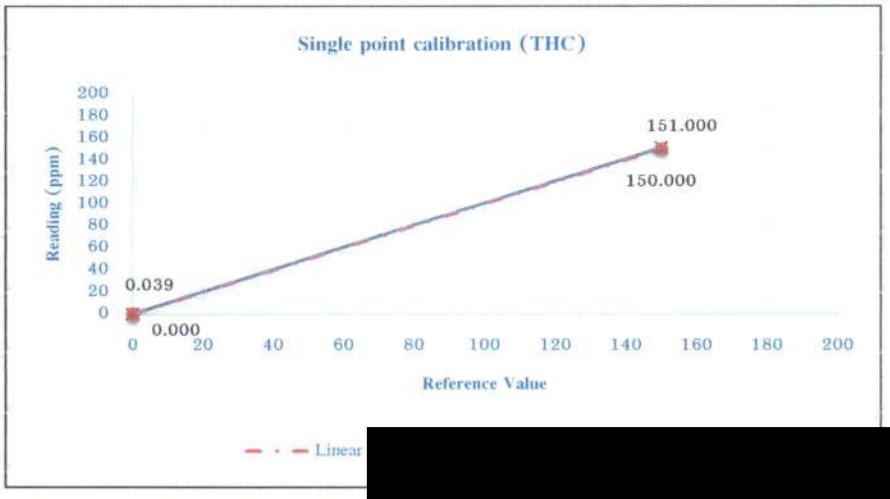
Gas Calibration	:	Thermo Environmental		Zero Air Generator	: API
Model	:	146C		Model	: 701
Serial No.	:	514811458		Serial No.	: 179

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



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Trade & Engineering

Certificate of Analyzer Performance Testing

Calibrated Date	:	8-Jan-26		Certificate No.	: 0126-002
				Page	: 1/1

Analyzer Instruments

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

Environmental

Temperature	:	25.0	°C
Humidity	:	46.1	%RH

Calibration System

Calibrator Units

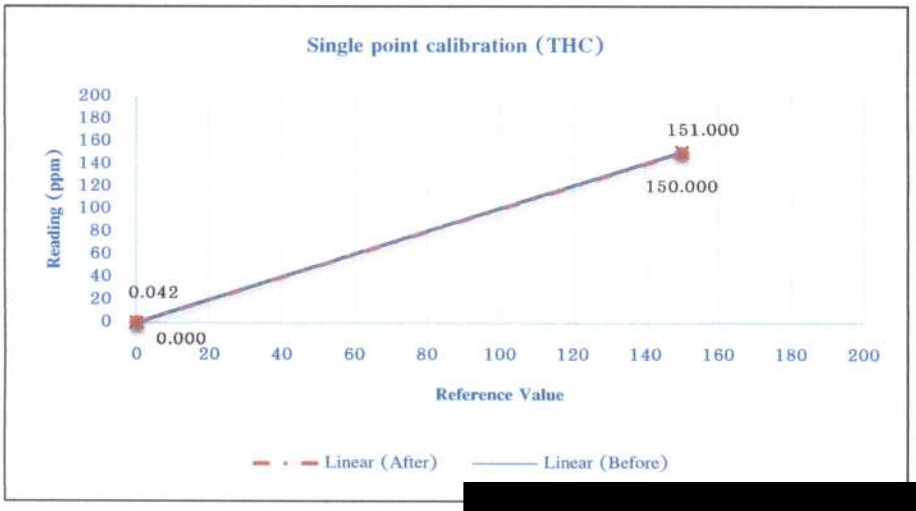
Gas Calibration	:	Thermo Environmental		Zero Air Generator	: API
Model	:	146C		Model	: 701
Serial No.	:	514811458		Serial No.	: 179

Standard Gas

Propane Conc.	:	150	ppm	Cylinder No.	: CGA350
				Expire Date	: 10-Apr-26

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
THC	0.042	0.000	0.042	151	150	0.667
After						
THC	0.000	0.000	0.000	150	150	0.000



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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

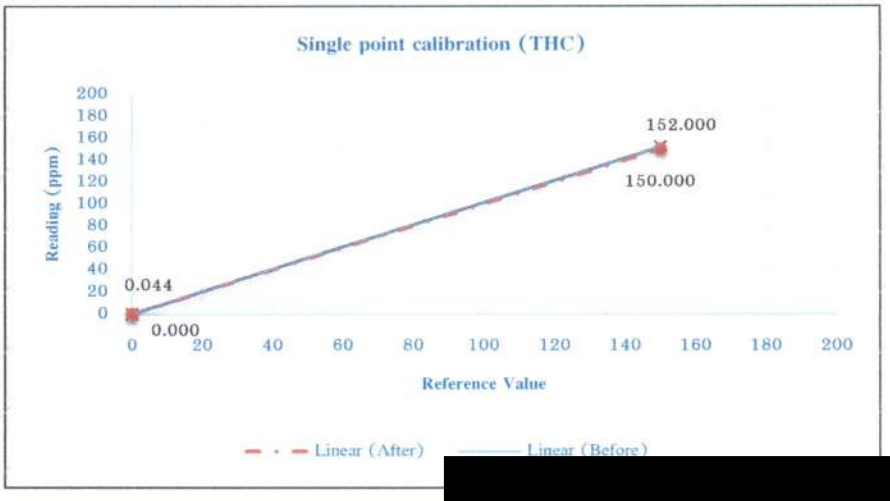
Gas Calibration	:	Thermo Environmental	Zero Air Generator	:	API
Model	:	146C	Model	:	701
Serial No.	:	514811458	Serial No.	:	179

Standard Gas

Propane Conc.	:	150 ppm	Cylinder No.	:	21W281046
			Expire Date	:	26-Sep-25

Calibration Check

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



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Trade & Engineering

TSP High Volume Sampler
TE-5000 TSP Sampler Verification

Site Information

Location: -	**Site ID:** -	**Date:** 10 Oct 25
Sampler: TE-5000 TSP	**Serial No:** 3269	**Tech:** Tong.P

Site Conditions

Barometric Pressure (in Hg): 27.70	**Corrected Pressure (mm Hg):** 703.6
Temperature (deg F): 76.4	**Temperature (deg K):** 297.8
Average Press. (in Hg): 27.32	**Corrected Average (mm Hg):** 693.9
Average Temp (Deg F): 75.0	**Average Temp: (Deg K):** 297.0

Calibration Orifice

Make: Tisch	**Qstd Slope:** 1.57894
Model: TE-5028A	**Qstd Intercept:** -0.01520
Serial#: 1179	**Calibration Due Date** 22 October 2025

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	8.05	1.739	60.2	57.94
2	6.60	1.576	55.6	53.51
3	5.20	1.400	47.9	46.10
4	4.60	1.317	43.1	41.48
5	4.05	1.112	35.3	33.97

Linear Regression

Slope: 39.3862
Intercept: -9.6675
Corr. Coeff: 0.9958
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): 48.4
Average Flow Calculation m3/min
1.422065879
Average Flow Calculation in cfm
50.21418999
Sample Time (Hrs): 24.0
Total flow in 24 hours m3/min
2047.774866
Total flow in 24 hours cfm
72308.43358

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:** 10 Oct 25
Sampler: TE-5000 TSP	**Serial No:** 3272	**Tech:** Tong.P

Site Conditions

Barometric Pressure (in Hg): 28.20	**Corrected Pressure (mm Hg):** 716.3
Temperature (deg F): 75.4	**Temperature (deg K):** 297.3
Average Press. (in Hg): 27.30	**Corrected Average (mm Hg):** 693.4
Average Temp (Deg F): 75.2	**Average Temp: (Deg K):** 297.2

Calibration Orifice

Make: Tisch	**Qstd Slope:** 1.57894
Model: TE-5028A	**Qstd Intercept:** -0.01520
Serial#: 1179	**Calibration Due Date** 22 October 2025

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	8.30	1.783	61.4	59.68
2	6.55	1.585	55.9	54.34
3	5.45	1.447	48.7	47.34
4	4.60	1.330	45.0	43.74
5	4.10	1.112	36.3	35.28

Linear Regression

Slope: 37.0610
Intercept: -5.7152
Corr. Coeff: 0.9964
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): 49.5
Average Flow Calculation m3/min
1.430793958
Average Flow Calculation in cfm
50.52238487
Sample Time (Hrs): 24.0
Total flow in 24 hours m3/min
2060.3433
Total flow in 24 hours cfm
72752.23421

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: 17 September 2025
Sampler: TE-6070 PM10
Serial No: 3245
Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 27.06
Temperature (deg F): 75.7
Average Press. (in Hg): 26.70
Average Temp. (deg F): 75.5
Corrected Pressure (mm Hg): 687.3
Temperature (deg K): 297.3
Corrected Average (mm Hg): 678.2
Average Temp. (deg K): 297.2

Calibration Orifice

Make: Tisch Environmental, Inc.
Model: TE-5028A
Serial#: 1179
Qstd Slope: 1.57894
Qstd Intercept: -0.01520
Calibration Due Date: 22 Oct 25

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)
1	9.50	1.293	61.0	40.12
2	7.80	1.173	57.8	38.01
3	6.60	1.080	53.5	35.18
4	5.80	1.037	51.3	33.74
5	5.15	1.006	46.8	30.78

Linear Regression
Slope 30.0144
Intercept 2.0161
Corr. Coeff 0.9603
SFR 1.115
SSP 53.97

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): 54.1
Average Flow over Sample (m3/min)
1.125540678
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min)
1620.778576
Total flow over sample (CFM)
57229.69153

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

Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location:	-	**Site ID:**	-	**Date:**	24 September 2025
Sampler:	TE-6070 PM10	**Serial No:**	3211	**Tech:**	Tong P.

Site Conditions

Barometric Pressure (in Hg):	27.19	**Corrected Pressure (mm Hg):**	690.6
Temperature (deg F):	76.2	**Temperature (deg K):**	297.6
Average Press. (in Hg):	26.75	**Corrected Average (mm Hg):**	679.5
Average Temp. (deg F):	76.3	**Average Temp. (deg K):**	297.6

Calibration Orifice

Make:	Tisch Environmental, Inc.	**Qstd Slope:**	1.57894
Model:	TE-5028A	**Qstd Intercept:**	-0.01520
Serial#:	1179	**Calibration Due Date:**	12 Oct 25

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)
1	9.50	1.291	61.3	40.24
2	7.55	1.152	56.5	37.09
3	6.50	1.069	52.4	34.39
4	5.45	1.037	50.3	33.02
5	5.05	1.006	47.8	31.38

Linear Regression

Slope	30.2242
Intercept	1.6407
Corr. Coeff	0.9876
SFR	1.112
SSP	53.68

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): 53.7
Average Flow over Sample (m3/min)
1.120724866
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min)
1613.843807
Total flow over sample (CFM)
56984.82481

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

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Trade & Engineering

Certificate of Calibration

Calibrated Date	:	27-Feb-25	Certificate No.	:	0225-001
			Page	:	1/1

Instruments

Instruments	:	PM2.5-PM10 Air Sampler	Manufacturer	:	Thermo Scientific
Model	:	2000-H	Serial No.	:	200FA201669708

Environmental

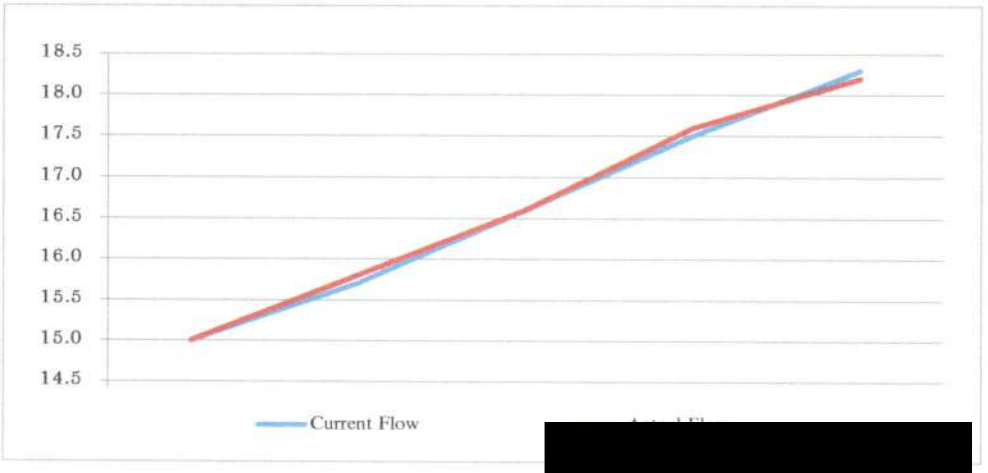
Temperature	:	26.4	℃
Humidity	:	45.2	%RH

Calibration System

Instruments	:	Drycal	Manufacturer	:	Bios
Model	:	DCL-H	Serial No.	:	102591
Calibration due date	:	18-Dec-25			

Flow Tetsing

Filter	Set Flow Instrument (L/min)	Current Flow Instrument reading (L/min)	Actual Flow Reference Standard (L/min)
47 mm.	16.7	16.6	16.6
	17.6	17.5	17.6
	15.8	15.7	15.8
	18.3	18.3	18.2
	15.1	15.0	15.0



[redacted]

TOP
Trade & Engineering

Certificate of Calibration

Calibrated Date : 1-Sep-25

Certificate No. : 0925-002

Page : 1/1

Instruments

Instruments : PM2.5-PM10 Air Sampler

Manufacturer : BGI

Model : PQ-200

Serial No. : 140AB25409410

Environmental

Temperature : 26.1 °C

Humidity : 46.2 %RH

Calibration System

Instruments : Drycal

Manufacturer : Bios

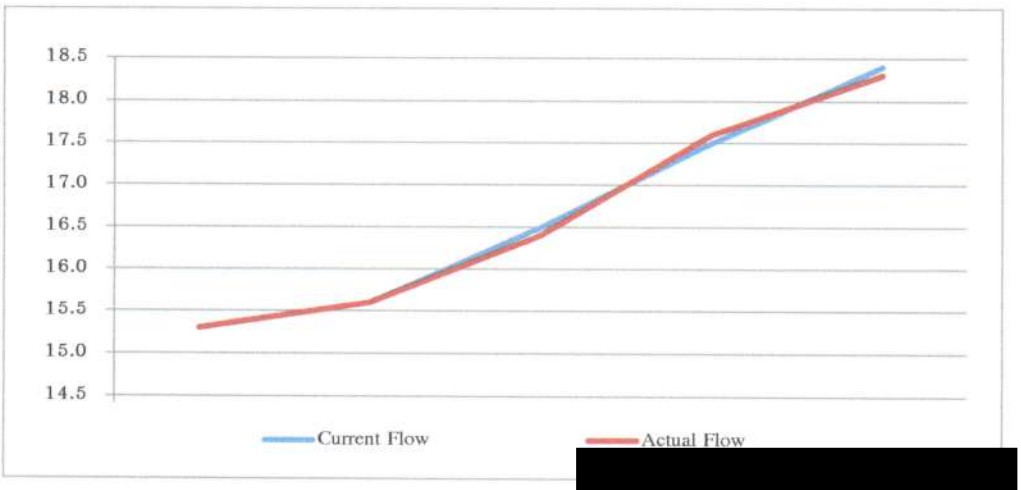
Model : DCL-H

Serial No. : 102591

Calibration due date : 18-Dec-25

Flow Tetsing

Filter	Set Flow Instrument (L/min)	Current Flow Instrument reading (L/min)	Actual Flow Reference Standard (L/min)
47 mm.	16.3	16.5	16.4
	17.5	17.5	17.6
	15.6	15.6	15.6
	18.4	18.4	18.3
	15.2	15.3	15.3



[redacted]

เอกสารการสอบเทียบเครื่องมือตรวจวัดความสั่นสะเทือน

สถาบันไฟฟ้าและอิเล็กทรอนิกส์
ELECTRICAL AND ELECTRONICS INSTITUTE

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.: CP20250114EA
Operation No.: CP2025030100

Certificate of Calibration

Equipment:	Vibration Meter
Manufacturer:	Instantel
Model/Type:	Micromate
Serial No.:	UM16048
ID No.:	VB-01-003
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 March 2025
Calibrated Date:	9 - 10 April 2025
Issued Date:	11 April 2025
Calibrated by:	Ms. Juntaporn Kunhakom

Approved by [redacted]

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.: CP20250114EA

Calibration Report

Equipment:	Vibration Meter
Manufacturer:	Instantel
Model:	Micromate
Serial No.:	UM16048
ID No.:	VB-01-003
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	3160-4-042	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.: CP20250114EA

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	9.860	-0.141	1.50	Longitudinal (L)
5.0	10.000	9.998	9.886	-0.112	1.50	
6.3	10.000	9.994	10.059	0.065	1.60	
8.0	10.000	10.006	9.915	-0.091	1.50	
10.0	10.000	10.008	9.923	-0.085	1.50	
12.5	10.000	10.006	9.900	-0.106	1.50	
16.0	10.000	10.001	9.923	-0.078	1.50	
	20.000	19.997	19.878	-0.119	1.50	
	30.000	29.970	29.754	-0.216	1.50	
	50.000	49.992	49.567	-0.426	1.50	
20.0	10.000	10.010	9.956	-0.054	1.60	
25.0	10.000	9.996	10.046	0.050	1.60	
31.5	10.000	9.998	10.049	0.051	1.60	
40.0	10.000	10.006	10.089	0.083	1.50	
52.0	10.000	10.008	10.128	0.120	1.50	
63.0	10.000	9.991	10.262	0.271	1.50	
80.0	10.000	9.994	10.428	0.434	1.50	

Certificate No.: CP20250114EA

Calibration Report

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

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty ± (%)	Direction
4.0	10.000	9.997	10.104	0.107	1.50	Transverse (T)
5.0	10.000	9.996	10.089	0.093	1.50	
6.3	10.000	10.013	10.302	0.289	1.50	
8.0	10.000	9.998	10.081	0.083	1.60	
10.0	10.000	9.998	10.089	0.091	1.60	
12.5	10.000	10.003	10.081	0.078	1.60	
16.0	10.000	9.996	10.059	0.063	1.60	
	20.000	19.983	20.041	0.058	1.60	
	30.000	29.995	29.939	-0.056	1.60	
	50.000	49.992	49.868	-0.124	1.50	
20.0	10.000	9.998	10.097	0.099	1.50	
25.0	10.000	10.006	10.112	0.106	1.50	
31.5	10.000	9.998	10.128	0.130	1.50	
40.0	10.000	10.003	10.207	0.204	1.50	
52.0	10.000	10.006	10.278	0.272	1.50	
63.0	10.000	10.001	10.467	0.466	1.50	
80.0	10.000	9.998	10.648	0.650	1.50	

Certificate No.: CP20250114EA

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	10.104	0.098	1.50	Vertical (V)
5.0	10.000	9.990	10.057	0.067	1.60	
6.3	10.000	9.998	10.262	0.264	1.50	
8.0	10.000	10.010	10.112	0.102	1.50	
10.0	10.000	9.998	10.144	0.146	1.50	
12.5	10.000	10.000	10.168	0.168	1.50	
16.0	10.000	9.994	10.191	0.197	1.50	
	20.000	19.997	20.288	0.291	1.50	
	30.000	29.995	30.290	0.295	1.50	
	50.000	49.992	50.459	0.467	1.50	
20.0	10.000	10.003	10.278	0.275	1.50	
25.0	10.000	10.001	10.570	0.569	1.50	
31.5	10.000	9.994	10.144	0.150	1.50	
40.0	10.000	10.006	10.286	0.280	1.50	
52.0	10.000	9.994	10.491	0.497	1.50	
63.0	10.000	10.013	10.585	0.572	1.50	
80.0	10.000	10.006	10.790	0.784	1.50	

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

- - End of Report - -

สถาบันไฟฟ้าและอิเล็กทรอนิกส์
ELECTRICAL AND ELECTRONICS INSTITUTE

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.: CP20250271EA
Operation No.: CP2025090264

Certificate of Calibration

Equipment:	Vibration Meter
Manufacturer:	Instantel
Model/Type:	Micromate
Serial No.:	UM21467 (Meter), UM15904 (Micromate Geophone)
ID No.:	VB-01-009
Customer:	C.E.M. Technology (Thailand) Co.,Ltd.
Address:	31/8 Moo 13, T.Rai Khing, A.Sam Phran, Nakhon Pathom 73210
Received Date:	22 September 2025
Calibrated Date:	30 September 2025 - 3 October 2025
Issued Date:	3 October 2025
Calibrated by:	Ms. Juntaporn Kunhakom

Approved by: [redacted]

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.: CP20250271EA

Calibration Report

Equipment:	Vibration Meter
Manufacturer:	Instantel
Model:	Micromate
Serial No.:	UM21467 (Meter), UM15904 (Micromate Geophone)
ID No.:	VB-01-009
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-0028-25	3-Jul-2026
2) Measuring Amplifier	2525	3016651	AV-0025AA-25	15-Aug-2026
3) LAN XI Analyzer	3160-4-042	3060-106135	CQ20240016EA	1-Dec-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.: CP20250271EA

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	10.013	11.029	1.016	1.5	Longitudinal (L)
5.0	10.000	10.003	11.013	1.010	1.5	
6.3	10.000	10.004	11.006	1.002	1.5	
8.0	10.000	10.017	10.918	0.901	1.5	
10.0	10.000	9.998	10.887	0.889	1.5	
12.5	10.000	10.003	10.806	0.803	1.5	
16.0	10.000	10.001	10.472	0.471	1.5	
	20.000	19.997	21.021	1.024	1.5	
	30.000	29.970	31.719	1.749	1.5	
	50.000	49.992	52.597	2.605	1.5	
20.0	10.000	10.013	10.690	0.677	1.5	
25.0	10.000	10.001	10.635	0.634	1.5	
31.5	10.000	10.003	10.846	0.843	1.5	
40.0	10.000	10.013	10.706	0.693	1.5	
52.0	10.000	10.003	10.883	0.880	1.5	
63.0	10.000	10.006	11.195	1.189	1.5	
80.0	10.000	10.000	11.326	1.326	1.5	

Certificate No.: CP20250271EA

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	10.020	11.205	1.185	1.5	Transverse (T)
5.0	10.000	10.013	11.118	1.105	1.5	
6.3	10.000	10.010	11.134	1.124	1.5	
8.0	10.000	9.998	10.814	0.816	1.5	
10.0	10.000	10.000	10.719	0.719	1.5	
12.5	10.000	10.017	10.585	0.568	1.5	
16.0	10.000	10.001	10.428	0.427	1.5	
	20.000	19.997	21.112	1.115	1.5	
	30.000	30.010	31.853	1.843	1.5	
	50.000	49.992	52.740	2.748	1.5	
20.0	10.000	10.014	10.491	0.477	1.5	
25.0	10.000	9.997	10.562	0.565	1.5	
31.5	10.000	10.001	10.727	0.726	1.5	
40.0	10.000	10.006	10.738	0.732	1.5	
52.0	10.000	9.998	10.856	0.858	1.5	
63.0	10.000	10.001	11.021	1.020	1.5	
80.0	10.000	10.013	11.305	1.292	1.5	

Certificate No.: CP20250271EA

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	10.001	10.420	0.419	1.5	Vertical (V)
5.0	10.000	10.006	10.467	0.461	1.5	
6.3	10.000	9.998	10.577	0.579	1.5	
8.0	10.000	10.004	10.223	0.219	1.5	
10.0	10.000	9.998	10.317	0.319	1.5	
12.5	10.000	10.013	10.278	0.265	1.5	
16.0	10.000	9.998	10.104	0.106	1.5	
	20.000	19.997	20.406	0.409	1.5	
	30.000	29.995	30.574	0.579	1.5	
	50.000	49.992	50.775	0.783	1.5	
20.0	10.000	10.003	10.506	0.503	1.5	
25.0	10.000	10.001	10.381	0.380	1.5	
31.5	10.000	10.013	10.436	0.423	1.5	
40.0	10.000	10.008	10.491	0.483	1.5	
52.0	10.000	9.994	10.714	0.720	1.5	
63.0	10.000	10.013	10.767	0.754	1.5	
80.0	10.000	10.006	10.924	0.918	1.5	

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

- - End of Report - -

เอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำ

DKSH

NSC-TISI-TIS 17025
Calibration 0087

Certificate of Calibration

Equipment:	Electronic Balance	Certificate No.:	C01261658
Manufacturer:	Sartorius	Job No.:	WO-00124610
Model:	QUINTIX 224-1S	Issued Date:	12 June 2026
Serial No.:	0035009070	Page:	1 of 2
ID No.:	CI-01-002		
Condition of the item:	Normal		

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

Environment Condition:

Temperature	21 °C	±	0.5 °C
Relative Humidity	44 %	±	1.7 %

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

Calibration By: Mr. Wasan Nuchnabee

Calibration Date: 11 June 2026

The Method Used: In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02260345

[redacted]

[redacted]

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 Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

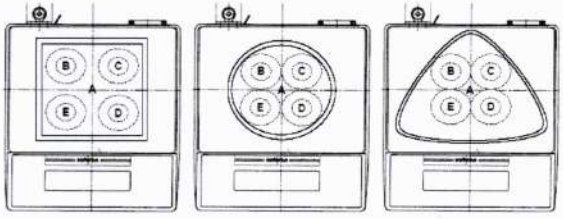
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2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Calibration Results:

Without Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.



Nominal Test Value 100000 (mg)

Reference Points (mg)				
A	B	C	D	E
-	0.0	0.0	-0.1	-0.1

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.1 (mg)

Nominal test value (mg)	Standard Deviation
20000	0.04
200000	0.04

Error of indication from nominal or conventional mass value., Readability 0.1 (mg)

Nominal Value (mg)	Conventional Mass (mg)	Displayed Value (mg)	Error of indication (mg)	Uncertainty (± mg)	k
Unload	0.00	0.0	0.0	0.096	2.02
100	100.00	100.0	0.0	0.096	2.02
200	200.00	200.0	0.0	0.096	2.02
500	500.00	500.0	0.0	0.097	2.02
1000	1000.01	1000.0	0.0	0.097	2.02
2000	2000.02	2000.0	0.0	0.098	2.02
5000	5000.01	5000.0	0.0	0.099	2.02
10000	10000.01	10000.0	0.0	0.10	2.02
20000	20000.00	20000.0	0.0	0.11	2.01
50000	50000.00	50000.0	0.0	0.12	2.01
100000	99999.91	100000.0	0.1	0.17	2.00
200000	199999.87	200000.0	0.1	0.29	2.00

The End of Certificate

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

ใบตรวจสอบสภาพเครื่องชั่ง

Electronic Balance Checklist

Equipment: Electronic Balance

Model: QUINTIX 224-1S

Serial No.: 0035009070

Certificate No.: C01261658

Job No.: WO-00124610

Check date		รายการตรวจเช็ค (Description)	Check before delivery		หมายเหตุ (Remark)
11 Jun 2026			11 Jun 2026		
(Normal)	(Defective)		(Normal)	(Defective)	
		General			
☑	☐	1. สายไฟ/ อะแดปเตอร์ (Electrical wire/ Adaptor)	☑	☐	
☑	☐	2. ความสมบูรณ์ชุดกระจกกันลม (Cover)	☑	☐	
☑	☐	3. ความสมบูรณ์ของระดับน้ำ (Bubble spirit level)	☑	☐	
☑	☐	4. ความสมบูรณ์ของชุดขาตั้งเครื่อง (Leveling foot)	☑	☐	
☑	☐	5. การตอบสนองของปุ่มกด (Keys)	☑	☐	
☑	☐	6. ความสมบูรณ์ของหน้าจอ (Display)	☑	☐	
☑	☐	7. การแสดงผลของหน้าจอ (Screen display)	☑	☐	
☑	☐	8. ชุดรองจานชั่ง (Stopper/ Pan support)	☑	☐	
☑	☐	9. การทำงานของฟังค์ชั่น (Internal/ External Function)	☑	☐	
☑	☐	10. ความสะอาดของตัวเครื่องภายนอก (External cleanliness of the balance)	☑	☐	
☑	☐	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่องชั่ง (Environment at the location of the balance)	☑	☐	

ข้อแนะนำ/ Note : _____

_____

_____

Mr. Wasan Nuchnabee

Service Engineer

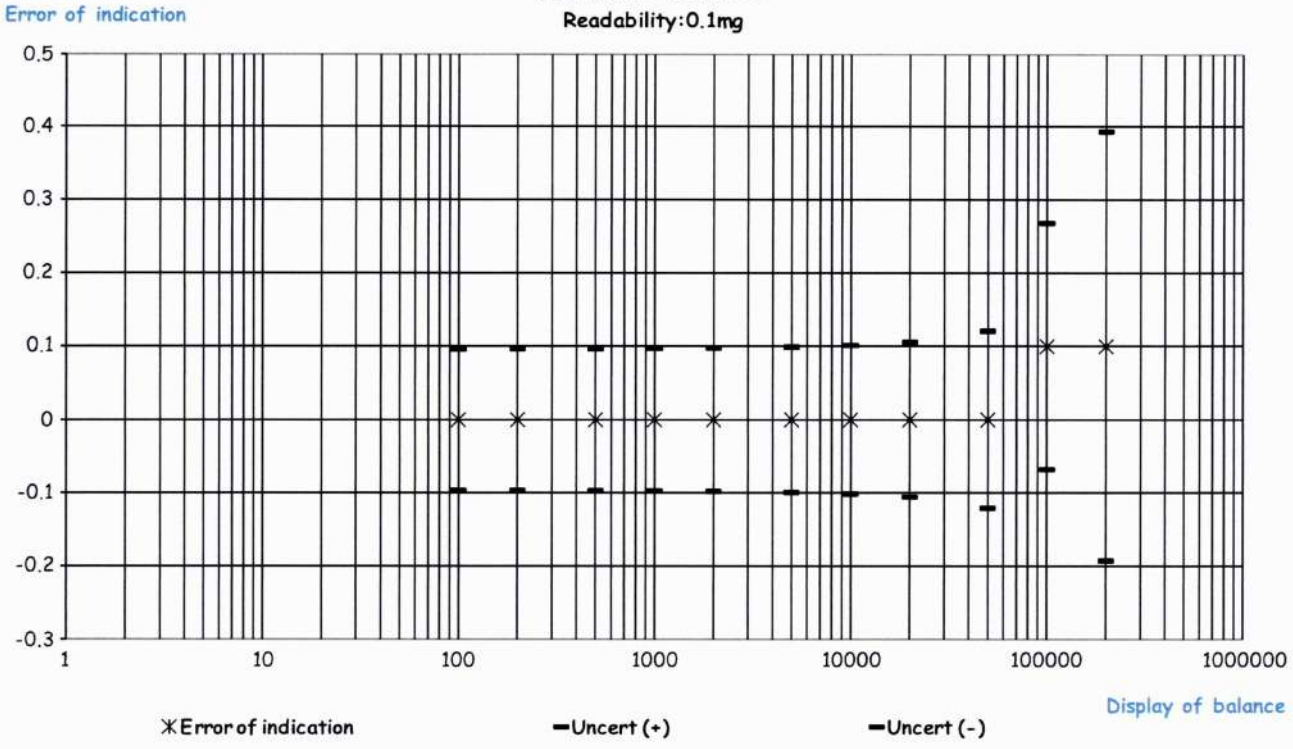
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2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
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Delivering Growth – in Asia and Beyond.

Without Adjustment

Job No.WO-00124610

Readability:0.1mg



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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

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THAI CALIBRATION SERVICES CO., LTD.
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Samphran, Nakhonpathom 73210 Tel. 0-3439-7682-5, 08-6341-8613
www.thaical.com E-mail : sales@thaicalibration.com, lab@thaicalibration.com

NSC-TISI-TIS 17025
CALIBRATION 0189

CALIBRATION CERTIFICATE

Certificate No.S2602960S

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

Equipment : Non-automatic weighing instrument (Electronic instrument)

Manufacturer :	Sartorius	**Order No. :**	69S0915-1
Model :	BSA224S-CW	**Ambient temperature :**	(25.1 ± 5.0) °C
Accuracy class :	-	**Relative humidity :**	(52.5 ± 10.0) %
Capacity :	220 g	**Received date :**	27-Feb-2026
Resolution :	0.0001 g	**Date of calibration :**	27-Feb-2026
Serial No. :	3139614148	**Date of issue :**	02-Mar-2026
ID No. :	CI-01-003	**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	10003101+0694	M2512001S	10-Dec-2026	7950

Traceability of the reference standard weight

The measurement results are traceable to the International System of Units (SI) through Mass Calibration Laboratory Thai Calibration Services Co., Ltd., NSC-ONSC accredited no. Calibration 0189.

Calibrated By [redacted]

Approved Signato[redacted]

**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 Raikhing 30, Phutthamonthon 5 Rd., Raikhing,
Samphran, Nakhonpathom 73210 Tel. 0-3439-7682-5, 08-6341-8613
www.thaical.com E-mail : sales@thaicalibration.com, lab@thaicalibration.com

NSC-TISI-TIS 17025
CALIBRATION 0189

CALIBRATION CERTIFICATE

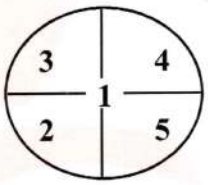
Certificate No.S2602960S

The repeatability of indication

Nominal Value (g)	Standard Deviation of reading (g)	Maximum difference between suscessive reading (g)	n
200	0.00004	0.0001	5

The effect of eccentric application of a load on the indication (test load : 100 g)

Position	Balance Reading (g)
Point 1	100.0000
Point 2	100.0001
Point 3	100.0001
Point 4	99.9999
Point 5	100.0000
Eccentric Value	0.0001



The error of indication

Nominal Value (g)	Value of Reference Standard Weight (g)	Balance Reading (g)	Correction (g)	Uncertainty (±) (g)	*k*
Unload	0.0000	0.0000	0.0000	0.00013	2.37
1	1.0000	1.0000	0.0000	0.00014	2.20
2	2.0000	2.0000	0.0000	0.00014	2.20
5	5.0000	4.9999	+0.0001	0.00014	2.18
10	10.0000	9.9999	+0.0001	0.00014	2.17
20	20.0000	20.0000	0.0000	0.00015	2.14
50	50.0000	50.0001	-0.0001	0.00015	2.11
100	100.0000	100.0000	0.0000	0.00018	2.04
120	120.0000	120.0001	-0.0001	0.00022	2.00
150	150.0001	150.0003	-0.0002	0.00024	2.00
200	200.0001	200.0003	-0.0002	0.00027	2.00

Remark : Adjustment, Internal weight

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--

DKSH

NSC-TISI-TIS 17025
Calibration 0087

Certificate of Calibration

Equipment:	Electronic Thermo-Hygrometer	Certificate No. :	C19262637
Manufacturer:	testo	Job No.:	WO-00122789
Model:	testo 608-H1	Issued Date:	28 May 2026
Serial No.:	45186322	Page:	1 of 2
ID No.:	CI-02-003		
Condition of the item:	Normal		

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	±	3 °C
Relative Humidity:	50 %	±	20 %
Voltage:	220 VAC	±	10 %

Calibration Place: Thermo-Hygro Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr. Tweewong Thaithiang

Calibration Date: 26 May 2026

The Method Used: In house method, CAL-WI-42, by comparison with standard thermometer and standard hygrometer

Traceability: This certificate is traceable to the International System of Unit maintained by:
DKSH Technology Limited and Quality Reborn Co., LTD.

[redacted] [redacted]

This [redacted] 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 Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

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

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท 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

Reference Standard Equipment:

Equipment Name	Certificate No.	Cal. Date	Next Cal. Date
Digital Thermometer With Probe	C15251384	24 December 2025	24 December 2026
Digital Thermo Hygrometer With Probe	QR26-0370	21 January 2026	21 January 2027

Calibration Results:

Function Temperature: Without adjustment

Calibrate Point. (°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction (°C)	Uncertainty (± °C)
15.0	15.011	15.2	-0.189	0.26
20.0	20.003	20.2	-0.197	0.26
25.0	25.008	25.2	-0.192	0.26
30.0	30.006	29.8	0.206	0.26

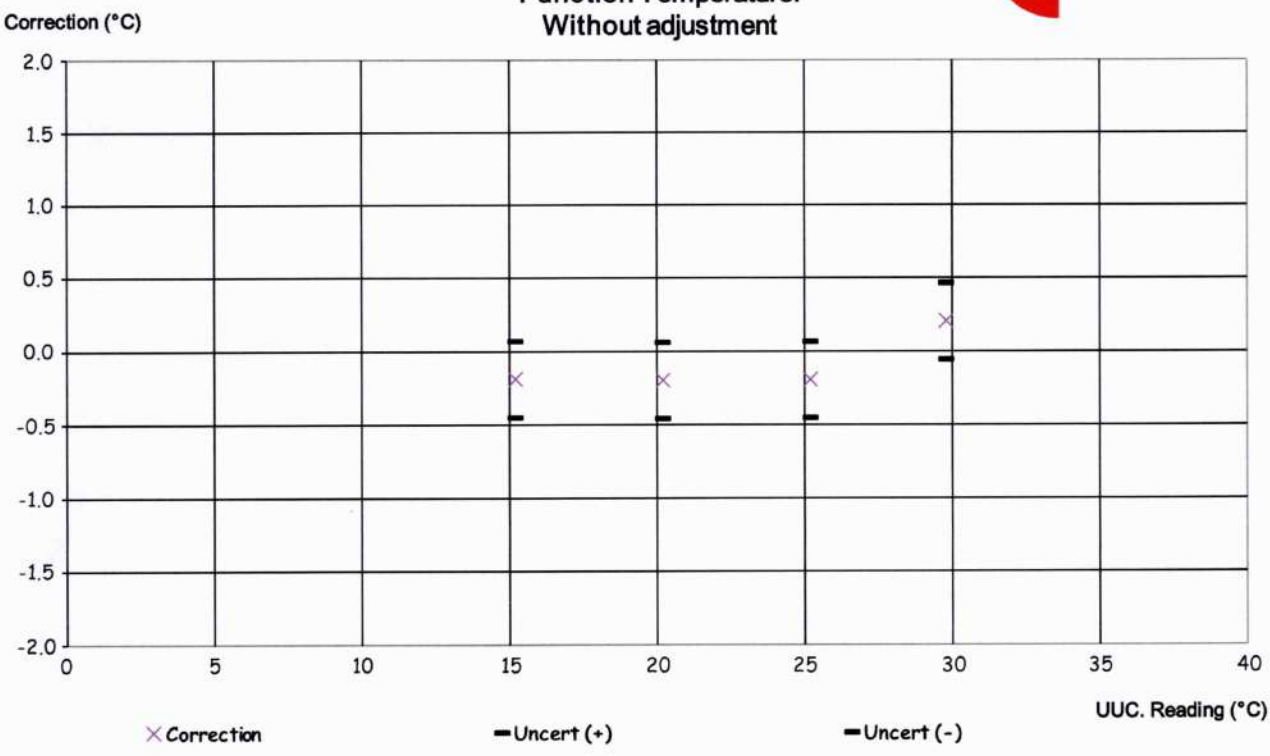
Function Relative Humidity: Without adjustment

Reference Temp. (°C)	Calibrate Point. (%RH)	STD. Reading (%RH)	UUC. Reading (%RH)	Correction (%RH)	Uncertainty (± %RH)
25.00	20.0	20.08	25.3	-5.22	1.1
25.00	30.0	29.99	35.4	-5.41	1.1
25.00	40.0	40.02	45.7	-5.68	1.3
25.00	50.0	50.05	55.7	-5.65	1.3

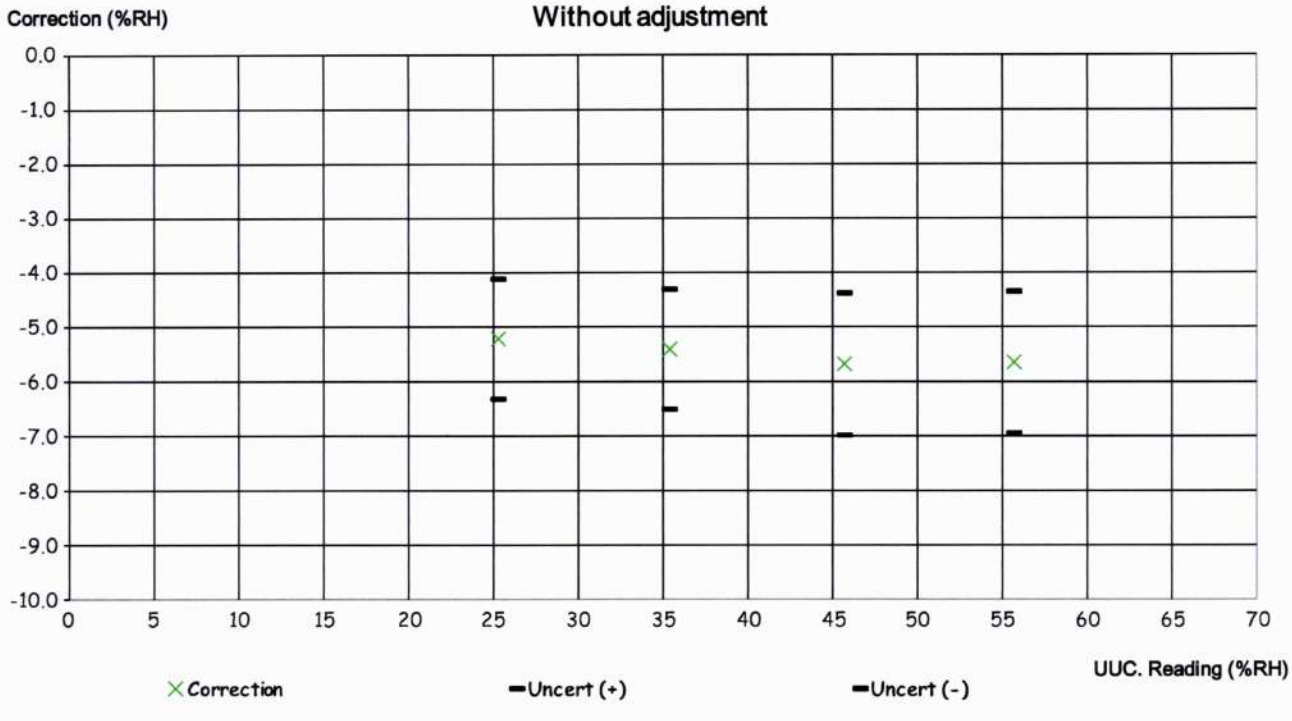
The End of Certificate

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

C19262637
Function Temperature:
Without adjustment



C19262637
Function Relative Humidity:
Without adjustment



ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ
(Thermo-Hygrometer Checklist)

Equipment : Electronic Thermo-Hygrometer

Certificate No. : C19262637

Serial No. : 45186322

Model : testo 608-H1

Check Date		รายการตรวจเช็ค	Check before delivery		หมายเหตุ (Remark)
26 May 2026			26 May 2026		
Normal	Defective		Normal	Defective	
		General			
☐	☐	1. สายไฟ (Electric wire)	☐	☐	ไม่มี
☐	☐	2. การทำงาน (On/Off Switch)	☐	☐	ไม่มี
☑	☐	3. การทำงานปุ่มกดต่างๆ (Selector Key)	☑	☐	
☑	☐	4. การแสดงผลหน้าจอ (Display)	☑	☐	
☑	☐	5. แบตเตอรี่ (Battery)	☑	☐	
☑	☐	6. สภาพตัวเครื่อง (Equipment Body)	☑	☐	
☐	☐	7. หัววัดเซ็นเซอร์ (Sensor External)	☐	☐	ไม่มี
☑	☐	8. ฝาปิดแบตเตอรี่ (Battery cover)	☑	☐	

Note : _____

_____

_____

[redacted]

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

Delivering Growth – in Asia and Beyond.

Certificate of Calibration

Equipment:	Electronic Thermo-Hygrometer	Certificate No. :	C19262638
Manufacturer:	testo	Job No.:	WO-00122789
Model:	testo 608-H1	Issued Date:	28 May 2026
Serial No.:	45186324	Page:	1 of 2
ID No.:	CI-02-004		
Condition of the item:	Normal		

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	±	3 °C
	Relative Humidity:	50 %	±	20 %
	Voltage:	220 VAC	±	10 %

Calibration Place: Thermo-Hygro Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr. Tweewong Thaithiang

Calibration Date: 26 May 2026

The Method Used: In house method, CAL-WI-42, by comparison with standard thermometer and standard hygrometer

Traceability: This certificate is traceable to the International System of Unit maintained by:
DKSH Technology Limited and Quality Reborn Co., LTD.

[redacted]

[redacted]

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 Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

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.

Reference Standard Equipment:

Equipment Name	Certificate No.	Cal. Date	Next Cal. Date
Digital Thermometer With Probe	C15251384	24 December 2025	24 December 2026
Digital Thermo Hygrometer With Probe	QR26-0370	21 January 2026	21 January 2027

Calibration Results:

Function Temperature: Without adjustment

Calibrate Point. (°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction (°C)	Uncertainty (± °C)
15.0	15.011	15.1	-0.089	0.26
20.0	20.003	20.2	-0.197	0.26
25.0	25.008	25.2	-0.192	0.26
30.0	30.006	29.9	0.106	0.26

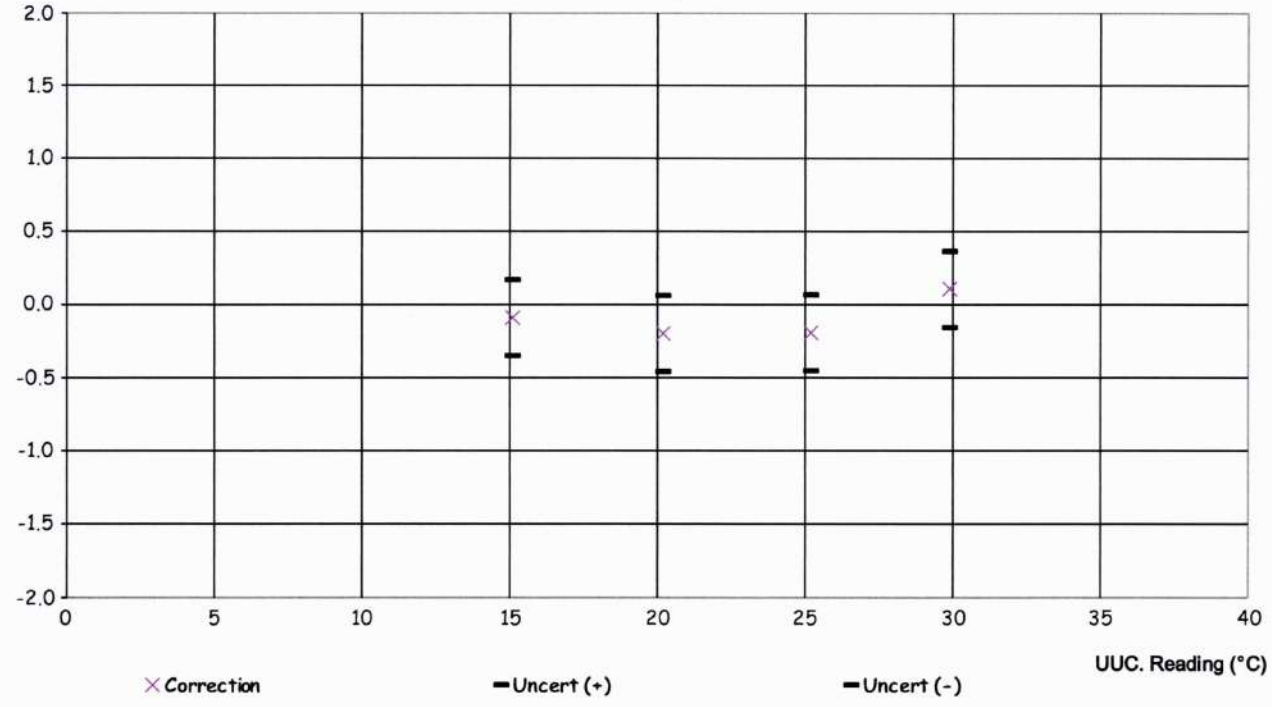
Function Relative Humidity: Without adjustment

Reference Temp. (°C)	Calibrate Point. (%RH)	STD. Reading (%RH)	UUC. Reading (%RH)	Correction (%RH)	Uncertainty (± %RH)
25.00	20.0	20.08	25.7	-5.62	1.1
25.00	30.0	29.99	35.7	-5.71	1.1
25.00	40.0	40.02	45.7	-5.68	1.3
25.00	50.0	50.05	55.6	-5.55	1.3

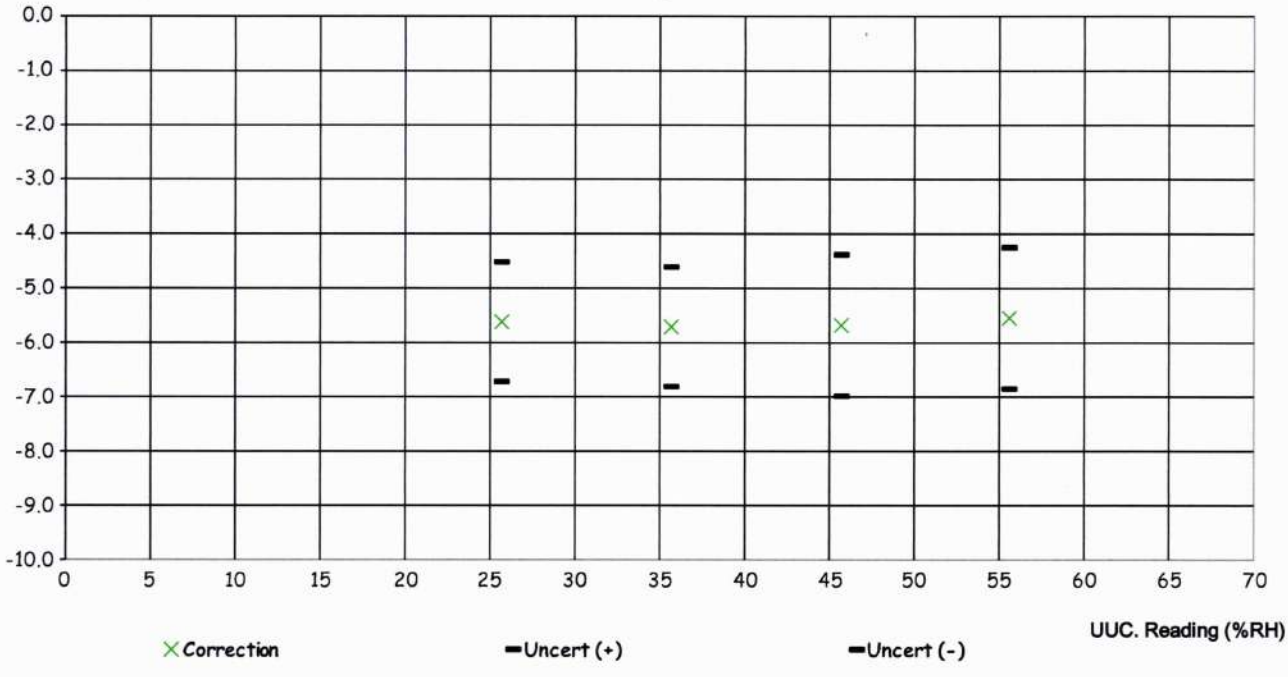
The End of Certificate

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

C19262638
Function Temperature:
Without adjustment



C19262638
Function Relative Humidity:
Without adjustment



ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ
(Thermo-Hygrometer Checklist)

Equipment : Electronic Thermo-Hygrometer

Certificate No. : C19262638

Serial No. : 45186324

Model : testo 608-H1

Check Date		รายการตรวจเช็ค	Check before delivery		หมายเหตุ (Remark)
26 May 2026			26 May 2026		
Normal	Defective		Normal	Defective	
		General			
☐	☐	1. สายไฟ (Electric wire)	☐	☐	ไม่มี
☐	☐	2. การทำงาน (On/Off Switch)	☐	☐	ไม่มี
☑	☐	3. การทำงานปุ่มกดต่างๆ (Selector Key)	☑	☐	
☑	☐	4. การแสดงผลหน้าจอ (Display)	☑	☐	
☑	☐	5. แบตเตอรี่ (Battery)	☑	☐	
☑	☐	6. สภาพตัวเครื่อง (Equipment Body)	☑	☐	
☐	☐	7. หัววัดเซ็นเซอร์ (Sensor External)	☐	☐	ไม่มี
☑	☐	8. ฝาปิดแบตเตอรี่ (Battery cover)	☑	☐	

Note : _____

_____

_____

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
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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

NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : **69-430003-1**

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 (55 to 60) %

Date of Received : 17 February 2026

Date of Calibration : 17 February 2026

Date of Issue : 24 February 2026

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
1413.1 µS/cm	1081106	28 February 2026	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
12.881 mS/cm	1081107	11 March 2026	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

App[redacted]

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. : 69-430003-1

Result of Calibration :

UUC Condition As-Received : Good

Function : Conductivity measurement

Before Adjustment

Standard Conductivity Solution	UUC Reading	Correction	Uncertainty (±)	Unit
84*	84.2	-0.2	1.1	µS/cm
1413	1416	-3	9.0	µS/cm
12.88	13.02	-0.14	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%

- oOo -

[redacted]

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. : **69-420017-1** **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 : Apera Model : PC 910
Range : N/A pH Resolution : 0.01 pH
Serial No. : PC910X1220811001 ID No. : WW-03-002
Electrode
Model : N/A Serial No. : VV1-15843
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 : (50 to 55) %

Date of Received : 17 February 2026

Date of Calibration : 17 February 2026

Date of Issue : 24 February 2026

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-00231/68	20 Aug 2027	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61340084	1146794	30 Oct 2027	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.988	61328150	1146796	25 Oct 2026	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.010	61323674	1146795	30 Oct 2026	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approve [redacted]

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. : 69-420017-1

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	0	0.59
	0.0000	7	7.00	0	0	0.58
	-177.4800	10	10.00	-178	1	0.59

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	4.00	0.01	0.0097
	6.988	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
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. : **69-400074-1** **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 :	Apera	Model :	PC 910
Range :	N/A °C	Resolution :	0.1 °C
Serial No. :	PC910X1220811001	ID No. :	WW-03-002

Thermistor probe

Model :	N/A	Sheath Material :	Stainless
Diameter :	4.8 mm.	Length :	95 mm.
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 :	(55 to 60)	%
Line Voltage :	(224.5 to 226.0)	VAC

Date of Received : 17 February 2026
Date of Calibration : 17 February 2026
Date of Issue : 24 February 2026
Calibrated by : Permpon Chanpu

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4003 by compared with PRT in the liquid bath 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
400016	TT-1019-25	13 May 2027	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)

[redacted]

The Uncertainties are for a confidence probability of approximately 95%

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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. : 69-400074-1

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)
95	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 -

DKSH

NSC-TISI-TIS 17025
Calibration 0087

Certificate of Calibration

Equipment:	Hot Air Oven	Certificate No.:	C31260296
Manufacturer:	Memmert	Issued Date:	11 February 2026
Model:	UF 55	Job No.:	WO-00105449
Serial No.:	B219.0142	Ventilation Valve:	Closed
ID No.:	WW-05-002	Page:	1 of 4
Shelves(pc.):	2		
Condition of the item:	Normal		

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

Environment Condition:

Temperature:	30 °C	±	1.1	°C
Relative Humidity:	53 %	±	4.6	%
Voltage:	227 VAC	±	1.8	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. Sittiphong Lekfu

Calibration Date: 09 February 2026

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. C10250013

[redacted]

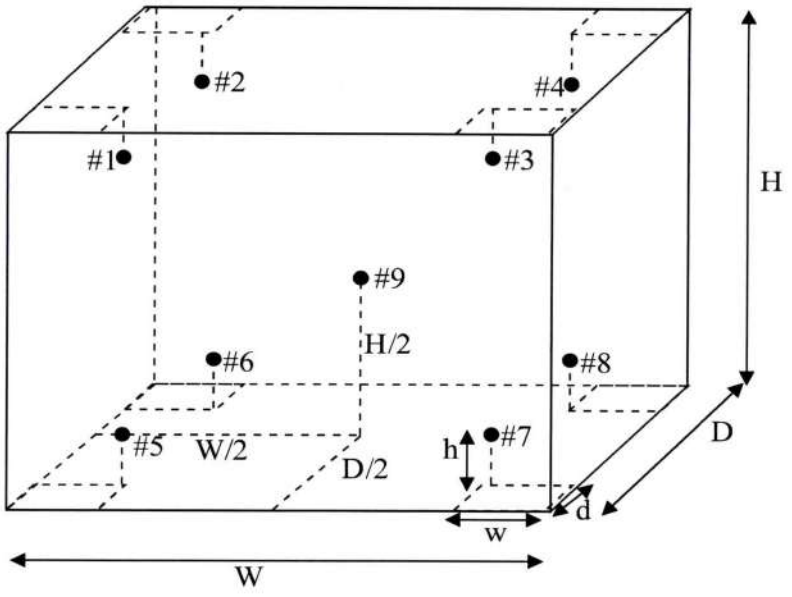
[redacted]

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 Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

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

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DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, 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	301	302	303	304	305	306	307	308	309

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.

Calibration Results:

Before adjustment

Setting:	Indicating:	#1:	#2:	#3:	#4:	#5:	#6:	#7:	#8:	#9:
180.0	180.0	179.68	179.97	180.88	180.46	180.66	180.07	180.16	180.55	180.64

After 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	103.89	-0.11	0.38
#2	103.90	-0.10	0.38
#3	104.20	0.20	0.38
#4	104.07	0.07	0.38
#5	104.13	0.13	0.38
#6	103.89	-0.11	0.38
#7	103.90	-0.10	0.38
#8	104.06	0.06	0.38
#9	104.17	0.17	0.38

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	103.89	103.90	104.20	104.07	104.13	103.89	103.90	104.06	104.17	0.38

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.36	0.07	0.42

Note: * Maximum uncertainty of the each position

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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

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	179.47	-0.53	0.42
#2	179.77	-0.23	0.42
#3	180.72	0.72	0.42
#4	180.19	0.19	0.42
#5	180.42	0.42	0.42
#6	179.87	-0.13	0.42
#7	179.94	-0.06	0.42
#8	180.42	0.42	0.42
#9	180.42	0.42	0.42

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	180.0	180.0	179.47	179.77	180.72	180.19	180.42	179.87	179.94	180.42	180.42	0.42

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.03	0.07	1.38

Note: * Maximum uncertainty of the each position

The End of Certificate

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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

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

[redacted]

After 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	103.89	-0.11	0.38	1.0	Pass
#2	103.90	-0.10	0.38	1.0	Pass
#3	104.20	0.20	0.38	1.0	Pass
#4	104.07	0.07	0.38	1.0	Pass
#5	104.13	0.13	0.38	1.0	Pass
#6	103.89	-0.11	0.38	1.0	Pass
#7	103.90	-0.10	0.38	1.0	Pass
#8	104.06	0.06	0.38	1.0	Pass
#9	104.17	0.17	0.38	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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2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
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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

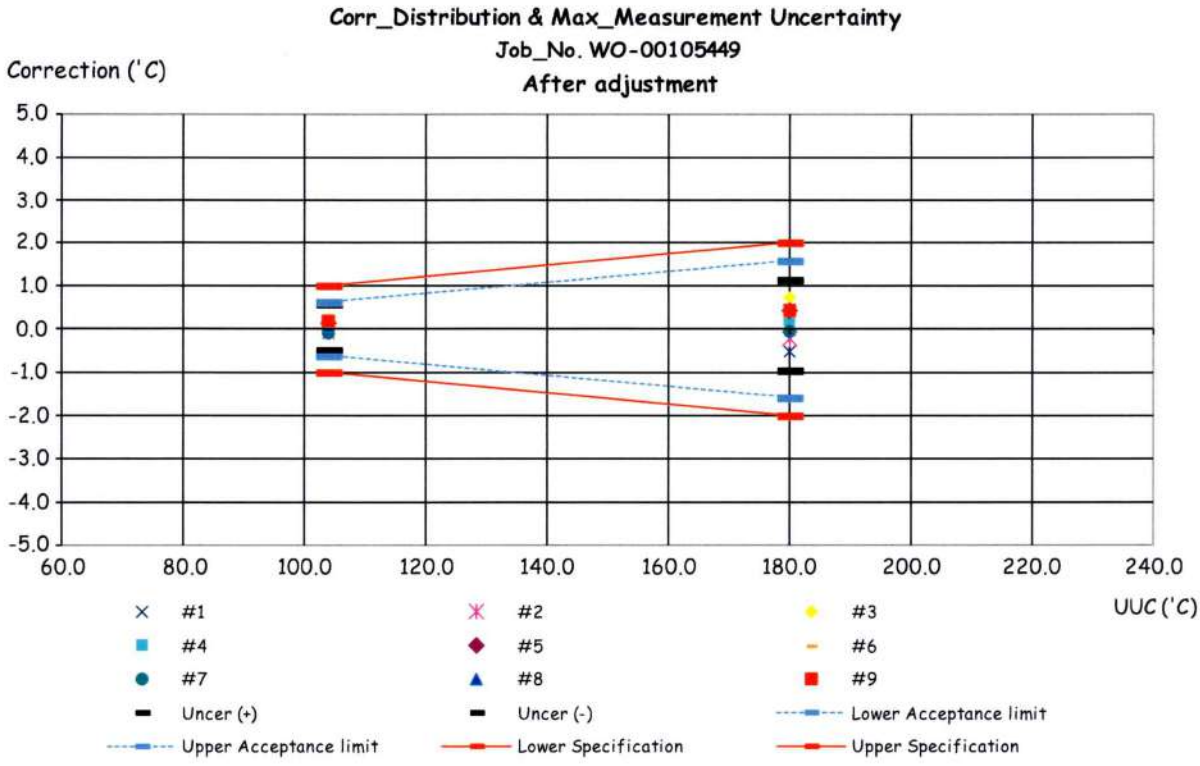
Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	179.47	-0.53	0.42	2.0	Pass
#2	179.77	-0.23	0.42	2.0	Pass
#3	180.72	0.72	0.42	2.0	Pass
#4	180.19	0.19	0.42	2.0	Pass
#5	180.42	0.42	0.42	2.0	Pass
#6	179.87	-0.13	0.42	2.0	Pass
#7	179.94	-0.06	0.42	2.0	Pass
#8	180.42	0.42	0.42	2.0	Pass
#9	180.42	0.42	0.42	2.0	Pass

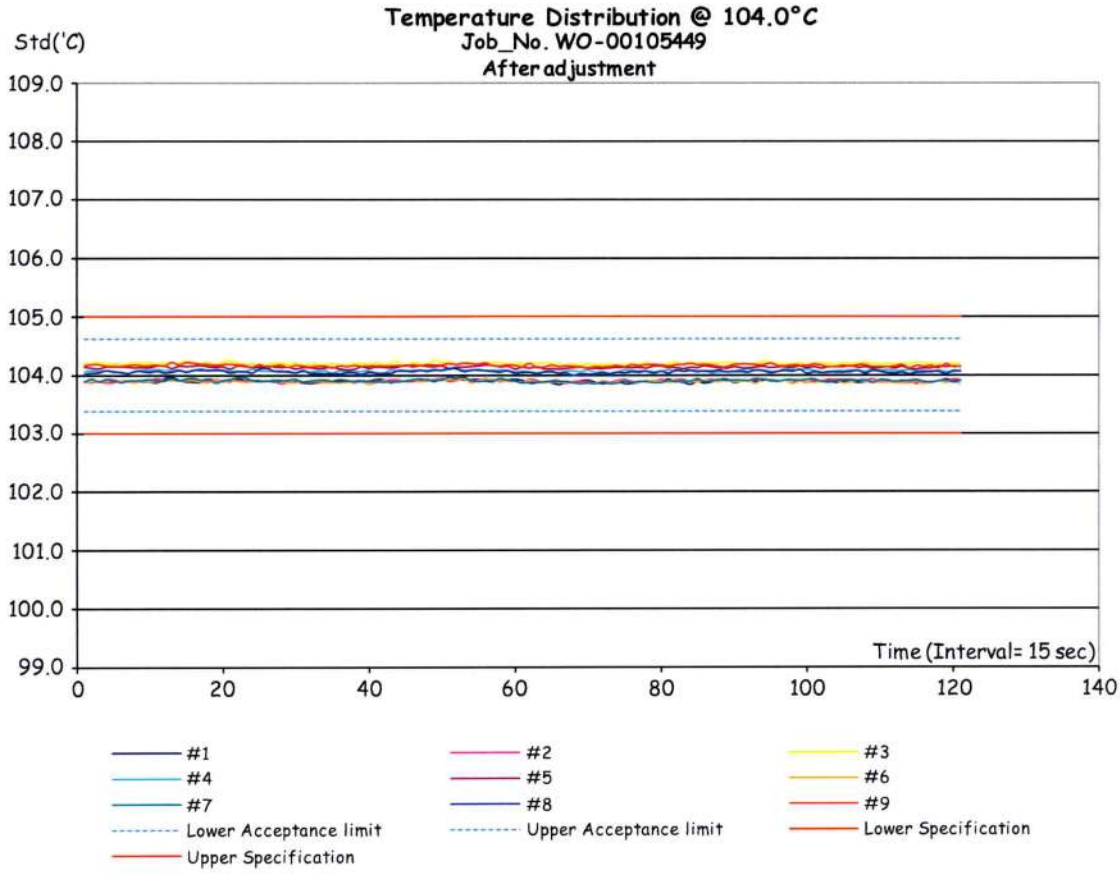
Correction* = Measured Temperature - Desired Temperature

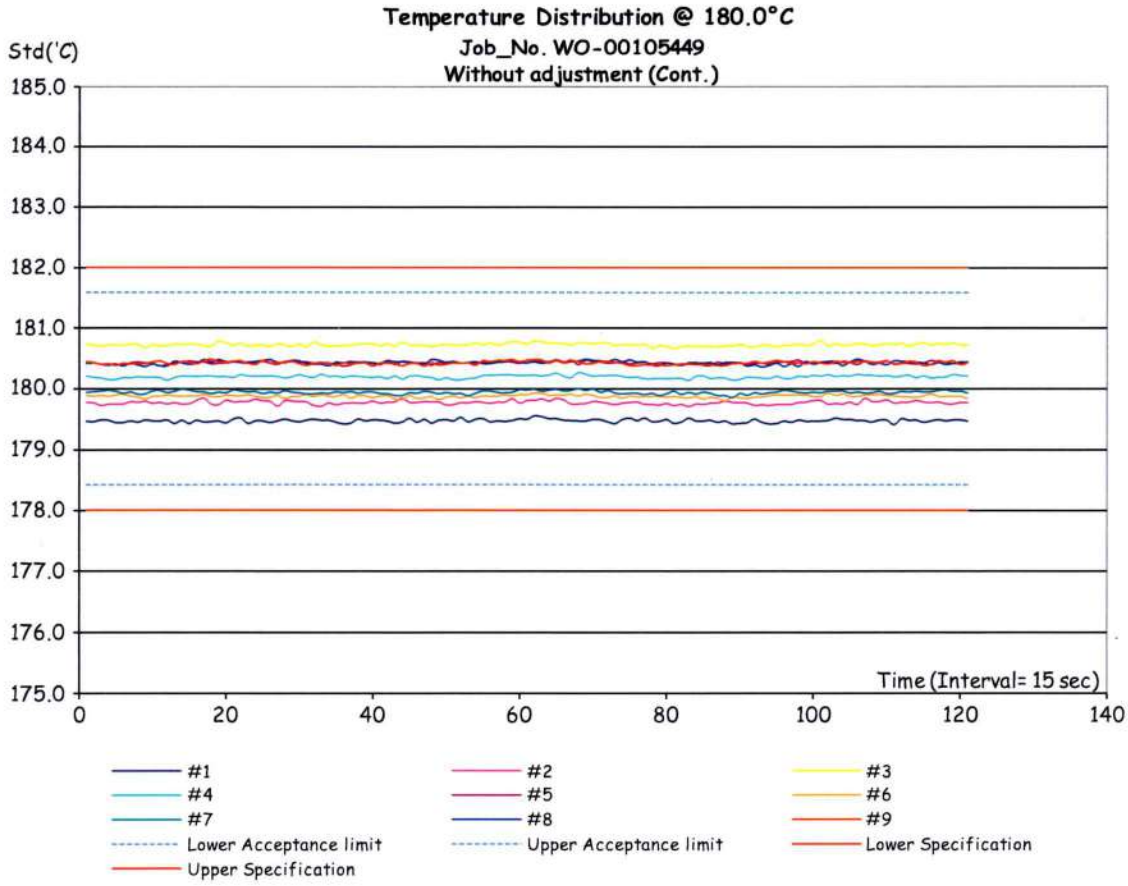
The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity

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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


Corr_Distribution & Max_Measurement Uncertainty
Job_No. WO-00105449
After adjustment
Correction ('C)
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
60.0
80.0
100.0
120.0
140.0
160.0
180.0
200.0
220.0
240.0
UUC ('C)
#1
#2
#3
#4
#5
#6
#7
#8
#9
Uncer (+)
Uncer (-)
Lower Acceptance limit
Upper Acceptance limit
Lower Specification
Upper Specification


Temperature Distribution @ 104.0°C
Job_No. WO-00105449
After adjustment
Std('C)
109.0
108.0
107.0
106.0
105.0
104.0
103.0
102.0
101.0
100.0
99.0
0
20
40
60
80
100
120
140
Time (Interval= 15 sec)
#1
#2
#3
#4
#5
#6
#7
#8
#9
Lower Acceptance limit
Upper Acceptance limit
Lower Specification
Upper Specification


Temperature Distribution @ 180.0°C
Job_No. WO-00105449
Without adjustment (Cont.)
Std('C)
185.0
184.0
183.0
182.0
181.0
180.0
179.0
178.0
177.0
176.0
175.0
0
20
40
60
80
100
120
140
Time (Interval= 15 sec)
#1
#2
#3
#4
#5
#6
#7
#8
#9
Lower Acceptance limit
Upper Acceptance limit
Lower Specification
Upper Specification

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00105449

ชนิดเครื่องมือ: Hot Air Oven รุ่น: UF 55

หมายเลขเครื่อง: B219.0142

ตรวจสอบ (รับ) 09 Feb 2026		รายการตรวจเช็ค	ตรวจสอบ (ส่ง) 09 Feb 2026		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	☑	☐	
☑	☐	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 : _____

_____

[redacted]

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DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
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Delivering Growth – in Asia and Beyond.

Certificate of Calibration

NSC-TISI-TIS 17025
Calibration 0087

Equipment:	Cooled Incubator	Certificate No.:	C31260297
Manufacturer:	Binder	Issued Date:	11 February 2026
Model:	KB 240	Job No.:	WO-00105449
Serial No.:	20180000012164	Ventilation Valve:	None
ID No.:	WW-16-001	Page:	1 of 3
Shelves(pc.):	3		
Condition of the item:	Normal		

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

Environment Condition:

Temperature:	24 °C	±	0.6	°C
Relative Humidity:	49 %	±	5.4	%
Voltage:	227 VAC	±	1.7	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. Sittiphong Lekfu

Calibration Date: 09 February 2026

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. C10250013

[redacted]

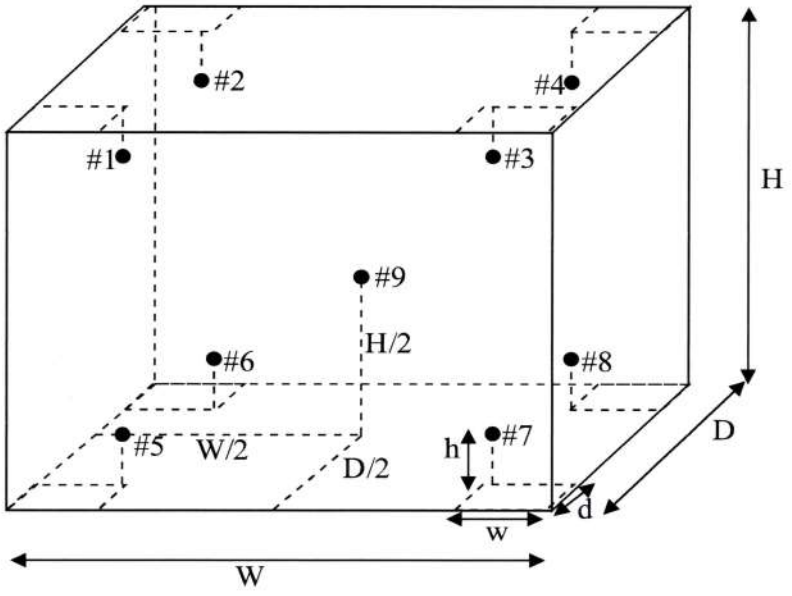
[redacted]

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



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	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.

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	20.06	0.06	0.64
#2	19.96	-0.04	0.82
#3	19.87	-0.13	0.78
#4	20.03	0.03	0.66
#5	20.18	0.18	0.62
#6	19.89	-0.11	0.69
#7	19.97	-0.03	0.62
#8	20.03	0.03	0.56
#9	20.21	0.21	0.60

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	20.06	19.96	19.87	20.03	20.18	19.89	19.97	20.03	20.21	0.82

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20.0	0.62	0.68	1.51

Note: * Maximum uncertainty of the each position

The End of Certificate

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

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

[redacted]

Without adjustment

Desired Temperature : 20.0°C **Tolerances : 1.0 °C**

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

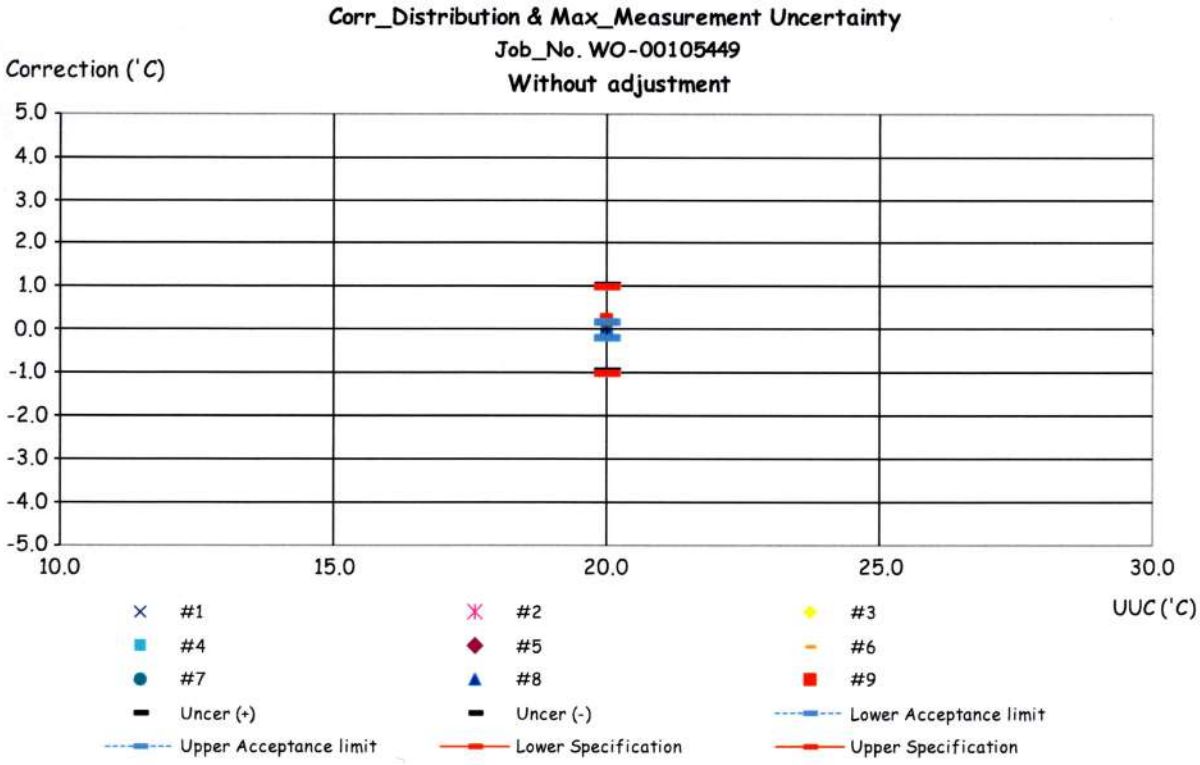
Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	20.06	0.06	0.64	1.0	Pass
#2	19.96	-0.04	0.82	1.0	Pass
#3	19.87	-0.13	0.78	1.0	Pass
#4	20.03	0.03	0.66	1.0	Pass
#5	20.18	0.18	0.62	1.0	Pass
#6	19.89	-0.11	0.69	1.0	Pass
#7	19.97	-0.03	0.62	1.0	Pass
#8	20.03	0.03	0.56	1.0	Pass
#9	20.21	0.21	0.6	1.0	Pass

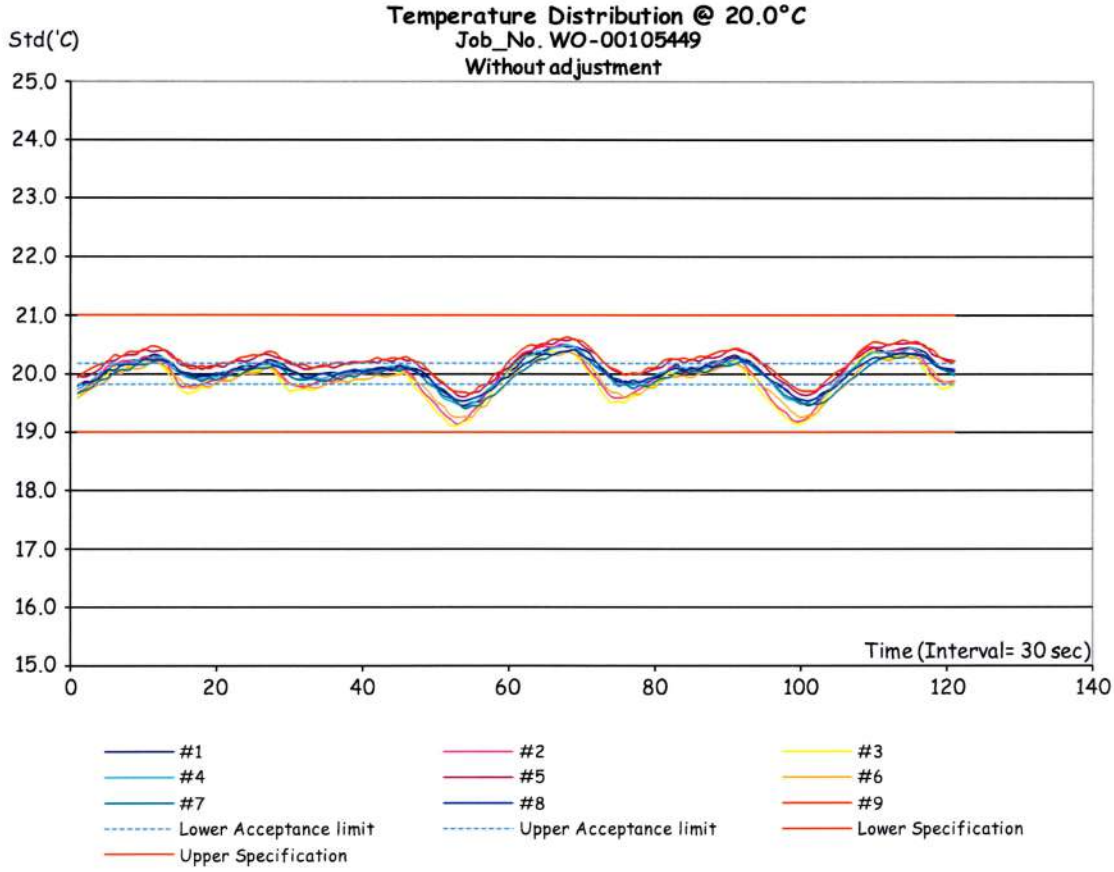
Correction* = Measured Temperature - Desired Temperature

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

The End of Statements of Conformity

บริษัท 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


Corr_Distribution & Max_Measurement Uncertainty
Job_No. WO-00105449
Without adjustment
Correction ('C)
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
10.0
15.0
20.0
25.0
30.0
UUC ('C)
#1
#2
#3
#4
#5
#6
#7
#8
#9
Uncer (+)
Uncer (-)
Lower Acceptance limit
Upper Acceptance limit
Lower Specification
Upper Specification


Temperature Distribution @ 20.0°C
Job_No. WO-00105449
Without adjustment
Std('C)
25.0
24.0
23.0
22.0
21.0
20.0
19.0
18.0
17.0
16.0
15.0
0
20
40
60
80
100
120
140
Time (Interval= 30 sec)
#1
#2
#3
#4
#5
#6
#7
#8
#9
Lower Acceptance limit
Upper Acceptance limit
Lower Specification
Upper Specification

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00105449

ชนิดเครื่องมือ: Cooled Incubator รุ่น: KB 240

หมายเลขเครื่อง: 20180000012164

ตรวจสอบ (รับ) 09 Feb 2026		รายการตรวจเช็ค	ตรวจสอบ (ส่ง) 09 Feb 2026		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 : _____

_____

[redacted]

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

Delivering Growth – in Asia and Beyond.

WK Electric Co.,Ltd.

68/242 Moo 5, Sawaipracharaj Rd., Tumbol Ladsawai, Amphur Lamlukka, Pathumthani 12150 AC-2487
Tel. +66 2993 4773, +66 2153 7132-3 Fax. +66 2994 5509 E-mail : wk.calibrations@gmail.com www.wk-etc.com

Certificate of Calibration

Certificate No.: WK2606-412-976

Customer : C.E.M Technology (Thailand) Co., Ltd
219/43 Moo 12 Phet Kasem Rd, Om Noi,
Krathum Baen District, Samut Sakhon 74130

Instrument	: Portable Turbidity Meter	**Ambient Temperature**	: (25 ± 2) °C
Manufacturer	: BANTE	**Humidity**	: (50 ± 15) %RH
Model	: TB100	**Received Date**	: 09-Jun-26
Serial No.	: 210128-023	**Calibrated Date**	: 11-Jun-26
Identity No.	: N/A	**Issued Date**	: 12-Jun-26
Range	: 0 NTU to 1100 NTU	**Calibrated Location**	: In Lab
Resolution	: 0.01 NTU, 0.1 NTU, 1 NTU		
Calibration Method	: CP-WK-C07		

Reference Standard Instrument :

Instrument	Serial No.	Certificate No.	Due Date	Traceability to
Turbidity Solution	TD10NTU.L5	1202697	17-Mar-27	CPAchem Ltd.
Turbidity Solution	TD20NTU.L5	1202698	17-Mar-27	CPAchem Ltd.
Turbidity Solution	TD100NTU.L5	1202699	17-Mar-27	CPAchem Ltd.
Turbidity Solution	TD500NTU.L5	1202700	17-Mar-27	CPAchem Ltd.
Turbidity Solution	TD800NTU.L5	1202701	17-Mar-27	CPAchem Ltd.
Turbidity Solution	TD1000NTU.L5	1202702	17-Mar-27	CPAchem Ltd.
Platinum Resistance Thermometer	4507	PSL-T 0494/69	06-Mar-27	TISTR

TISTR : Thailand Institute of Scientific and Technological Research.
This result calibrate was found accurate as shown on date and place of calibrate only
This certificate is traceability to the International System of Unit (SI)

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverange factor k = 2 , providing a level of confidence approximately 95 %

Calibrated by : [redacted] **Approved by :** [redacted]

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WK Electric Co.,Ltd.
68/242 Moo 5, Sawaipracharaj Rd., Tumbol Ladsawai, Amphur Lamlukka, Pathumthani 12150
Tel. +66 2993 4773, +66 2153 7132-3 Fax. +66 2994 5509 E-mail : wk.calibrations@gmail.com www.wk-etc.com

Calibration Results

Certificate No. : WK2606-412-976

Calibration Result of the Accuracy

Function : Turbidity Measurement at 25 °C

Resolution : 0.01 NTU, 0.1 NTU, 1 NTU

Unit : NTU

Standard Solution	UUC Reading	Error	Uncertainty (±)
10.00	10.03	0.03	0.051
20.00	20.03	0.03	0.10
100.0	100.2	0.2	0.80
500.0	500.2	0.2	3.0
800.0	800.1	0.1	4.0
1000	1000	0	7.0

(X) Without Adjustment ( ) After Adjustment

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**** End of Certificate****

ARCHEMICA

Certificate of Calibration

Aquion RFIC: Anion (ID#1084)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co.,Ltd.

Aquion **S/N: 221280114**

AS-DV **S/N: 2205880126**

For

C.E.M Tec[redacted]Co., Ltd.

Operator Signature: [redacted] Date: Feb 19-20 ,2026

Applications Chemist

Qualification Report

PM Check list, CM_OQ and PQ

Aquion RFIC: Anion (ID#1084)

(2nd (PM,PQ) / Contact) For

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

PM

Preventive Maintenance

Check List

Dionex Ion Chromatography
Preventive Maintenance Report

Customer Organization	**Name/ Department**
C.E.M Technology (Thailand) Co., Ltd	
Engineer	**Date**
Mr. Teerapat Boonla	19-20/Feb/26

Instrument Detail

Instrument Model	**Application**
Aquion RFIC: Anion (ID#1084)	Anion
Instrument components	**Serial Number**
Aquion	221280114
AS-DV	2205880126

Consumable Detail

Columns	Guard Columns	Suppressors	Concentrators	Etc.
AS18	AG18	ADRS 600		EGC III

Remark:

[redacted]

Perform By Archemica

Customer

Date

General ICS Maintenance Checklist

No.	Description	Result			
Power on & Connection		**Checked**	**Cleaned**	**Replaced**	**N.A.**
1	Instrument power on	☒	-	-	☐
2	Instrument connection	☒	-	-	☐
Injection Valve Rebuild		**Checked**	**Cleaned**	**Replaced**	**N.A.**
3	Rebuilt injection valve 6 port	☒	☐	☐	☐
4	- Rotor seal	☒	☐	☐	☐
5	- Stator face	☒	☐	☐	☐
(Optional) Auxiliary Valve Rebuild		**Checked**	**Cleaned**	**Replaced**	**N.A.**
6	Rebuilt auxiliary valve 0 port	☒	☐	☐	☐
7	- Rotor seal	☒	☐	☐	☐
8	- Stator face	☒	☐	☐	☐
Check Valve Cartridge		**Checked**	**Cleaned**	**Replaced**	**N.A.**
9	Inlet check valve assembly	☒	☐	☐	☐
10	Outlet check valve assembly	☒	☐	☐	☐
11	Verified correct flow orientation	☒	-	-	☐
Pump Piston Rinse Seal, Piston Seal and Piston		**Checked**	**Cleaned**	**Replaced**	**N.A.**
12	Piston rinse seal in *primary* pump head	☒	☐	☐	☐
13	Piston seal in *primary* pump head	☒	☐	☐	☐
14	Piston in *primary* pump head	☒	☐	☐	☐
15	Piston rinse seal in *secondary* pump head	☒	☐	☐	☐
16	Piston seal in *secondary* pump head	☒	☐	☐	☐
17	Piston in *secondary* pump head	☒	☐	☐	☐
Waste Valve and Priming Valve		**Checked**	**Cleaned**	**Replaced**	**N.A.**
18	Waste valve	☒	☐	☐	☐
19	Priming valve	☒	☐	☐	☐
Cell Detector		**Checked**	**Cleaned**	**Replaced**	**N.A.**
20	Check conductivity cell	☒	☐	☐	☐
21	Check electrochemical cell	☐	☐	☐	☒
22	- Working electrode	☐	☐	☐	☒
23	- Reference electrode	☐	☐	☐	☒
24	- Gasket	☐	☐	☐	☒
25	- Cell body	☐	☐	☐	☒
Other		**Checked**	**Cleaned**	**Replaced**	**N.A.**
26	Sample Loop Size 25 ul	☐	☒	☐	☐
27	End-line filter	☒	-	☐	☐
28	Leak sensor	☒	☐	☐	☐
29	Lubricate pump mechanic	☐	☒ Lubricated	-	☐
30	Reconnected liquid lines to the valve	☒	-	-	☐
31	Reconnected liquid lines to pump heads	☒	-	-	☐
32	Primed pump	☒	-	-	☐
33	Checked pump for leaks	☒	-	-	☐
34	Checked gas for leaks	☒	-	-	☐

CM OQ

Chromeleon

Operation Qualification

ThermoFisher SCIENTIFIC

Chromeleon Operational Qualification

General Information

	Computer Name	Version Number:
Instrument Controller:	DESKTOP-32T6H3B	7.3.1 Build 6535
Client:	DESKTOP-32T6H3B	7.3.1.6535
Operator:	IC-User	

Overall Test Result: ***Passed***

Comparison Format:

All Parameters:	Significant Digits:	10

[redacted]

Reviewer's Signature // Date

ThermoFisher
SCIENTIFIC

Chromeleon Operational Qualification, Part 1

Verification of Selected Results

Detection Algorithm:	Cobra
Calibration Type:	Lin, WithOffset
Evaluation Type:	Area
Standard Method:	External
Calibration Mode:	Total

Report Variable	*Peak Name*	*Status*
Offset (c0)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Slope (c1)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Correlation Coeffl.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Variance	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Std. Deviation	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Rel. Std. Dev.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Variance Coeff.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

ThermoFisher
SCIENTIFIC

Chromeleon Operational Qualification, Part 1

Verification of Selected Results

Report Variable	*Peak Name*	*Status*
Calibration Point X	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Calibration Point Y	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Amount [ng]	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Resolution (EP)	Acetanilide	ok
	Acetophenone	ok
Resolution (USP)	Acetanilide	ok
	Acetophenone	ok
Peak Asymmetry (EP/USP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Peak Asymmetry (AIA)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

ThermoFisher
SCIENTIFIC

Chromeleon Operational Qualification, Part 1

Verification of Selected Results

Report Variable	*Peak Name*	*Status*
Theoretical Plates (EP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Theoretical Plates (USP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Theoretical Plates (JP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

Test Result: ***Passed***

ThermoFisher
SCIENTIFIC

Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Detection Algorithm: Cobra
Calibration Type: Lin, WithOffset
Evaluation Type: Area
Standard Method: External
Calibration Mode: Total

Variable Category	*Report Variable*	*Peak Name*	*Status*
Injection	**No.**		ok
	Name		ok
	Type		ok
	Position		ok
	Status		ok
	Volume		ok
	Dilution Factor		ok
	Weight		ok
	IntStd		ok
	InstrumentMethod		ok
	ProcessingMethod		ok
Chromatogram	**Channel**		ok
	No. of Peaks		ok
	Chromatogram Start Time		ok
	Signal Min.		ok
	Signal Max.		ok
	Unit		ok
	Noise		ok
Peak Results	**No.**	Acetanilide	ok
	No.	Acetophenone	ok
	No.	Propiophenone	ok
	Peak Name	Acetanilide	ok
	Peak Name	Acetophenone	ok
	Peak Name	Propiophenone	ok
	Ret.Time	Acetanilide	ok
	Ret.Time	Acetophenone	ok
	Ret.Time	Propiophenone	ok

ThermoFisher
SCIENTIFIC

Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	*Report Variable*	*Peak Name*	*Status*
Peak Results	**Abs.Ret.Dev.**	Acetanilide	ok
	Ret.Dev.(abs)	Acetophenone	ok
	Ret.Dev.(abs)	Propiophenone	ok
	Rel.Ret.Dev.	Acetanilide	ok
	Ret.Dev.(rel)	Acetophenone	ok
	Ret.Dev.(rel)	Propiophenone	ok
	Area	Acetanilide	ok
	Area	Acetophenone	ok
	Area	Propiophenone	ok
	Rel.Area	Acetanilide	ok
	Rel.Area (Total)	Acetophenone	ok
	Rel.Area (Total)	Propiophenone	ok
	Height	Acetanilide	ok
	Height	Acetophenone	ok
	Height	Propiophenone	ok
	Rel.Height (Total)	Acetanilide	ok
	Rel.Height (Total)	Acetophenone	ok
	Rel.Height (Total)	Propiophenone	ok
	Amount	Acetanilide	ok
	Amount	Acetophenone	ok
	Amount	Propiophenone	ok
	Concentration	Acetanilide	ok
	Concentration	Acetophenone	ok
	Concentration	Propiophenone	ok
	Rel.Amount	Acetanilide	ok
	Rel.Amount	Acetophenone	ok
	Rel.Amount	Propiophenone	ok
	Peak Width (0%)	Acetanilide	ok
	Peak Width (0%)	Acetophenone	ok
	Peak Width (0%)	Propiophenone	ok
	Peak Width (5%)	Acetanilide	ok
	Peak Width (5%)	Acetophenone	ok
	Peak Width (5%)	Propiophenone	ok
	Peak Width (10%)	Acetanilide	ok
	Peak Width (10%)	Acetophenone	ok
	Peak Width (10%)	Propiophenone	ok

ThermoFisher
SCIENTIFIC

Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	*Report Variable*	*Peak Name*	*Status*
Peak Results	Peak Width (50%)	Acetanilide	ok
	Peak Width (50%)	Acetophenone	ok
	Peak Width (50%)	Propiophenone	ok
	Left Width (0%)	Acetanilide	ok
	Left Width (0%)	Acetophenone	ok
	Left Width (0%)	Propiophenone	ok
	Right Width (0%)	Acetanilide	ok
	Right Width (0%)	Acetophenone	ok
	Right Width (0%)	Propiophenone	ok
	Peak Start	Acetanilide	ok
	Peak Start	Acetophenone	ok
	Peak Start	Propiophenone	ok
	Peak Stop	Acetanilide	ok
	Peak Stop	Acetophenone	ok
	Peak Stop	Propiophenone	ok
	Peak Start Value	Acetanilide	ok
	Peak Start Value	Acetophenone	ok
	Peak Start Value	Propiophenone	ok
	Peak Stop Value	Acetanilide	ok
	Peak Stop Value	Acetophenone	ok
	Peak Stop Value	Propiophenone	ok
	BL-Value Peak Start	Acetanilide	ok
	BL-Value Peak Start	Acetophenone	ok
	BL-Value Peak Start	Propiophenone	ok
	BL-Value Peak Stop	Acetanilide	ok
	BL-Value Peak Stop	Acetophenone	ok
	BL-Value Peak Stop	Propiophenone	ok
	Type	Acetanilide	ok
	Type	Acetophenone	ok
	Type	Propiophenone	ok
	Resolution (EP)	Acetanilide	ok
	Resolution(EP)	Acetophenone	ok
	Resolution(USP)	Acetanilide	ok
	Resolution(USP)	Acetophenone	ok
	Asymmetry(EP)	Acetanilide	ok
	Asymmetry(EP)	Acetophenone	ok
	Asymmetry(EP)	Propiophenone	ok

ThermoFisher
SCIENTIFIC

Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	*Report Variable*	*Peak Name*	*Status*
Peak Results	Asymmetry(AIA)	Acetanilide	ok
	Asymmetry(AIA)	Acetophenone	ok
	Asymmetry(AIA)	Propiophenone	ok
	Theor. Plates(EP)	Acetanilide	ok
	Theor. Plates(EP)	Acetophenone	ok
	Theor. Plates(EP)	Propiophenone	ok
	Theor. Plates(USP)	Acetanilide	ok
	Theor. Plates(USP)	Acetophenone	ok
	Theor. Plates(USP)	Propiophenone	ok
	Theor.Plates (JP)	Acetanilide	ok
	Theor. Plates(JP)	Acetophenone	ok
	Theor. Plates(JP)	Propiophenone	ok
Peak Calibration	Cal.Mode	Acetanilide	ok
	Cal.Mode	Acetophenone	ok
	Cal.Mode	Propiophenone	ok
	Cal.Type	Acetanilide	ok
	Cal.Type	Acetophenone	ok
	Cal.Type	Propiophenone	ok
	Weights	Acetanilide	ok
	Weights	Acetophenone	ok
	Weights	Propiophenone	ok
	Calibr. Coefficient C0	Acetanilide	ok
	Calibr. Coefficient C0	Acetophenone	ok
	Calibr. Coefficient C0	Propiophenone	ok
	Calibr. Coefficient C1	Acetanilide	ok
	Calibr. Coefficient C1	Acetophenone	ok
	Calibr. Coefficient C1	Propiophenone	ok
	RF-Value	Acetanilide	ok
	RF-Value	Acetophenone	ok
	RF-Value	Propiophenone	ok
	No. of Points	Acetanilide	ok
	No. of Points	Acetophenone	ok

ThermoFisher
SCIENTIFIC

Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	*Report Variable*	*Peak Name*	*Status*
Peak Calibration	**No. of Points**	Propiophenone	ok
	No. of Points(disabled)	Acetanilide	ok
	No. of Points(disabled)	Acetophenone	ok
	No. of Points(disabled)	Propiophenone	ok
	Variance	Acetanilide	ok
	Variance	Acetophenone	ok
	Variance	Propiophenone	ok
	Var.Coeff	Acetanilide	ok
	Var.Coeff	Acetophenone	ok
	Var.Coeff	Propiophenone	ok
	Std.Dev.	Acetanilide	ok
	Std.Dev.	Acetophenone	ok
	Std.Dev.	Propiophenone	ok
	Rel.Std.Dev.	Acetanilide	ok
	Rel.Std.Dev.	Acetophenone	ok
	Rel.Std.Dev.	Propiophenone	ok
	Corr.Coeff.	Acetanilide	ok
	Corr.Coeff.	Acetophenone	ok
	Corr.Coeff.	Propiophenone	ok
	R-Square	Acetanilide	ok
	R-Square	Acetophenone	ok
	R-Square	Propiophenone	ok
	Adj. R-Square	Acetanilide	ok
	Adj. R-Square	Acetophenone	ok
	Adj. R-Square	Propiophenone	ok
	X	Acetanilide	ok
	X	Acetophenone	ok
	X	Propiophenone	ok
	Y	Acetanilide	ok
	Y	Acetophenone	ok
	Y	Propiophenone	ok
	W	Acetanilide	ok
	W	Acetophenone	ok
	W	Propiophenone	ok
	F(X)	Acetanilide	ok
	F(X)	Acetophenone	ok
	F(X)	Propiophenone	ok

ThermoFisher
SCIENTIFIC

Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	*Report Variable*	*Peak Name*	*Status*
Peak Calibration	**Residual for Cal.Point X**	Acetanilide	ok
	Residual for Cal.Point X	Acetophenone	ok
	Residual for Cal.Point X	Propiophenone	ok
	Calibration Point Status	Acetanilide	ok
	Calibration Point Status	Acetophenone	ok
	Calibration Point Status	Propiophenone	ok
	Amount	Acetanilide	ok
	Amount	Acetophenone	ok
	Amount	Propiophenone	ok
Component	**Cal.Type**	Acetanilide	ok
	Peak Type	Acetanilide	ok
	Left Limit	Acetophenone	ok
	Right Limit	Acetanilide	ok
	Group	Acetanilide	ok
	Factor	Acetophenone	ok
	Amount	Acetanilide	ok
	Conc.Unit	Acetophenone	ok

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Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	*Report Variable*	*Peak Name*	*Status*
Peak Purity	**PPI**	Acetanilide	ok
	PPI	Acetophenone	ok
	PPI	Propiophenone	ok
	RSD PPI	Acetanilide	ok
	RSD PPI	Acetophenone	ok
	RSD PPI	Propiophenone	ok
	Match	Acetanilide	ok
	Match	Acetophenone	ok
	Match	Propiophenone	ok
	RSD Match	Acetanilide	ok
	RSD Match	Acetophenone	ok
	RSD Match	Propiophenone	ok
	Rel.Max at	Acetanilide	ok
	Rel.Max at	Acetophenone	ok
	Rel.Max at	Propiophenone	ok

Test Result: ***Passed***

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Chromeleon Operational Qualification, Part 3

System Suitability Test: Comparison with Expected Results

Variable Category	*Report Variable*	*Status*
System Suitability Test Case	Number	ok
	Name	ok
	Inj.Condition	ok
	Eval. Formula	ok
	Operator	ok
	Statistics	ok
	Rounding	ok
	MinimumNumberOfInjections	ok
	MaximumNumberOfInjections	ok
	Channel	ok
	Peak	ok
	Ref. Value Formula 1	ok
	Ref. Value Formula 2	ok
	N.A.	ok
System Suitability Test Case Result	Inj. Eval. Result	ok
	Eval. Result	ok
	Peak Result	ok
	Injection Condition Result	ok
	Ref. Value 1	ok
	Ref. Value 2	ok
	Result	ok
	Message	ok
	Average	ok
	Count	ok
	Maximum	ok
	Minimum	ok
	Range	ok
	Rel. Range	ok
	Rel. Std. Dev.	ok
	Std. Dev.	ok
	Sum	ok

Test Result: ***Passed***

PQ

Performance Qualification

Service Summary

These IQOQ Results should be reviewed by the Customer. If the IQOQ is accepted, both the Customer and the Service Representative should sign the IQOQ Results, below.

IQOQ Results

Based upon the actual results obtained, this IQOQ **PASSED** the acceptance criteria described in the Installation Qualification and Operational Qualification procedure.

Service Representative

A Field Service Representative signature below confirms the completion of all aspects of the Installation Qualification and Operational Qualification and have concluded that the system has been successfully verified to be operating as required.

Customer

A Customer signature below confirms the completion of all aspects of the Installation Qualification and Operational Qualification have been completed and that the system has been successfully verified to be operating as required.

[redacted]

	Date: 19/Feb/26
Customer	
Signature:	**Date:**

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Service Details

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System Repeatability OQ Autosampler AS-DV 1 Test 1	PASSED
Carryover OQ Autosampler AS-DV 1 Test 1	PASSED
Flow Rate Repeatability OQ Pump Aquion 1 Test 1	PASSED
Noise Drift OQ Detector (Aquion CD) Conductivity Detector 1 Test 1	PASSED
Detector Linearity OQ Detector (Aquion CD) Conductivity Detector 1 Test 1	PASSED
EG Current OQ IC EG Aquion RFIC 1 Test 1	PASSED
Service Review and Completion	PASSED

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Document Generation

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This document was generated based on the system configuration being qualified.	RPGReports
Application Version	V3.4.8.0
Database Version	02.07.2025.001
Document Generated	09 - Mar - 2026
Service Representative Name	teerapat.b

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Introduction

Documented evidence must be provided to demonstrate the integrity of data collected and validate the results obtained on laboratory instrumentation.

Many laboratories achieve this by formal quality systems, which are generally implemented in accordance with one or more of the following recognized quality standards and other quality guidelines:

- Good Laboratory Practice (GLP)
- Current Good Manufacturing Practice (cGMP)
- International Organization for Standardization (ISO) guidelines
- United States Pharmacopeia (USP)

These standards are written in broad terms, to make them as widely applicable as possible. All stipulate general requirements specifying instruments must be fit for purpose, properly maintained, and calibrated to national or international standards. The procedure used for the Thermo Fisher Scientific qualification methodology is adapted to these standards.

This qualification is intended to be performed only by trained and certified individuals. This report was created for a Thermo Scientific system using the RPG Reports software.

Reference Documents

- Site Preparation Document(s)
- Individual Component Manuals
- Factory Installation Procedures

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Test Equipment and Standards

ThermoFisher SCIENTIFIC

Test Equipment

Equipment	Manufacturer	Model	Serial Number	Cal Ver Date	Good Until
IC Qualification	Thermo Scientific	Test Box II	22109053	n/a	n/a
Multimeter	FLUKE	289	32320105	n/a	n/a
Thermocouple	FLUKE	K Type	32320105	n/a	n/a

Test Standards and Solvents

Description	Manufacturer	Conc. / Grade	Part Number	Lot Number	Expiration Date
Nitrate	Thermo Scientific	5	060254	250414	Apr2026
Nitrate	Thermo Scientific	10	060254	250414	Apr2026
Nitrate	Thermo Scientific	25	060254	250414	Apr2026
Nitrate	Thermo Scientific	50	060254	250414	Apr2026
Nitrate	Thermo Scientific	100	060254	250414	Apr2026
Nitrate	Thermo Scientific	1000	060254	250414	Apr2026

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Autosampler Information

Autosampler Model	AS-DV
Serial Number	2205880126
Firmware Version	1.6.0
Instrument Assigned	Instrument 1
Tray Type	N/A
Syringe Volume	N/A
Loop Volume	25 µL
Connection	USB
Powered On Successfully?	Yes

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System Repeatability OQ Autosampler AS-DV 1 Test 1

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System Information

Model	AS-DV	Acquisition Date	N/A
Serial Number	2205880126	Sequence	N/A
System Name	N/A		
Test Configuration	Default		

Data Entry Mode

Data Entry Mode	Import

Peak Results

Sample Name	Injection Volume (uL)	Retention Time (min)	Area (µS*min)
Repeatability 1	25	0.185	2.512
Repeatability 2	25	0.1833	2.531
Repeatability 3	25	0.1833	2.528
Repeatability 4	25	0.185	2.554
Repeatability 5	25	0.1833	2.558
Repeatability 6	25	0.1833	2.555

Repeatability Results

Test	Measured	OQ Limit	Result
Retention Time Result	0.5 % RSD	≤ 5.0 % RSD	PASSED
Area Result	0.7 % RSD	≤ 1.0 % RSD	PASSED

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Carryover OQ Autosampler AS-DV 1 Test 1

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System Information

Model	AS-DV	Acquisition Date	N/A
Serial Number	2205880126	Sequence	N/A
System Name	N/A		
Test Configuration	Default		

Data Entry Mode

Data Entry Mode	Import

Peak Results

	Sample Name	Injection Volume (uL)	Retention Time (min)	Area (µS*min)
Blank	Carry over	25	0.185	0.021
High	Hight	25	0.1833	43.512
Carryover	Carry over	25	0.1833	0.02

Carryover Area Results

Test	Measured	OQ Limit	Result
Carryover Area Result	0.00 %	≤ 0.10 %	PASSED

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Pump Information

Pump Model	Aquion
Serial Number	221280114
Firmware Version	3.1.0
Pump Position	Single Unit
Seal Type	Normal Phase
Pressure Units	psi
Connection	USB
Powered On Successfully?	Yes

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Flow Rate Repeatability OQ Pump Aquion 1 Test 1

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System Information

Model	Aquion	Acquisition Date	N/A
Serial Number	221280114	Sequence	N/A
System Name	N/A	Pump Position	Single Unit
Test Configuration	Default		

Data Entry Mode

Data Entry Mode	Import

Peak Results

Sample Name	Injection Volume (uL)	Retention Time (min)
Repeatability 1	25	0.185
Repeatability 2	25	0.1833
Repeatability 3	25	0.1833
Repeatability 4	25	0.185
Repeatability 5	25	0.1833
Repeatability 6	25	0.1833

Repeatability Results

Test	Measured	OQ Limit	Result
Retention Time Result	0.5 % RSD	≤ 5.0 % RSD	PASSED

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Detector (Aquion CD) Conductivity Detector 1

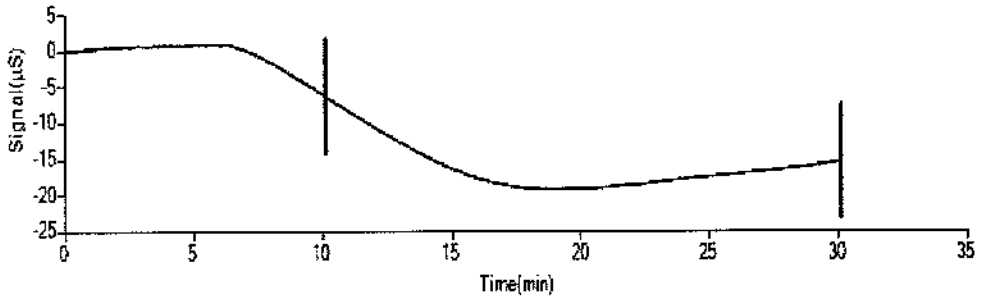
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Detector Information

Detector Model	Aquion CD
Serial Number	221260053
Powered On Successfully?	Yes

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Noise Drift OQ Detector (Aquion CD) Conductivity Detector 1 Test 1



System Information

Model	Aquion CD	Acquisition Date	N/A
Serial Number	221260053	Sequence	N/A
System Name	N/A		
Test Configuration	Default		

Data Entry Mode

Data Entry Mode	Import

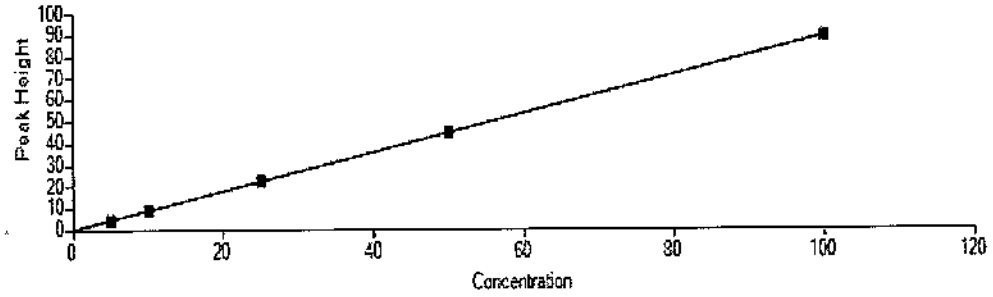
Noise Drift Results

Test	Measured	OQ Limit	Result	Conversion Factor
Noise Result	0.1 nS	≤ 2.0 nS	PASSED	1000
Drift Result	17.7 nS/hr	≤ 20.0 nS/hr	PASSED	1000

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Detector Linearity OQ Detector (Aquion CD)
Conductivity Detector 1 Test 1

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System Information

Model	Aquion CD	Acquisition Date	N/A
Serial Number	221260053	Sequence	N/A
System Name	N/A		
Test Configuration	Default		

Data Entry Mode

Data Entry Mode	Import

Peak Results

Sample Name	Concentration (ppm)	Peak Height (µS)	Calculated
Detector Linear	5	4.868	4.983897
Detector Linear	10	9.29	9.945030
Detector Linear	25	22.754	25.050568
Detector Linear	50	45.04	50.053690
Detector Linear	100	89.529	99.966815

Linearity Results

Test	Measured	OQ Limit	Result
R^2	1.000	≥ 0.999	PASSED

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EG Information

Model	Aquion RFIC
Serial Number	221280114
Firmware Version	3.1.0
Cartridge Type	EGC III KOH
Instrument Assigned	Instrument 1
Connection	USB
Powered On Successfully?	Yes

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EG Current OQ IC EG Aquion RFIC 1 Test 1

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System Information

Model	Aquion RFIC	Acquisition Date	
Serial Number	221280114	Sequence	
System Name			
Test Configuration	KOH - Analytical		

Current Results

Set Point	Expected Result	Reading	Deviation	OQ Limit	Result
1.00 mM	1.61 mA	1.6100 mA	0.00 mA	± 0.01 mA	PASSED
5.00 mM	8.04 mA	8.0400 mA	0.00 mA	± 0.05 mA	PASSED
10.00 mM	16.08 mA	16.0800 mA	0.00 mA	± 0.10 mA	PASSED
50.00 mM	80.41 mA	80.4200 mA	0.01 mA	± 0.50 mA	PASSED
100.00 mM	160.81 mA	160.8300 mA	0.02 mA	± 1.00 mA	PASSED

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Service Review and Completion

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Service Results:
PASSED
This assessment was completed by a certified Service Representative after reviewing all performed service, including any testing performed per approved procedures, as documented in this report.The assessment is done prior to the generation of the final report, and does not preclude the customer's ultimate acceptance of this report.

Comments

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Certificate

Certificate of Standards and Instruments for Qualification

Certificate of Analysis

Dionex Nitrate OQ/PQ IC Standards Kit
(Set of 6)

Product Number 060254
Certificate of Analysis

Lot Number 250414

Expiration of Certification
April 2026

The Dionex Nitrate Standard was developed to aid the analysis of anions by Ion Chromatography (IC). The single-ion standard was prepared by the dissolution of high-purity salt in ≥18.2 megohm deionized water, which was tested by IC for ionic contaminants. The bottle label states the nominal concentration value of the ionic component for informational purposes only. The actual ion concentration value was determined by Ion Chromatography. The IC system was standardized using the National Institute of Standards & Technology (NIST), Standard Reference Material, SRM 3185 (Nitrate Standard Solution). Actual concentration values determined for the single-ion is listed below.

Dionex Nitrate Standard

Vial #	Concentration (mg/L)	
1	5.10	± 0.03
2	10.15	± 0.04
3	25.49	± 0.05
4	50.03	± 0.06
5	99.7	± 0.3
6	993	± 18

[redacted]

The concentration value is based a proven reliable method of analysis. The estimated uncertainties are two standard deviations of the concentration value. The concentration value is warranted to be stable for one year from the date of manufacture.

The preparation and analyses of the Dionex Nitrate Standard was performed with extreme care by Thermo Scientific Corporation Consumables Manufacturing Department in Sunnyvale California.

Document No. 078690-01 20-Dec-2011

Learn more at **thermofisher.com/documents**

thermoscientific

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CALIBRATION 0312

CERTIFICATE OF CALIBRATION

Certificate No : EL251725
Job No : 25120018

Customer Name. : Archemica Lab Co., Ltd.
Customer Address. : 39 Soi Sukhumvit 63 (Ekamai)
: Sukhumvit Rd.,North Klongton,
: Wattana , Bangkok 10110
Instrument Description. : TRUE RMS MULTIMETER
Manufacturer. : FLUKE
Model No. : 289
Serial Number. : 32320105

Received Date : 08 Dec 2025
Calibrated Date : 09 Dec 2025
Issued Date : 09 Dec 2025

Tag No : -
Service : -
Condition As Received : Used

Calibration Procedure.
Calibration were conducted using in-house calibration procedure according to direct measurement with reference standard.

Procedure No.
CP-EL-01, 02, 03, 04, 05, 06, 07, 10.

Comment.
-

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ARCHEMICA LAB CO.,LTD
Teerapon R. 11/19/Feb/26

Reference Standards Instrument.

Instrument Name	Model	Serial No.	Cert. No.	Due Date.
Multi-Function Calibrator	Fluke 5500A	9395005	E2U2500317	05 Nov 2026
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Traceability Information.
- Traceable to the International System of Units (SI) through the National Institute of Metrology (Thailand), NIMT.

Environmental Conditions.
Temperature : (23 +/- 3) °C Relative Humidity : (50 +/- 15) %

Calibration Information.
- The result of calibration was found accurate as show on date and place of calibration only.
- The reported uncertainty of measurement is based on standard uncertainty multiplied by a coverage factor $k = 2$, providing confidence level of approximately 95%.

Calibrated by : [redacted]

This certificate may not be re
from the calibration organizatio

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CERTIFICATE OF CALIBRATION

Range		Standard Value			UUC*Reading	Error	(±) Uncertainty
Function : DC Voltage Measurement (Without Adjustment)							
50	mV	0.0000 mV			0.000 mV	0.000 mV	0.0027 mV
50	mV	5.0000 mV			4.991 mV	-0.009 mV	0.0029 mV
50	mV	45.0000 mV			44.991 mV	-0.009 mV	0.0047 mV
50	mV	-45.0000 mV			-45.011 mV	-0.011 mV	0.0047 mV
500	mV	50.0000 mV			50.00 mV	0.00 mV	0.0076 mV
500	mV	450.000 mV			449.96 mV	-0.04 mV	0.023 mV
500	mV	-450.000 mV			-450.01 mV	-0.01 mV	0.023 mV
5	V	0.500000 V			0.5000 V	0.0000 V	0.000063 V
5	V	4.50000 V			4.4998 V	-0.0002 V	0.00023 V
5	V	-4.50000 V			-4.4996 V	0.0004 V	0.00023 V
50	V	5.00000 V			5.000 V	0.000 V	0.00063 V
50	V	-5.00000 V			-5.000 V	0.000 V	0.00063 V
50	V	25.00000 V			25.000 V	0.000 V	0.0012 V
50	V	45.0000 V			44.999 V	-0.001 V	0.0024 V
50	V	-45.0000 V			-44.998 V	0.002 V	0.0024 V
500	V	50.0000 V			50.00 V	0.00 V	0.0063 V
500	V	450.000 V			449.99 V	-0.01 V	0.022 V
500	V	-450.000 V			-449.98 V	0.02 V	0.022 V
1000	V	100.0000 V			100.0 V	0.0 V	0.058 V
1000	V	900.000 V			899.9 V	-0.1 V	0.070 V
1000	V	-900.000 V			-899.9 V	0.1 V	0.070 V
Function : DC Voltage Measurement LoZ (Without Adjustment)							
1000	V	0.0000000 V			0.0 V	0.0 V	0.058 V
1000	V	100.0000 V			100.0 V	0.0 V	0.058 V
1000	V	900.000 V			900.5 V	0.5 V	0.070 V
1000	V	-900.000 V			-900.5 V	-0.5 V	0.070 V
Function : AC Voltage Measurement (Without Adjustment)							
50	mV	5.000 mV	50	Hz	4.993 mV	-0.007 mV	0.022 mV
50	mV	45.000 mV	50	Hz	44.997 mV	-0.003 mV	0.033 mV
50	mV	45.000 mV	1	kHz	44.99 mV	-0.01 mV	0.034 mV
500	mV	50.000 mV	50	Hz	49.99 mV	-0.01 mV	0.036 mV
500	mV	450.00 mV	50	Hz	449.98 mV	-0.02 mV	0.16 mV
500	mV	450.00 mV	1	kHz	449.87 mV	-0.13 mV	0.16 mV
5	V	0.50000 V	50	Hz	0.4999 V	-0.0001 V	0.00018 V
5	V	4.5000 V	50	Hz	4.5022 V	0.0022 V	0.0019 V
5	V	4.5000 V	1	kHz	4.5012 V	0.0012 V	0.0019 V
50	V	5.0000 V	50	Hz	5.009 V	0.009 V	0.0021 V
50	V	25.0000 V	50	Hz	25.018 V	0.018 V	0.0083 V
50	V	45.000 V	50	Hz	45.031 V	0.031 V	0.023 V
50	V	45.000 V	1	kHz	45.020 V	0.020 V	0.023 V
500	V	50.000 V	50	Hz	50.00 V	0.00 V	0.026 V
500	V	450.00 V	50	Hz	450.26 V	0.26 V	0.24 V
500	V	450.00 V	1	kHz	450.17 V	0.17 V	0.24 V
1000	V	100.000 V	50	Hz	100.0 V	0.0 V	0.073 V
1000	V	900.00 V	50	Hz	900.5	[redacted]	

Remark : (*) UUC : Unit Under Calibration

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CALIBRATION 0312

CERTIFICATE OF CALIBRATION

Range	Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : AC Voltage Measurement LoZ (Without Adjustment)				
1000 V	100.000 V 50 Hz	100.3 V	0.3 V	0.073 V
1000 V	900.00 V 50 Hz	904.2 V	4.2 V	0.42 V
Function : DC Current Measurement (Without Adjustment)				
500 uA	0.00 uA	0.00 uA	0.00 uA	0.040 uA
500 uA	50.00 uA	50.02 uA	0.02 uA	0.045 uA
500 uA	450.00 uA	450.00 uA	0.00 uA	0.085 uA
5000 uA	500.00 uA	500.0 uA	0.0 uA	0.11 uA
5000 uA	4500.0 uA	4499.6 uA	-0.4 uA	0.57 uA
50 mA	5.0000 mA	5.000 mA	0.000 mA	0.00082 mA
50 mA	45.000 mA	44.995 mA	-0.005 mA	0.0061 mA
400 mA	40.000 mA	39.99 mA	-0.01 mA	0.0081 mA
400 mA	200.000 mA	199.96 mA	-0.04 mA	0.019 mA
400 mA	360.00 mA	359.96 mA	-0.04 mA	0.12 mA
400 mA	-360.00 mA	-359.94 mA	0.06 mA	0.12 mA
5 A	0.50000 A	0.4999 A	-0.0001 A	0.00017 A
5 A	4.5000 A	4.5010 A	0.0010 A	0.0024 A
10 A	1.00000 A	1.000 A	0.000 A	0.00064 A
10 A	9.0000 A	9.001 A	0.001 A	0.0045 A
Function : AC Current Measurement (Without Adjustment)				
500 uA	50.00 uA 50 Hz	49.96 uA	-0.04 uA	0.25 uA
500 uA	450.0 uA 50 Hz	449.63 uA	-0.37 uA	0.59 uA
500 uA	450.0 uA 1 kHz	449.86 uA	-0.14 uA	0.59 uA
5000 uA	500.0 uA 50 Hz	500.0 uA	0.0 uA	0.63 uA
5000 uA	4500. uA 50 Hz	4499.9 uA	-0.1 uA	5.5 uA
5000 uA	4500. uA 1 kHz	4500.3 uA	0.3 uA	5.5 uA
50 mA	5.000 mA 50 Hz	4.991 mA	-0.009 mA	0.0059 mA
50 mA	45.00 mA 50 Hz	44.955 mA	-0.045 mA	0.055 mA
50 mA	45.00 mA 1 kHz	44.963 mA	-0.037 mA	0.055 mA
400 mA	40.00 mA 50 Hz	40.00 mA	0.00 mA	0.052 mA
400 mA	200.00 mA 50 Hz	199.93 mA	-0.07 mA	0.17 mA
400 mA	360.00 mA 50 Hz	359.92 mA	-0.08 mA	0.52 mA
400 mA	360.00 mA 1 kHz	360.08 mA	0.08 mA	0.52 mA
5 A	0.50000 A 50 Hz	0.4991 A	-0.0009 A	0.00063 A
5 A	4.5000 A 50 Hz	4.4986 A	-0.0014 A	0.0038 A
5 A	4.5000 A 1 kHz	4.4998 A	-0.0002 A	0.014 A
10 A	1.00000 A 50 Hz	1.000 A	0.000 A	0.0012 A
10 A	9.0000 A 50 Hz	9.001 A	0.001 A	0.0059 A
10 A	9.0000 A 1 kHz			

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Remark : (*) UUC : Unit Under Calibration

[redacted]

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CALIBRATION 0312

CERTIFICATE OF CALIBRATION

Range		Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : Resistance Measurement (Without Adjustment)					
500	Ω	0.000 Ω	0.00 Ω	0.00 Ω	0.0085 Ω
500	Ω	50.000 Ω	50.05 Ω	0.05 Ω	0.017 Ω
500	Ω	450.00 Ω	449.96 Ω	-0.04 Ω	0.079 Ω
5	kΩ	0.50000 kΩ	0.4999 kΩ	-0.0001 kΩ	0.00010 kΩ
5	kΩ	4.5000 kΩ	4.4991 kΩ	-0.0009 kΩ	0.00079 kΩ
50	kΩ	5.0000 kΩ	5.000 kΩ	0.000 kΩ	0.0010 kΩ
50	kΩ	45.000 kΩ	45.000 kΩ	0.000 kΩ	0.0086 kΩ
500	kΩ	50.000 kΩ	50.01 kΩ	0.01 kΩ	0.011 kΩ
500	kΩ	450.00 kΩ	449.77 kΩ	-0.23 kΩ	0.096 kΩ
5	M Ω	0.50000 M Ω	0.4996 M Ω	-0.0004 M Ω	0.00012 M Ω
5	M Ω	4.5000 M Ω	4.4972 M Ω	-0.0028 M Ω	0.0026 M Ω
30	M Ω	3.00000 M Ω	2.998 M Ω	-0.002 M Ω	0.00070 M Ω
30	M Ω	27.0000 M Ω	26.964 M Ω	-0.036 M Ω	0.022 M Ω
50	M Ω	5.0000 M Ω	4.99 M Ω	-0.01 M Ω	0.0064 M Ω
50	M Ω	45.000 M Ω	44.92 M Ω	-0.08 M Ω	0.18 M Ω
100	M Ω	10.0000 M Ω	10.0 M Ω	0.0 M Ω	0.058 M Ω
100	M Ω	90.000 M Ω	89.7 M Ω	-0.3 M Ω	0.36 M Ω
500	M Ω	150.000 M Ω	149.4 M Ω	-0.6 M Ω	0.60 M Ω
500	M Ω	330.000 M Ω	327.4 M Ω	-2.6 M Ω	4.4 M Ω
Function : Resistance Measurement LoΩ (Without Adjustment)					
50	Ω	0.000 Ω	0.000 Ω	0.000 Ω	0.0063 Ω
50	Ω	5.000 Ω	5.003 Ω	0.003 Ω	0.0067 Ω
50	Ω	25.000 Ω	25.004 Ω	0.004 Ω	0.014 Ω
50	Ω	45.000 Ω	45.009 Ω	0.009 Ω	0.015 Ω
Function : Capacitance Measurement (Without Adjustment)					
1	nF	0.0000 nF	0.000 nF	0.000 nF	0.0078 nF
1	nF	0.5000 nF	0.499 nF	-0.001 nF	0.0098 nF
1	nF	0.9000 nF	0.899 nF	-0.001 nF	0.012 nF
10	nF	1.0000 nF	1.00 nF	0.00 nF	0.013 nF
10	nF	9.000 nF	9.00 nF	0.00 nF	0.044 nF
100	nF	10.000 nF	10.0 nF	0.0 nF	0.075 nF
100	nF	90.00 nF	90.1 nF	0.1 nF	0.29 nF
1	uF	0.10000 uF	0.100 uF	0.000 uF	0.00064 uF
1	uF	0.9000 uF	0.900 uF	0.000 uF	0.0029 uF
10	uF	1.0000 uF	1.00 uF	0.00 uF	0.0064 uF
10	uF	9.000 uF	9.00 uF	0.00 uF	0.033 uF
100	uF	10.000 uF	10.0 uF	0.0 uF	0.068 uF
100	uF	90.00 uF	90.0 uF	0.0 uF	0.44 uF
1000	uF	100.00 uF	100 uF	0 uF	0.75 uF
1000	uF	900.0 uF	899 uF	-1 uF	7.3 uF
10	mF	1.0 mF	1.00 mF	0.00 mF	0.0099 mF

Remark : (*) UUC : Unit Under Calibration

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ARCHEMICA LAB CO.,LTD.

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SYSTRONICS INSLAB COMPANY LIMITED
19/11-12, Sukhumvit Rd., Nernphra, Muang Rayong, Rayong 21150, Thailand
Tel.+66(38) 694 145-8, Email : calibration@systronics.co.th

NSC - TISI - TIS 17025
CALIBRATION 0312

CERTIFICATE OF CALIBRATION

Certificate No. EL251725

Range	Standard Value		UUC*Reading	Error	(±) Uncertainty
Function : Frequency Measurement (Without Adjustment)					
100 Hz	10.00 Hz	@ 1 V	10.000 Hz	0.000 Hz	0.0012 Hz
100 Hz	90.00 Hz	@ 1 V	90.000 Hz	0.000 Hz	0.0026 Hz
1000 Hz	100.00 Hz	@ 1 V	100.00 Hz	0.00 Hz	0.0064 Hz
1000 Hz	900.0 Hz	@ 1 V	900.00 Hz	0.00 Hz	0.020 Hz
10 kHz	1.0000 kHz	@ 1 V	1.0000 kHz	0.0000 kHz	0.000062 kHz
10 kHz	9.000 kHz	@ 1 V	9.0000 kHz	0.0000 kHz	0.00019 kHz
100 kHz	10.000 kHz	@ 1 V	10.000 kHz	0.000 kHz	0.00061 kHz
100 kHz	90.00 kHz	@ 1 V	90.000 kHz	0.000 kHz	0.0019 kHz
1000 kHz	100.00 kHz	@ 1 V	100.00 kHz	0.00 kHz	0.0061 kHz
1000 kHz	500.0 kHz	@ 1 V	500.00 kHz	0.00 kHz	0.012 kHz

Range	Standard Value	Required UUC*Reading	UUC*Reading	Error	(±) Uncertainty
Function : Thermocouple Measurement K Type (Without Adjustment)					
-200 to 1350 °C	-5.550 mV	-180.0 °C	-179.6 °C	0.4 °C	0.40 °C
-200 to 1350 °C	0.000 mV	0.0 °C	0.2 °C	0.2 °C	0.25 °C
-200 to 1350 °C	4.096 mV	100.0 °C	100.2 °C	0.2 °C	0.22 °C
-200 to 1350 °C	24.905 mV	600.0 °C	600.2 °C	0.2 °C	0.23 °C
-200 to 1350 °C	37.326 mV	900.0 °C	900.2 °C	0.2 °C	0.24 °C
-200 to 1350 °C	48.838 mV	1200.0 °C	1200.2 °C	0.2 °C	0.26 °C

Remark : (*) UUC : Unit Under Calibration

END OF CALIBRATION

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SYSTRONICS INSLAB COMPANY LIMITED
19/11-12, Sukhumvit Rd., Nernphra, Muang Rayong, Rayong 21150, Thailand
Tel.+66(38) 694 145-8, Email : calibration@systronics.co.th

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CALIBRATION 0312

CERTIFICATE OF CALIBRATION

Certificate No. TL250426
Job No. 25120018
Page. 1 of 2

Customer Name	:	Archemica Lab Co., Ltd.	**Received Date** :	08 Dec 2025
Customer Address	:	39 Soi Sukhumvit 63 (Ekamai)Sukhumvit Rd.,	**Calibrated Date** :	11 Dec 2025
	:	North Klongton, Wattana ,	**Issued Date** :	11 Dec 2025
	:	Bangkok 10110.		

Instrument Description	:	Digital Thermometer with sensor	**Tag No.** :	-
Manufacturer	:	FLUKE	**Service** :	-
Model No.	:	289	**Condition As Received** :	Used Item
Serial Number	:	32320105		

Calibration Procedure.
Calibration were conducted using in-house calibration procedure according to comparison measurement with Platinum Resistance Thermometer (PRT) into temperature source.

Procedure No.
CP-TL-01

Comment.
-

Reference Standards Instrument.

Instrument Name	Model	Serial No.	Cert No.	Due Date
Platinum Resistance Thermometer	5615	958332	TT-1018-25	28 Apr 2027
Thermometer Readout	1529	B29730	23E4020	22 Dec 2025
-	-	-	-	-

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Traceability Information.
The temperature scale used was based on ITS-90.
This certification is traceable to the International System of Units (SI).

Environmental Conditions
Temperature : (23 ± 3) °C Relative Humidity : (50 ± 15) %RH

Calibration Information.
The result of calibration was found accurate as show on date and place of calibration only.
The reported uncertainty of measurement is based on standard uncertainty multiplied by a coverage factor *(k)*, providing confidence level of approximately 95%.

Calibrated by : Nuttapon Srisuwan

SYSTRONICS INSLAB

[redacted]

This certificate may not be reproduced, except in full unless permission for the publication of an approved abstract is obtained in writing from the calibration organization issuing this report.

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19/11-12, Sukhumvit Rd., Nemphra, Muang Rayong, Rayong 21150, Thailand
Tel.+66(38) 694 145-8, Email : calibration@systronics.co.th

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CERTIFICATE OF CALIBRATION

Certificate No. TL250426
Page. 2 of 2

Result of Calibration :

(Without Adjustment)

Parameter Setting : OFFSET = 0.0
Sensor of UUC* : Thermocouple Wire Type : K Serial No.: - ID/Tag No.: 32320105
Dimension : Length : 930 mm Diameter : 1.5 mm

Immersion Depth	Standard Reading	UUC* Reading	Correction Value	Uncertainty of Measurement (±)	Coverage Factor
mm	°C	°C	°C	°C	k =
150	0.0041	0.7	-0.7	0.50	2.00
150	50.0053	49.6	0.4	0.50	2.00
150	100.0055	99.4	0.6	0.50	2.00

UUC* : Unit Under Calibration

END OF CERTIFICATE

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Thermo SCIENTIFIC

CERTIFICATE OF CONFORMITY

IC QUALIFICATION TEST BOX II

This certificate validates that the product values referenced below meet or exceed all Thermo Scientific functional specifications and release requirements.

Instrument Serial Number: 22109053
Instrument Part Number: 22000-60001

TEST BOX LOADS AND FUNCTIONS

[x]	AES	100Ω	+/- 5%	[x]	CR-TC 3-pin ANA INT	1.3KΩ	+/- 5%
[x]	EGC CAP KOH	100Ω	+/- 5%	[x]	CR-TC 3-pin CAP INT	13.05kΩ	+/- 1%
[x]	EGC CAP MSA	100Ω	+/- 5%	[x]	CR-TC 4-pin ANA INT	1.3KΩ	+/- 5%
[x]	EGC ANA KOH	100Ω	+/- 5%	[x]	CR-TC 4-pin CAP INT	13.05kΩ	+/- 1%
[x]	EGC ANA MSA	100Ω	+/- 5%	[x]	EGC – Memory Test		
[x]	ERS (CC)	12Ω	+/- 5%	[x]	ERS – Memory Test		
[x]	ERC (CV)	250Ω	+/- 5%	[x]	CR-TC – Memory Test		

[redacted]

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May 15, 2018

To whom it may concern,

Be advised that the IC Qualification Test Box II (P/N 22000-60001) no longer comes with a sticker labelled "Periodic Calibration Required". An IC Qualification Test Box II can be used without any re-calibration after shipment.

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Chromatography and Mass Spectrometry Division
IC/SP Product Marketing
Dionex Products

1214 Oakmead Pkwy

Sunnyvale, CA
94085-4024

408-737-0700
408-481-6508 fax

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Certificate of Completion

This certifies that

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Has successfully completed

OJT RPG Mentoring: Ion Chromatography System Qualification Service Training

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Important note: The certificate is only valid during employment with the Thermo Fisher Scientific including its subsidiaries and certified contractors.