

ภาคผนวกที่ 4

สรุปเอกสารสอบเทียบอุปกรณ์เครื่องมือ

เอกสารการสอบเทียบเครื่องมือตรวจวัดระดับเสียงในบรรยากาศ



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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




Certificate No.: CP20260112FA
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 Phatthom 73210
Received Date:	12 March 2026
Calibrated Date:	19 - 24 March 2026
Issued Date:	25 March 2026
Calibrated by:	Ms. Juntaporn Kunhakorn

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

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

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

Page 1 of 7

F-CAL-004 Ed.1

Certificate No.: 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 :-
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	01R0	2661000	AA-1011-25	28 June 2026
2) Arbitrary Function Generator	AFG2021	C010063	CK20250037EA	25 June 2026
3) Programmable Attenuator	PA5	2913	BF-0025-25	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 CD20250094EA	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) : II AC Policy, item 2 (1) No II AC-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 Calibrations:-

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 (dB)	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 80 dB

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve (dB)			
	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 (dB)			
	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)
68.0	68.0	0.0	±1.1
69.0	69.0	0.0	±1.1
70.0	70.0	0.0	±1.1
71.0	71.0	0.0	±1.1
72.0	72.0	0.0	±1.1
73.0	73.0	0.0	±1.1
74.0	74.0	0.0	±1.1
75.0	75.0	0.0	±1.1
76.0	76.0	0.0	±1.1
77.0	77.0	0.0	±1.1
78.0	78.0	0.0	±1.1
79.0	79.0	0.0	±1.1
80.0	80.0	0.0	±1.1
81.0	81.0	0.0	±1.1
82.0	82.0	0.0	±1.1
83.0	83.0	0.0	±1.1
84.0	84.0	0.0	±1.1
85.0	85.0	0.0	±1.1
86.0	86.0	0.0	±1.1
87.0	87.0	0.0	±1.1
88.0	88.0	0.0	±1.1
89.0	89.0	0.0	±1.1
90.0	90.0	0.0	±1.1
91.0	91.0	0.0	±1.1
92.0	92.0	0.0	±1.1
93.0	93.0	0.0	±1.1
94.0	94.0	0.0	±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 ; -2.3
	0.25	89.9	-0.1	+1.5 ; -5.0
Slow	200	109.5	-0.1	±1.0
	2	89.9	-0.2	+1.0 ; -5.0
	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		0.60 (10Hz to 4kHz)
- Free-field sound pressure response level	0.30	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	0.30	0.30
11) Overload indication	0.24	0.25
12) High-Level Stability	0.10	0.10

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

-- End of Report --



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



ISO 9001:2015
CERTIFICATION 2019

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.Hai 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 Kurihakorn

Approved by:
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k=2) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

Page 1 of 6

F-CAL-004 Ed.1



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	CD10063	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	CL14P250034 CD20250094EA	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)
-	-	-	-

Page 2 of 6

F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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 (dB)	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 94 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

Page 3 of 6

F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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

Page 4 of 6

F-CAL-005 Ed.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, T_b (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	$+1.0, -5.0$
	0.25	107.0	0.0	± 1.0
SEL	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 (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
130.0	130.0	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	0.10
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 --



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:
(Mr. Sittichai Swaksulyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.
This 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 $\pm$ 2) °C
Relative Humidity: (50 $\pm$ 15) %
Pressure: (101.3 $\pm$ 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	2441000	AA-1011-35	24 June 2024
2) Arbitrary function generator	AFG2021	C010063	CK20250037EA	25 June 2026
3) Programmable Attenuator	PA5	27055	EF-0035-24	28 October 2025
4) 6.5 Digit precision multimeter	8846A	9410014	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	LI8903B	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 94 dB

Frequency (Hz)	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	-0.0	±5.0

Function : 4. Electrical signal tests of frequency weightings

Frequency (Hz)	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	-0.0	-0.5	0.0	±5.0

Function : 5. Frequency and time 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
26.0	26.1	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
	200	125.0	0.0	±1.0
SEL	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 (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
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 --



CERTIFICATE OF CALIBRATION

NO. 20250629190

Name of Product:	Sound Level Meter
Model:	ST-210
Serial Number:	821070
Specification:	Class 2
Conclusion:	Pass
Date of calibration:	2025-05-08
Due Date:	2026-05-07



Calibrated by: *Chanchai*

- 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 surpasses them, and applies only to the unit identified above.
II. This certificate is produced with advance 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: 94.9 dB

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

4. Measuring up limit: 128 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	-0.8	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

27.9 dBA	26.7 dBC	37.8 dBZ
----------	----------	----------

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 99.0 dB

Max error at 10dB steps under 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 _{max} -L ₁	L _{max} -L ₂	L _{max} -L ₃	L _{max} -L ₄
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 count level: 123.0 dB

Sweep amplitude: 40 dB

Scan cycle time: 40 S; Measurement period: 180 S

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	113.3	113.4	+0.1
L _E	121.0	121.0	0.0
L _W	119.0	119.0	0.0
L _{SD}	103.0	103.0	0.0
L ₉₀	87.1	87.0	0.1
L ₉₅	85.1	85.0	0.1

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

Environment conditions:

Air temperature: 25.1°C
Relative humidity: 50.5%
Static pressure: 102.0 kPa

References:

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



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,

Phraek Sa, Muang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4050 Fax: +66 2224 0917



Certificate No.: CP20260089EA
Operation No.: CP2026020052

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: SCARLET TECH
Model/Type: ST11D (Meter), AWA14425 (Microphone), (Preamplifier)
Serial No.: 821486 (Meter), 61344 (Microphone), (Preamplifier)
ID No.: NS-12-004
Customer: C.E.M. Technology (Thailand) Co.,Ltd.
Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran, Nakorn Phathom 73210
Received Date: 9 February 2026
Calibrated Date: 11 - 12 March 2026
Issued Date: 13 March 2026
Calibrated by: Ms. Juntaporn Kuntakorn

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

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

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



Certificate No.: CP20260089EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: SCARLET TECH
Model/Type: ST11D (Meter), AWA14425 (Microphone), - (Preamplifier)
Serial No.: 821486 (Meter), 61344 (Microphone), - (Preamplifier)
ID No.: NS-12-004
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 CD20250098EA	10 April 2026 29 March 2026
7) Performance Audio Analyzer	U8903B	MY56510003	CB20260043EA CK20250063EA	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(s) 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.0208

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.: CP20260089EA

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	8.4
C-weighting	10.1
Z-weighting	15.4

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

Meter free-field acoustic response at a level of 04 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	±1.0
1000	0.2	0.2	0.2	±0.7
6300	-0.8	-0.7	-0.7	+1.5; -2.3

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	-0.2	-0.1	±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	0.0	0.1	0.0	±1.0
6000	-0.1	0.0	-0.1	+1.5; -2.5
16000	-5.2	-5.2	0.1	+2.5; -16.0



Certificate No.: CP20260089EA

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.: CP20260089EA

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
24.0	23.8	-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	135.9	-0.1	±0.5
	2	118.9	-0.1	+1.0; -1.5
	0.25	109.7	0.3	+1.0; -3.0
Slow	200	129.5	0.0	±0.5
	2	110.0	0.0	+1.0; -3.0
	0.25	130.0	0.0	±0.5
SEL	200	110.0	0.0	+1.0; -1.5
	2	101.0	0.0	+1.0; -3.0
	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	134.4	133.0	-0.4	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.0	-0.4	±1.0



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20260089EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
142.8	143.0	0.2	±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



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: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

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

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



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: 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) °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 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; NSG Accredited Calibration No.0119

- IRPC Metrology Center, IRPC Public Co., Ltd.; NSG 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)
-	-	-	-



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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

Page 4 of 6

F-CAL-005 Ed.1

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
	200	130.0	0.0	±0.5
SEL	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

Page 5 of 6

F-CAL-005 Ed.1

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	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
- Free-field sound pressure response level		
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 --

Page 6 of 6

F-CAL-005 Ed.1

เอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพอากาศในบรรยากาศ

TOP

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)	Linear Regression
1	8.05	1.739	60.2	57.94	Slope: 39.3862
2	6.60	1.576	55.6	53.51	Intercept: -9.6675
3	5.20	1.400	47.9	46.10	Corr. Coeff: 0.9958
4	4.60	1.317	43.1	41.48	
5	4.05	1.112	35.3	33.97	# 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

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

TOP

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: 3270	Tech: Tong, P

Site Conditions

Barometric Pressure (in Hg): 28.50	Corrected Pressure (mm Hg): 723.9
Temperature (deg F): 75.3	Temperature (deg K): 297.2
Average Press. (in Hg): 27.33	Corrected Average (mm Hg): 694.2
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)	Linear Regression
1	8.20	1.782	60.4	59.03	Slope: 38.8216
2	6.55	1.594	55.6	54.34	Intercept: -9.3751
3	5.60	1.474	47.9	46.81	Corr. Coeff: 0.9935
4	4.55	1.330	43.3	42.32	
5	4.10	1.112	34.5	33.72	# 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):	48.3
Average Flow Calculation m3/min	1.433237179
Average Flow Calculation in cfm	50.60865679
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	2063.861538
Total flow in 24 hours cfm	72876.46578

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

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

TOP

Trade & Engineering
PM10 High Volume Sampler Verification

Site Information

Location: -	Site ID: -	Date: 17 September 2025
Sampler: TE-6010 PM10	Serial No: 3183	Tech: Tong, P

Site Conditions

Barometric Pressure (in Hg): 27.05	Corrected Pressure (mm Hg): 687.1
Temperature (deg F): 75.8	Temperature (deg K): 297.2
Average Press. (in Hg): 26.71	Corrected Average (mm Hg): 678.4
Average Temp. (deg F): 75.8	Average Temp. (deg K): 297.2

Calibration Orifice

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

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	8.30	1.280	60.5	59.53	Slope: 32.5138
2	7.70	1.166	57.5	57.82	Intercept: -1.1739
3	4.60	1.089	52.9	54.66	Corr. Coeff: 0.9953
4	5.75	1.077	58.6	53.15	SFR: 1.115
5	5.10	1.006	45.8	29.99	SSP: 53.35
# 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:
 $1/m[(I[\sqrt{(Ta/Pa)}]) - b]$

$$SFR = 1.13(Pa/Pstd)(Ta/Ts)$$

$$SSP = (m*SFR + b)/(\sqrt{(Pa/Pstd)})$$

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):	53.3
Average Flow over Sample (m3/min)	1.120690582
Enter Total Time (Hrs):	24.0
Total flow over sample (m3/min)	1613.784338
Total flow over sample (CFM)	36883.0916

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

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

TOP

Trade & Engineering
PM10 High Volume Sampler Verification

Site Information

Location: -	Site ID: -	Date: 17 September 2025
Sampler: TE-6010 PM10	Serial No: 3245	Tech: Tong, P

Site Conditions

Barometric Pressure (in Hg): 27.05	Corrected Pressure (mm Hg): 687.1
Temperature (deg F): 75.8	Temperature (deg K): 297.2
Average Press. (in Hg): 26.71	Corrected Average (mm Hg): 678.4
Average Temp. (deg F): 75.8	Average Temp. (deg K): 297.2

Calibration Orifice

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

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	8.30	1.280	60.5	59.53	Slope: 32.5138
2	7.70	1.166	57.5	57.82	Intercept: -1.1739
3	4.60	1.089	52.9	54.66	Corr. Coeff: 0.9953
4	5.75	1.077	58.6	53.15	SFR: 1.115
5	5.10	1.006	45.8	29.99	SSP: 53.35
# 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:
 $1/m[(I[\sqrt{(Ta/Pa)}]) - b]$

$$SFR = 1.13(Pa/Pstd)(Ta/Ts)$$

$$SSP = (m*SFR + b)/(\sqrt{(Pa/Pstd)})$$

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)	1.120540678
Enter Total Time (Hrs):	24.0
Total flow over sample (m3/min)	1668.778576
Total flow over sample (CFM)	37229.69133

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

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

Certificate of Analyzer Performance Testing

Calibrated Date : 8-Jan-25 Certificate No. : 0125-001
Page : 1/1

Analyzer Instruments
Analyzer Type : THC Analyzer Manufacturer : Thermo Environmental
Model : 51 Serial No. : 31107-70344-973

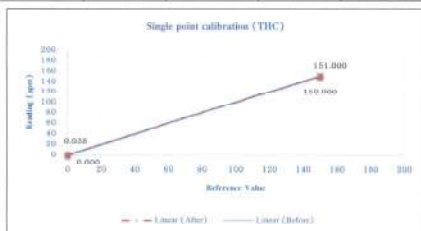
Environmental
Temperature : 25.0 °C
Humidity : 48.2 %RH

Calibration System
Calibrator Units
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 140C Model : 701
Serial No. : 314811438 Serial No. : 179

Standard Gas
Propane Conc. : 100 ppm Cylinder No. : C0A000
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



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

Certificate of Analyzer Performance Testing

Calibrated Date : 8-Jan-25 Certificate No. : 0125-002
Page : 1/1

Analyzer Instruments
Analyzer Type : THC Analyzer Manufacturer : Baseline
Model : Series RK600 Serial No. : 344

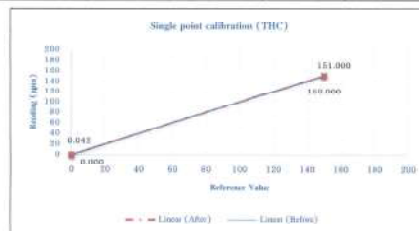
Environmental
Temperature : 25.0 °C
Humidity : 48.1 %RH

Calibration System
Calibrator Units
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 140C Model : 701
Serial No. : 314811438 Serial No. : 179

Standard Gas
Propane Conc. : 100 ppm Cylinder No. : C0A000
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



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

Certificate of Analyzer Performance Testing

Calibrated Date : 8-Jan-25 Certificate No. : 0025-001
Page : 1/1

Analyzer Instruments
Analyzer Type : CO Analyzer Manufacturer : Thermo Environmental
Model : 48C Serial No. : 308011068

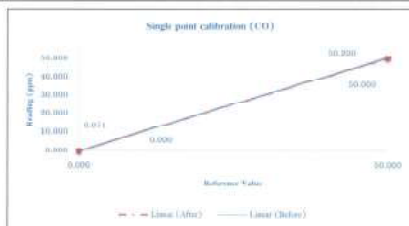
Environmental
Temperature : 25.0 °C
Humidity : 51.0 %RH

Calibration System
Calibrator Units
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 140C Model : 701
Serial No. : 314811438 Serial No. : 179

Standard Gas
NO Conc. : 2 ppm Cylinder No. : 307119
NO2 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	0.051	0.000	0.051	50.2	50.000	0.40
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



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

Certificate of Analyzer Performance Testing

Calibrated Date : 20-Aug-23 Certificate No. : 0023-006
Page : 1/1

Analyzer Instruments
Analyzer Type : CO Analyzer Manufacturer : Thermo Environmental
Model : 48C Serial No. : 308011064

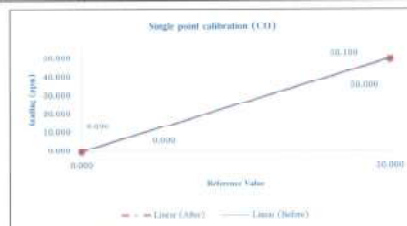
Environmental
Temperature : 25.7 °C
Humidity : 38.1 %RH

Calibration System
Calibrator Units
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 140C Model : 701
Serial No. : 314811438 Serial No. : 179

Standard Gas
NO Conc. : 2 ppm Cylinder No. : 307119
NO2 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	0.008	0.000	0.10	50.1	50.000	0.20
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



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

Certificate of Analyzer Performance Testing

Calibrated Date: 18-Aug-23 Certificate No.: 0025-002
Page: 1/1

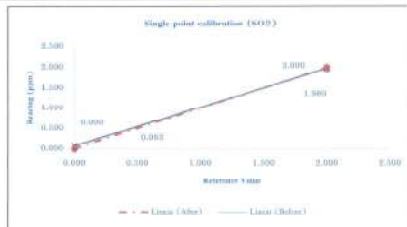
Analyzer Instruments
Analyzer Type: SO₂ Analyzer Manufacturer: Thermo Environmental
Model: 43C Serial No.: 43C-30853-387

Environmental
Temperature: 21.5 °C
Humidity: 42.7 %RH

Calibration System
Calibrator Units
Gas Calibration: Thermo Environmental Zero Air Generator: API
Model: 149C Model: 701
Serial No.: 314811438 Serial No.: 179

Standard Gas
NO Conc.: 0 ppm Cylinder No.: 107189
SO₂ Conc.: 0 ppm Expire Date: 10-04-25
CO Conc.: 0 ppm

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (m)	Reading Value (ppm)	Expected Value (ppm)	Drift (m)
Before						
SO ₂	0.000	0.000	0.00	1.98	2.000	-1.00
After						
SO ₂	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by: [Signature]

(My Yong Puan)

Certificate of Analyzer Performance Testing

Calibrated Date: 29-Jul-23 Certificate No.: 0123-001
Page: 1/1

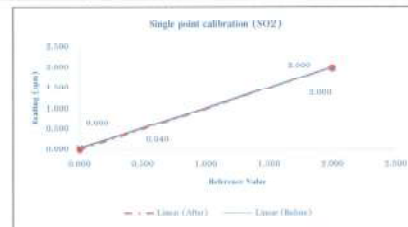
Analyzer Instruments
Analyzer Type: SO₂ Analyzer Manufacturer: Thermo Environmental
Model: 43C Serial No.: 43C-40801-334

Environmental
Temperature: 26.8 °C
Humidity: 45.2 %RH

Calibration System
Calibrator Units
Gas Calibration: Thermo Environmental Zero Air Generator: API
Model: 149C Model: 701
Serial No.: 314811438 Serial No.: 179

Standard Gas
NO Conc.: 0 ppm Cylinder No.: 107189
SO₂ Conc.: 0 ppm Expire Date: 10-04-25
CO Conc.: 0 ppm

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (m)	Reading Value (ppm)	Expected Value (ppm)	Drift (m)
Before						
SO ₂	0.040	0.000	0.04	2.00	2.000	0.00
After						
SO ₂	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by: [Signature]

(My Yong Puan)

Certificate of Analyzer Performance Testing

Calibrated Date: 28-Jul-23 Certificate No.: 0124-002
Page: 1/1

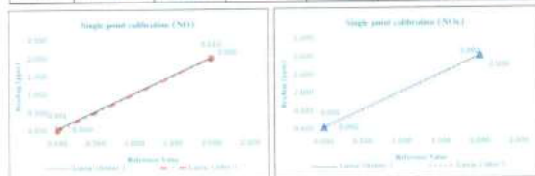
Analyzer Instruments
Analyzer Type: NO/NO₂ Analyzer Manufacturer: Thermo Environmental
Model: 43C Serial No.: 43C-30853-387

Environmental
Temperature: 21.5 °C
Humidity: 42.7 %RH

Calibration System
Calibrator Units
Gas Calibration: Thermo Environmental Zero Air Generator: API
Model: 149C Model: 701
Serial No.: 314811438 Serial No.: 179

Standard Gas
NO Conc.: 0 ppm Cylinder No.: 107189
NO₂ Conc.: 0 ppm Expire Date: 10-04-25
CO Conc.: 0 ppm

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (m)	Reading Value (ppm)	Expected Value (ppm)	Drift (m)
Before						
NO	0.000	0.000	0.00	2.00	2.000	-0.01
NO ₂	0.000	0.000	0.00	2.00	2.000	0.00
After						
NO	0.000	0.000	0.00	2.00	2.000	0.00
NO ₂	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by: [Signature]

(My Yong Puan)

Certificate of Analyzer Performance Testing

Calibrated Date: 28-Jul-23 Certificate No.: 0124-001
Page: 1/1

Analyzer Instruments
Analyzer Type: NO/NO₂ Analyzer Manufacturer: Thermo Environmental
Model: 43C Serial No.: 43C-40801-334

Environmental
Temperature: 21.5 °C
Humidity: 42.7 %RH

Calibration System
Calibrator Units
Gas Calibration: Thermo Environmental Zero Air Generator: API
Model: 149C Model: 701
Serial No.: 314811438 Serial No.: 179

Standard Gas
NO Conc.: 0 ppm Cylinder No.: 107189
NO₂ Conc.: 0 ppm Expire Date: 10-04-25
CO Conc.: 0 ppm

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (m)	Reading Value (ppm)	Expected Value (ppm)	Drift (m)
Before						
NO	0.000	0.000	0.00	2.00	2.000	-0.01
NO ₂	0.000	0.000	0.00	2.00	2.000	0.00
After						
NO	0.000	0.000	0.00	2.00	2.000	0.00
NO ₂	0.000	0.000	0.00	2.00	2.000	0.00



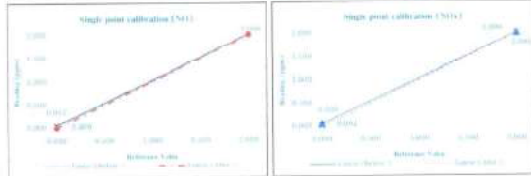
Calibrated by: [Signature]

(My Yong Puan)

Certificate of Analyzer Performance Testing

Calibrated Date	1-Aug-25	Certificate No.	00075-0023
Analyzer Instruments		Page	2 of 3
Analyzer Type	565 Series Nitrogen Analyzer	Manufacturer	Thermo Environmental
Model	820	Serial No.	1-00000-0000
Environmental			
Temperature	23.8 °C		
Humidity	45.9 %RH		
Calibration System			
Calibrator Units			
Gas Calibration	Thermo Environmental	Zero Air Calibrator	1-000
Model	100	Model	1-000
Serial No.	1-00000-0000	Serial No.	1-000
Standard Gas		Cylinder No.	1-00000-0000
N ₂ Conc.	5 %	Expiry Date	1-00000-0000
NO	5 %		
CO	5 %		

Calibration Check						
Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Diff. (ppm)	Reading Value (ppm)	Expected Value (ppm)	Diff. (ppm)
Before						
NO	0.000	0.000	0.000	0.000	0.000	0.000
NO	0.000	0.000	0.000	0.000	0.000	0.000
After						
NO	0.000	0.000	0.000	0.000	0.000	0.000
NO	0.000	0.000	0.000	0.000	0.000	0.000



Calibrated by: *Taylor*
(Mr. Jang Hoon)

เอกสารการสอบเทียบเครื่องมือตรวจวัดความชื้นเหือน



**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. +66-2709-4000 Fax. +66-2324-0917

Certificate No.: CP20250114EA
Operation No.: CP2025030100

Certificate of Calibration

Equipment: Vibration Meter
Manufacturer: Instanteel
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: *[Signature]*
(Mr. Sitthichai Swakuriyavong)
Group Manager

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

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



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

Certificate No.: CP20250114EA

Calibration Report

Equipment: Vibration Meter
Manufacturer: Instanteel
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 standard instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard Accelerometer	8305	2708237	AV-0040-24	19-Sep-2025
2) Measuring Amplifier	Z525	2685961	AV-0034-24	7-Aug-2025
3) IAN XI Analyzer	3160-4-042	3040-106135	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



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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 (%)
5.0	10.000	9.998	9.858	-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	
50.0	10.000	10.000	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	

Page 3 of 5

F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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 (%)
5.0	10.000	9.996	10.089	0.093	1.50	
6.3	10.000	10.013	10.502	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	
50.0	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	

Page 4 of 5

F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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 (%)
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	
50.0	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 --

Page 5 of 5

F-CAL-005 Ed.1



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 2328 0917

Certificate No.: CP20250269EA

Operation No.: CP2025060184

Certificate of Calibration

Equipment: Vibration Meter
Manufacturer: Instantel
Model/Type: Micromate
Serial No.: UM20453 (Meter), UM6231 (Micromate Geophone)
ID No.: VB-01-007
Customer: C.E.M. Technology (Thailand) Co., Ltd.
Address: 31/8 Moo 13, T.Rai Khing, A.Sam Phran, Nakhon Pathom 73210
Received Date: 24 June 2025
Calibrated Date: 25 - 30 September 2025
Issued Date: 1 October 2025
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:
(Mr. Sittichai Swaksuriyawong)
Group Manager

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

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

Page 1 of 5

F-CAL-004 Ed.1



Certificate No.: CP20250269EA

Calibration Report

Equipment: Vibration Meter
Manufacturer: Instantel
Model: Micromate
Serial No.: UM20455 (Meter), UM6231 (Micromate Geophone)
ID No.: VR-01-007
Ambient Temperature: $(23 \pm 5) ^\circ\text{C}$
Relative Humidity: $(50 \pm 15) \%$
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	90120	AV-0028-25	5-Jul-2026
2) Measuring Amplifier	2525	3016651	AV-0025AA-25	15-Aug-2026
3) LAN Xi Analyzer	3160-4-042	3060-106135	CQ20240016CA	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.: CP20250269EA

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 $\pm$ (%)	Direction
4.0	10.000	10.001	11.145	1.144	1.5	Longitudinal (L)
5.0	10.000	10.007	11.038	1.031	1.5	
6.3	10.000	10.006	11.179	1.179	1.5	
8.0	10.000	9.997	10.801	0.804	1.5	
10.0	10.000	10.001	10.779	0.778	1.5	
12.5	10.000	10.003	10.785	0.782	1.5	
16.0	10.000	10.001	10.803	0.802	1.5	
	20.000	19.997	21.134	1.137	1.5	
	30.000	29.970	31.747	1.777	1.5	
	50.000	49.992	52.787	2.795	1.5	
20.0	10.000	10.003	10.696	0.693	1.5	
25.0	10.000	10.006	10.719	0.713	1.5	
31.5	10.000	10.003	10.625	0.622	1.5	
40.0	10.000	10.006	10.609	0.603	1.5	
52.0	10.000	9.994	10.814	0.820	1.5	
63.0	10.000	9.987	10.893	0.906	1.5	
80.0	10.000	9.987	11.169	1.182	1.5	



Certificate No.: CP20250269EA

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 $\pm$ (%)	Direction
4.0	10.000	10.015	11.237	1.222	1.5	Transverse (T)
5.0	10.000	10.004	11.329	1.325	1.5	
6.3	10.000	10.007	11.426	1.419	1.5	
8.0	10.000	10.005	11.066	1.063	1.5	
10.0	10.000	10.013	11.084	1.071	1.5	
12.5	10.000	10.010	10.995	0.985	1.5	
16.0	10.000	10.001	10.675	0.674	1.5	
	20.000	19.997	20.910	0.913	1.5	
	30.000	30.010	31.299	1.289	1.5	
	50.000	49.992	51.961	1.969	1.5	
20.0	10.000	10.006	10.577	0.571	1.5	
25.0	10.000	10.004	10.538	0.534	1.5	
31.5	10.000	10.006	10.398	0.382	1.5	
40.0	10.000	9.998	10.365	0.367	1.5	
52.0	10.000	9.998	10.617	0.619	1.5	
63.0	10.000	10.011	10.577	0.566	1.5	
80.0	10.000	10.013	10.867	0.854	1.5	



Certificate No.: CP20250269EA

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 $\pm$ (%)	Direction
4.0	10.000	10.006	10.097	0.091	1.5	Vertical (V)
5.0	10.000	9.997	10.112	0.115	1.5	
6.3	10.000	10.006	10.349	0.343	1.5	
8.0	10.000	10.006	10.097	0.091	1.5	
10.0	10.000	9.998	10.199	0.201	1.5	
12.5	10.000	10.000	10.238	0.238	1.5	
16.0	10.000	9.994	10.136	0.142	1.5	
	20.000	19.997	20.256	0.259	1.5	
	30.000	29.995	30.392	0.397	1.5	
	50.000	49.992	50.770	0.778	1.5	
20.0	10.000	10.003	10.349	0.346	1.5	
25.0	10.000	10.001	10.320	0.319	1.5	
31.5	10.000	10.013	10.451	0.438	1.5	
40.0	10.000	10.006	10.380	0.374	1.5	
52.0	10.000	10.021	10.706	0.685	1.5	
63.0	10.000	10.013	10.893	0.880	1.5	
80.0	10.000	10.006	11.239	1.233	1.5	

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

-- End of Report --

เอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำ



Certificate of Calibration

Equipment: Electronic Balance
Manufacturer: Sartorius
Model: QUINTIX 224-1S
Serial No.: 0035009070
ID No.: CI-01-002
Condition of the item: Normal

Certificate No.: C01261658
Job No.: WO-00124610
Issued Date: 12 June 2026
Page: 1 of 2

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

Environment Condition: Temperature 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

(Mr. Wasan Nuchnabee)
 Person in charge

(Mr. Adisal Maknoi)
 Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
 The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with 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 ดีเคเอส อีเซีย จำกัด
 DKSH Technology Limited
 2533 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10200
 2533 Sukhumvit Road, Bangkok, Phra Prathung, Bangkok 10200
 Phone: +66 2636 7000 Email: info.calibration@dksh.com Website: www.dksh.com/en/thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C01-15: 30 Jun 2025



Certificate No.: C01261658
 Page: 2 of 2

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 ดีเคเอส อีเซีย จำกัด
 DKSH Technology Limited
 2533 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10200
 2533 Sukhumvit Road, Bangkok, Phra Prathung, Bangkok 10200
 Phone: +66 2636 7000 Email: info.calibration@dksh.com Website: www.dksh.com/en/thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C01-15: 30 Jun 2025



ใบตรวจสอบสภาพเครื่องชั่ง Electronic Balance Checklist

Equipment: Electronic Balance
Model: QUINTIX 224-1S
Serial No.: 0035009070

Certificate No.: C01261658
Job No.: WO-00124610

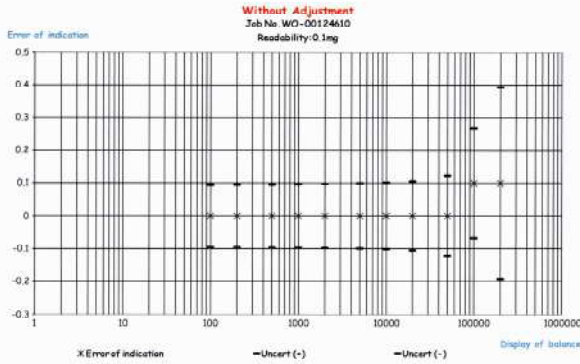
Check date	รายการตรวจเช็ค (Description)		Check before delivery	หมายเหตุ (Remark)
11 Jun 2026	(Normal)	(Defective)	11 Jun 2026 (Normal) (Defective)	
	General			
☒	☐	1. สายไฟ อะแดปเตอร์ (Electrical wire/ Adapter)	☒	☐
☒	☐	2. ความสมบูรณ์ชุดกรงเหล็กกันลม (Cover)	☒	☐
☒	☐	3. ความสมบูรณ์ของระดับน้ำ (Bubble spirit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

ข้อควรระวัง Note :

Mr. Wasan Nuchnabee
 Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
 DKSH Technology Limited
 2533 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10200
 2533 Sukhumvit Road, Bangkok, Phra Prathung, Bangkok 10200
 Phone: +66 2636 7000 Email: info.calibration@dksh.com Website: www.dksh.com/en/thailand

Delivering Growth - in Asia and Beyond.



CALIBRATION CERTIFICATE

Certificate No. S26029605
page 1 of 2

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

Equipment : Non-automatic weighing instrument (Electronic instrument)

Manufacturer : Sartorius

Model : RSA224S-CW

Accuracy class : -

Capacity : 220 g

Resolution : 0.0001 g

Serial No. : 3139614148

ID No. : CL-01-003

Place of calibration : กรุงเทพมหานคร

Order No. : 6950915-1

Ambient temperature : (25.1 ± 5.0) °C

Relative humidity : (52.5 ± 10.0) %

Received date : 27-Feb-2026

Date of calibration : 27-Feb-2026

Date of issue : 02-Mar-2026

Condition of the balance : Good working conditions

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	M25120015	10-Dec-2026	7990

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 : Sathaporn Rucangplupla
Technician

Approved Signatory :
Somwang Wongduang

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

TCS-F-138 Issue 01/Rev.02/8 Aug 2025

CALIBRATION CERTIFICATE

Certificate No. S26029605

page 2 of 2

The repeatability of indication

Nominal Value (g)	Standard Deviation of reading (g)	Maximum difference between successive 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 Weights (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--

Certificate of Calibration

Equipment : Electronic Thermo-Hygrometer

Manufacturer : testo

Model : testo 608-H1

Serial No. : 46186322

ID No. : CL-02-003

Condition of the item : Normal

Certificate No. : C19262837

Job No. : WO-0122789

Issued Date : 28 May 2026

Page : 1 of 2

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

Environment Condition : Temperature: 22 °C ± 3 °C
Relative Humidity: 60 % ± 20 %
Voltage: 220 VAC ± 10 %

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

Calibration By : Mr. Tweewong Thaitiang

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.

(Mr. Tweewong Thaitiang)
Person in charge

(Mr. Pramote Ramrong)
Authorized signatory

This certificate is issued for 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.



Certificate No. : C19262637
Page: 2 of 2

Reference Standard Equipment:

Equipment Name	Certificate No.	Cal. Date	Next Cal. Date
Digital Thermometer With Probe	C14261384	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

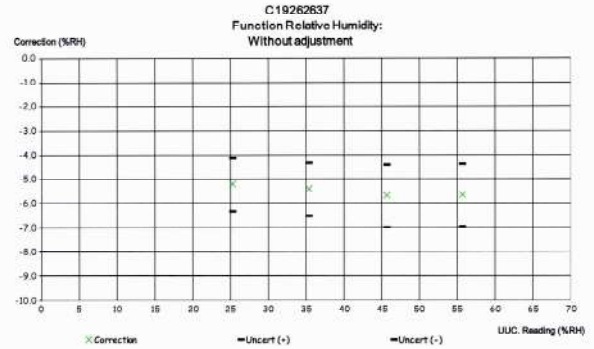
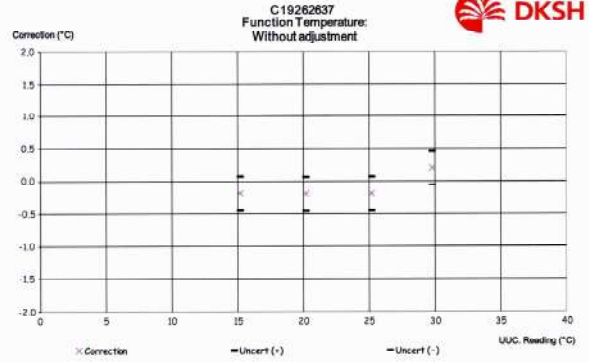
Reference Temp. (°C)	Calibrate Point (%RH)	STD. Reading (%RH)	UUC. Reading (%RH)	Correction (%RH)	Uncertainty (± %RH)
25.00	20.0	20.08	25.3	-5.22	1.1
25.00	30.0	29.99	35.4	-5.41	1.1
25.00	40.0	40.02	45.7	-5.68	1.3
25.00	50.0	50.05	55.7	-5.65	1.3

The End of Certificate

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

Delivering Growth - in Asia and Beyond.

CAL-FM-C19-12: 30 Jun 2025



Delivering Growth - in Asia and Beyond.



ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ
(Thermo-Hygrometer Checklist)

Equipment : Electronic Thermo-Hygrometer
Serial No. : 45186322

Certificate No. : C19262637
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. การทำงานปุ่มกด (Selector Key)	☒ ☐
☒	☐	4. การแสดงผลหน้าจอ (Display)	☒ ☐
☒	☐	5. แบตเตอรี่ (Battery)	☒ ☐
☒	☐	6. สภาพตัวเครื่อง (Equipment Body)	☒ ☐
☐	☐	7. หัววัดเซ็นเซอร์ (Sensor External)	☐ ☐ ไม่มี
☒	☐	8. ฝาปิดแบตเตอรี่ (Battery cover)	☒ ☐

Note :

Mr. Tweewong Thaihiang
Service Engineer

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

Delivering Growth - in Asia and Beyond.



Certificate of Calibration

Equipment: Electronic Thermo-Hygrometer
Manufacturer: testo
Model: testo 608-H1
Serial No.: 45186324
ID No.: CI-02-004
Condition of the item: Normal

Certificate No. : C19262638
Job No.: WO-00122789
Issued Date: 28 May 2026
Page: 1 of 2

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

Environment Condition: Temperature: 22 °C ± 3 °C
Relative Humidity: 50 % ± 20 %
Voltage: 220 VAC ± 10 %

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

Calibration By: Mr. Tweewong Thaihiang
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.

(Mr. Tweewong Thaihiang)
Person in charge

(Mr. Pramote Ramrong)
Authorized signatory

This certificate is based on 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. This report shall not be reproduced except in full without approval of DKSH Technology Limited.

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

Delivering Growth - in Asia and Beyond.

CAL-FM-C19-12: 30 Jun 2025



Certificate No. : C19262638
Page: 2 of 2

Reference Standard Equipment:

Equipment Name	Certificate No.	Cal. Date	Next Cal. Date
Digital Thermometer With Probe	C15231384	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	0.20
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

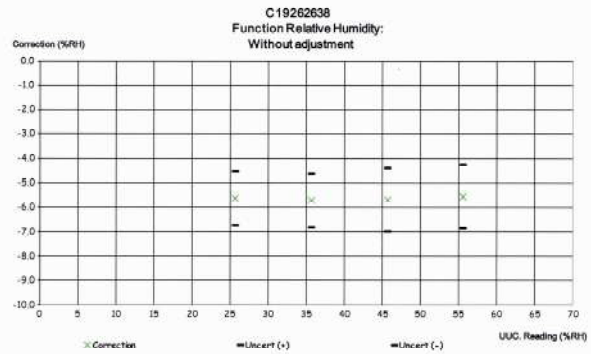
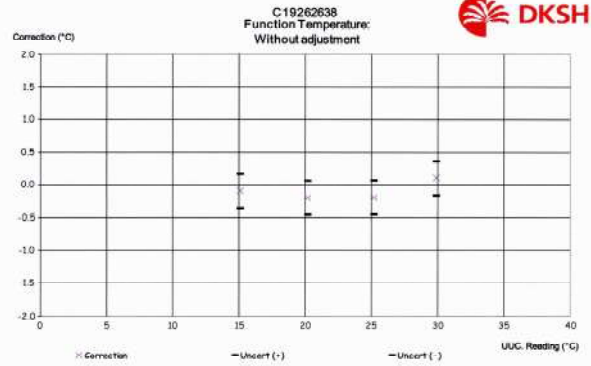
Reference Temp. (°C)	Calibrate Point (%RH)	STD. Reading (%RH)	UUC. Reading (%RH)	Correction (%RH)	Uncertainty (± %RH)
25.00	20.0	20.08	25.7	-5.62	1.1
25.00	30.0	29.99	35.7	-5.71	1.1
25.00	40.0	40.02	45.7	-5.68	1.3
25.00	50.0	50.05	55.6	-5.55	1.3

The End of Certificate

DKSH Technology Limited
2533 Sukhvitay Road, Bangkok, Thailand 10260
Phone: +66 2630 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C19-12: 30 Jun 2025



Delivering Growth - in Asia and Beyond.



ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ
(Thermo-Hygrometer Checklist)

Equipment : Electronic Thermo-Hygrometer
Serial No. : 45186324

Certificate No. : C19262638
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. Tiewong Thaihang
Service Engineer

DKSH Technology Limited
2533 Sukhvitay Road, Bangkok, Thailand 10260
Phone: +66 2630 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - in Asia and Beyond.



Certificate of Calibration

Certificate No. : 69-430003-1 Page : 1 of 2

Submitted by : C.E.M Technology (Thailand) Co., Ltd.
219/43 Moo.12 Petchkasem Rd, Omnoi, Kruthumban, 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 : Permporn 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

Approved by : _____
(Permporn Chanpu)
Supervisor

The Uncertainties are for a confidence probability of approximately 95%
This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co., Ltd.



CAL-F003-03

Certificate of Calibration

Certificate No. : 69-430003-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Conductivity measurement

Before Adjustment

Standard Conductivity Solution	UUC Reading	Correction	Uncertainty ($\pm$)	Unit
84*	84.2	-0.2	1.1	$\mu\text{S/cm}$
1413	1416	-3	9.0	$\mu\text{S/cm}$
12.88	13.02	-0.14	0.082	mS/cm

After Adjustment : at 84, 1413 $\mu\text{S/cm}$ 12.880 mS/cm

Standard Conductivity Solution	UUC Reading	Correction	Uncertainty ($\pm$)	Unit
84*	84.0	0.0	1.1	$\mu\text{S/cm}$
1413	1413	0	9.0	$\mu\text{S/cm}$
12.88	12.88	0.00	0.082	mS/cm

Remark

UUC : Unit Under Calibration

* This parameter is out of accreditation's scope.

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

- (0) -

Certificate of Calibration

Certificate No. : 69-420017-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

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

Adjustment Curve at nominal pH	Applied Voltage (mV)	Nominal Value (pH)	UUC Reading (pH) (mV)	Correction (mV)	Uncertainty ($\pm$ 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 ($\pm$ 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 measurement was based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

- (0) -

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 : Pernnon 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

Approved by :

(Pernnon Chanpu)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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

CAL-F0031-03

Certificate of Calibration

Certificate No. : 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 : Pernnon 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)

Approved by :

(Pernnon Chanpu)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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

CAL-F0031-03

Certificate of Calibration

Certificate No. : 69-400074-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As Received : Good

Function : Temperature measurement

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
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%.

- 0.00 -



CAL-F0031-03



Certificate of Calibration

Equipment: Hot Air Oven
 Manufacturer: Memmert
 Model: UF 55
 Serial No.: B219.0142
 ID No.: WW-05-002
 Shelves(pc.): 2
 Condition of the item: Normal

Certificate No.: C31260296
 Issued Date: 11 February 2026
 Job No.: WO-00105449
 Ventilation Valve: Closed
 Page: 1 of 4

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

(Mr. Sittiphong Lekfu)

Person in charge

(Mr. Pramote Ramrong)

Authorized signatory

This certificate is issued in 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 in 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.

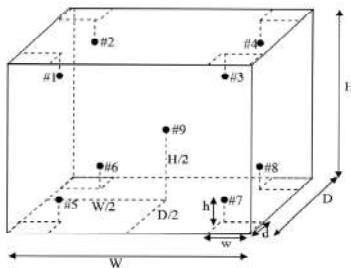
info@calibratech.co.th
 DKSH Technology Limited
 2533 Sukhprachuen Road, Bangkhen, Prachinburi, Bangkok 10260
 Phone: +66 2639 7000 Email: info@calibratech.co.th Website: www.dksh.com/certificatethailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-11: 30 Jun 2025

Certificate No.: C31260296

Page: 2 of 4



Standard Installation Locations

Volume (Calibration Zone): 21 (Liters)

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

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

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

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	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.

Certificate No.: C31260296

Page: 3 of 4

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	104.01	0.01	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)*
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

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)	Setpoint (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
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

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 w to have applied as guard band ($w = n \times U$); PFA = Probability of False Accept.

(Signature)

(Mr. Pramote Ramrong)
Authorized signatory

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.

Statements of conformity:(Cont.)

Without adjustment (Cont.)

Desired Temperature : 180.0 °C Tolerances : 2.0 °C

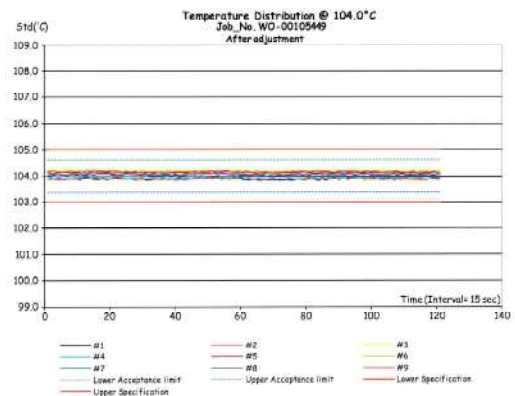
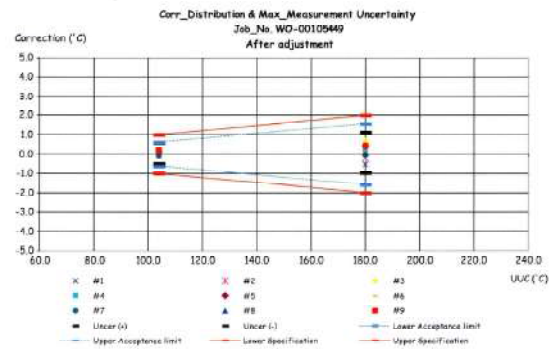
Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

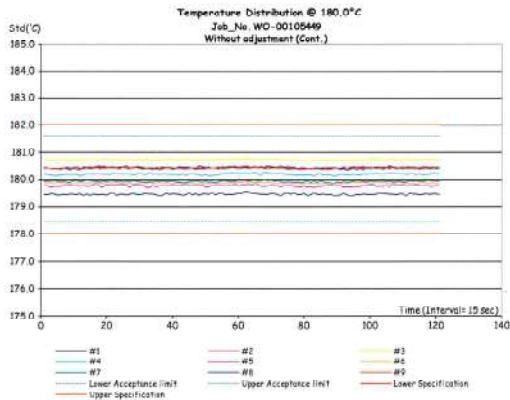
Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	179.47	-0.53	0.42	2.0	Pass
#2	179.77	-0.23	0.42	2.0	Pass
#3	180.72	0.72	0.42	2.0	Pass
#4	180.19	0.19	0.42	2.0	Pass
#5	180.42	0.42	0.42	2.0	Pass
#6	179.87	-0.13	0.42	2.0	Pass
#7	179.94	-0.06	0.42	2.0	Pass
#8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





ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

ชนิดเครื่อง: Hot Air Oven
หมายเลขเครื่อง: B219.0142

รุ่น: UF 55

เลขที่ใบงาน: WO-00105449

ตรวจสอบ (วัน)		รายการตรวจสอบ	ตรวจสอบ (ส่ง)		หมายเหตุ
09 Feb 2026			09 Feb 2026		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
General					
☒	☐	1. สายไฟ	☒	☐	
☒	☐	2. การทำงาน Main Switch	☒	☐	
☒	☐	3. การทำงาน Selector Key	☒	☐	
☒	☐	4. การแสดงผล Display	☒	☐	
☒	☐	5. การทำงาน หัวต้ม	☒	☐	
☒	☐	6. สภาวะ Lever of Ventilation valve	☒	☐	
☒	☐	7. สภาวะ Lever door open / close	☒	☐	
☒	☐	8. สภาวะ Door seal	☒	☐	
☒	☐	9. การทำงานของระบบ Safety	☒	☐	
☐	☐	10. การทำงานของระบบทำความเย็น	☐	☐	ไม่มี
☐	☐	11. การทำงานของระบบทำความร้อน	☐	☐	ไม่มี
☒	☐	12. สภาพตัวเครื่อง	☒	☐	
☒	☐	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	☒	☐	

ชื่อและนามสกุล:

Mr. Sittiphong Lekfu
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
2533 Sukhumvit Road Bangkok, Phrahanong Bangkok 10260
Phone: +66 2023 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - in Asia and Beyond.



Certificate of Calibration

Certificate No.: C31260297 Page: 2 of 3

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

Certificate No.: C31260297
Issued Date: 11 February 2026
Job No.: WO-00105449
Ventilation Valve: None
Page: 1 of 3

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

Environment Condition: Temperature: 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

(Mr. Sittiphong Lekfu)
Person in charge

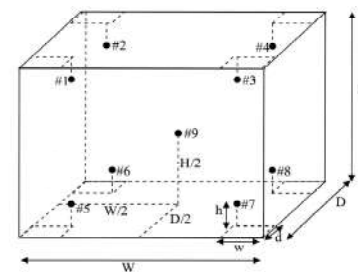
(Mr. Pramote Ramrong)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated in 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 ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
2533 Sukhumvit Road Bangkok, Phrahanong Bangkok 10260
Phone: +66 2023 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-11: 30 Jun 2026



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 = 0 (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.

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
2533 Sukhumvit Road Bangkok, Phrahanong Bangkok 10260
Phone: +66 2023 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-11: 30 Jun 2026

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	0.66
#9	20.21	0.21	0.60

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
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 ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Phone: +66 2029 7000 Email: info.certificate@dksh.com Website: www.dksh.com/certificate-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-11: 30 Jun 2025

Statements of conformity:

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

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

Tolerance and Decision rules:

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

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



(Mr. Pramote Ramrong)
Authorized signatory

Without adjustment

Desired Temperature: 20.0°C Tolerances: 1.0 °C

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

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	20.06	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	0.66	1.0	Pass
#9	20.21	0.21	0.6	1.0	Pass

Correction* = Measured Temperature - Desired Temperature

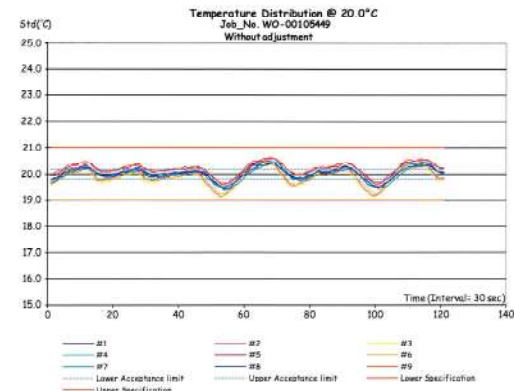
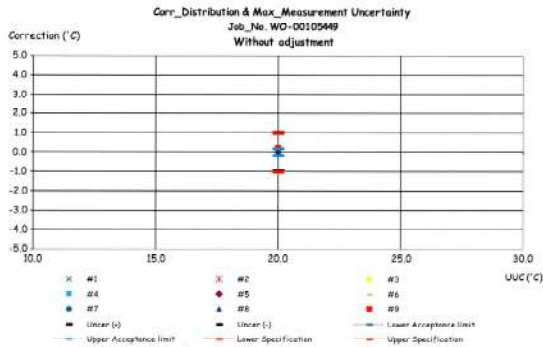
The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Phone: +66 2029 7000 Email: info.certificate@dksh.com Website: www.dksh.com/certificate-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-11: 30 Jun 2025



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00105449

ชนิดเครื่อง: Cooled Incubator

รุ่น: KB 240

หมายเลขเครื่อง: 20180000012164

ตรวจสอบ (วัน)		รายการตรวจสอบ	ตรวจสอบ (สิ่ง)		หมายเหตุ
09 Feb 2026			09 Feb 2026		
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. การทำงานของระบบทำความร้อน	☐	☐	ไม่มี
☒	☐	12. สภาพพนักพิง	☒	☐	
☒	☐	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	☒	☐	

เขียนโดย :

Mr. Sittiphong Lekfu
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Phone: +66 2029 7000 Email: info.certificate@dksh.com Website: www.dksh.com/certificate-thailand

Delivering Growth - in Asia and Beyond.

Certificate of Calibration

Certificate No.: WK2606-412-976

Page 1 of 2

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

Instrument : Portable Turbidity Meter
Manufacturer : BANTE
Model : TB100
Serial No. : 210128 023
Identity No. : N/A
Range : 0 NTU to 1100 NTU
Resolution : 0.01 NTU, 0.1 NTU, 1 NTU
Calibration Method : CP-WK-C07

Ambient Temperature : (25 ± 2) °C
Humidity : (50 ± 15) %RH
Received Date : 09-Jun-26
Calibrated Date : 11-Jun-26
Issued Date : 12-Jun-26
Calibrated Location : In Lab

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 0494/09	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 coverage factor $k = 2$, providing a level of confidence approximately 95 %

Calibrated by : Ms. Usa Phuangphiphat

Approved by :


Mr. Ratchadawut Rungravee
Authorized Signatory

This certificate may not be reproduced except in full unless permission for the reproduction has been obtained in writing from the laboratory.

F5100

REV.00 27 Oct 16

Calibration Results

Certificate No.: WK2606-412-976

Page 2 of 2

Calibration Result of the Accuracy

Function : Turbidity Measurement at 25 °C
Resolution : 0.01 NTU, 0.1 NTU, 1 NTU

Standard Solution	UUC Reading	Error	Unit : NTU
			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

This certificate may not be reproduced except in full unless permission for the reproduction has been obtained in writing from the laboratory.

**** End of Certificate****

F5100

REV.00 27 Oct 16



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 Technology (Thailand) Co., Ltd.



Operator Signature:  Date: Feb 19-20, 2026

(Mr. Teerapat Boonla)

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



Checklist ICS Preventive Maintenance

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 800		EGC III

Remark:

Perform By Archemica



Teerapat R
Archemica
19 Feb 26
Date

Customer
Date



Checklist ICS Preventive Maintenance

General ICS Maintenance Checklist

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

Overall Test Result: **Passed**

Comparison Format:

All Parameters:	Significant Digits:	10
-----------------	---------------------	----



Tran Nguyen R. M. Feb 19
Operator's Signature & Date

ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification, Part 1
Verification of Selected Results

Integration Algorithm:	Cobra	
Calibration Type:	Lin. With Offset	
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 Coeff.	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 (AIA)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

Test Result: **Passed**



Chromleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Detection Algorithm	Costra
Calibration Type	1m, WPC/Min
Evaluation Type	Smc
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
	No.	Acetanilide	ok
	No.	Acetophenone	ok
	No.	Propiophenone	ok
Peak Results	Peak Name	Acetanilide	ok
	Peak Name	Acetophenone	ok
	Peak Name	Propiophenone	ok
	Ret.Time	Acetanilide	ok
	Ret.Time	Acetophenone	ok
	Ret.Time	Propiophenone	ok
	Ret.Time	Acetanilide	ok
	Ret.Time	Acetophenone	ok
	Ret.Time	Propiophenone	ok
	Ret.Time	Propiophenone	ok



Chromleon 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
	Rel.Dev.(rel)	Acetophenone	ok
	Rel.Dev.(rel)	Propiophenone	ok
	Area	Acetanilide	ok
	Area	Acetophenone	ok
	Area	Propiophenone	ok
	Rel.Area	Acetanilide	ok
Chromatogram	Rel.Area (Total)	Acetophenone	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
Peak Calibration	Concentration	Acetanilide	ok
	Concentration	Acetophenone	ok
	Concentration	Propiophenone	ok
	Rel.Amount	Acetanilide	ok
	Rel.Amount	Acetophenone	ok
	Rel.Amount	Propiophenone	ok
	Peak Width (5%)	Acetanilide	ok
	Peak Width (5%)	Acetophenone	ok
	Peak Width (5%)	Propiophenone	ok
	Peak Width (5%)	Acetanilide	ok
Peak Calibration	Peak Width (5%)	Acetophenone	ok
	Peak Width (5%)	Propiophenone	ok
	Peak Width (5%)	Acetanilide	ok
	Peak Width (5%)	Acetophenone	ok
	Peak Width (5%)	Propiophenone	ok
	Peak Width (5%)	Acetanilide	ok
	Peak Width (5%)	Acetophenone	ok
	Peak Width (5%)	Propiophenone	ok
	Peak Width (5%)	Acetanilide	ok
	Peak Width (5%)	Acetophenone	ok



Chromleon 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 (50%)	Acetanilide	ok
	Left Width (50%)	Acetophenone	ok
	Left Width (50%)	Propiophenone	ok
	Right Width (50%)	Acetanilide	ok
	Right Width (50%)	Acetophenone	ok
	Right Width (50%)	Propiophenone	ok
	Peak Start	Acetanilide	ok
Peak Calibration	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 Calibration	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
Peak Calibration	Resolution (EP)	Acetanilide	ok
	Resolution (EP)	Acetophenone	ok
	Resolution (EP)	Propiophenone	ok
	Resolution (USP)	Acetanilide	ok
	Resolution (USP)	Acetophenone	ok
	Resolution (USP)	Propiophenone	ok
	Asymmetry (EP)	Acetanilide	ok
	Asymmetry (EP)	Acetophenone	ok
	Asymmetry (EP)	Propiophenone	ok
	Asymmetry (EP)	Acetanilide	ok



Chromleon 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(USP)	Acetanilide	ok
Peak Calibration	Theor. Plates(USP)	Acetophenone	ok
	Theor. Plates(USP)	Propiophenone	ok
	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
Peak Calibration	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
Peak Calibration	No. of Points	Acetanilide	ok
	No. of Points	Acetophenone	ok
	No. of Points	Propiophenone	ok
	No. of Points	Acetanilide	ok
	No. of Points	Acetophenone	ok
	No. of Points	Propiophenone	ok
	No. of Points	Acetanilide	ok
	No. of Points	Acetophenone	ok
	No. of Points	Propiophenone	ok
	No. of Points	Acetanilide	ok



Chromleon 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



Chromleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

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



Chromleon 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
	Ref.Max at	Acetanilide	ok
	Ref.Max at	Acetophenone	ok
	Ref.Max at	Propiophenone	ok
	Ref.Max at	Propiophenone	ok
	Ref.Max at	Propiophenone	ok
	Ref.Max at	Propiophenone	ok

Test Result: Passed



Chromleon Operational Qualification, Part 3

System Suitability Test: Comparison with Expected Results

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

Test Result: Passed

PQ

Performance Qualification

Service Summary

ThermoFisher
SCIENTIFIC

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.



Thermo Representative	
Signature: <i>Trevor B</i>	Date: <i>19 Feb 2025</i>
Customer	
Signature:	Date:

RPGReports v3.4.8.0
© 2020-2025 Thermo Fisher Scientific
Qualification #: 2028030913428338

Printed Date: 09-Mar-2026
Page 1 of 16

Service Details

ThermoFisher
SCIENTIFIC

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

Document Generation

ThermoFisher
SCIENTIFIC

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	(signature)

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 total 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 stipulated 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 Documentation
- Individual Component Manuals
- Factory Installation Procedures

Test Equipment

Equipment	Manufacturer	Model	Serial Number	Cal Ver Date	Good Until
IC Qualification	Thermo Scientific	Test Box II	22105053	n/a	n/a
Manometer	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
Miscela	Thermo Scientific	5	050254	250414	Apr 2026
Nitrate	Thermo Scientific	10	050254	250414	Apr 2026
Nitrate	Thermo Scientific	25	050254	250414	Apr 2026
Nitrate	Thermo Scientific	50	050254	250414	Apr 2026
Nitrate	Thermo Scientific	100	050254	250414	Apr 2026
Nitrate	Thermo Scientific	1000	050254	250414	Apr 2026

Autosampler AS-DV 1

Autosampler Information

Autosampler Model	AS-DV
Serial Number	2205860126
Firmware Version	1.6.0
Instrument Assignee	Instrument 1
Tray Type	N/A
Syringe Volume	N/A
Loop Volume	25 µL
Connection	USB
Powered On Successfully?	Yes

System Repeatability OQ Autosampler AS-DV 1 Test 1

System Information

Model	AS-DV	Acquisition Date	N/A
Serial Number	2205860126	Sequence	N/A
System Name	N/A		
Test Configuration	Default		

Data Entry Mode

Data Entry Mode	Import
-----------------	--------

Peak Results

Sample Name	Injection Volume (µL)	Retention Time (min)	Area (µg/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	≤ 5 % RSD	≤ 5.0 % RSD	PASSED
Area Result	≤ 7 % RSD	≤ 7.0 % RSD	PASSED

Carryover OQ Autosampler AS-DV 1 Test 1

ThermoFisher
SCIENTIFIC

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	Input
-----------------	-------

Peak Results

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

Carryover Area Results

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

Pump Aquion 1

ThermoFisher
SCIENTIFIC

Pump Information

Pump Model	Aquion
Serial Number	221290114
Firmware Version	3.0
Pump Position	Single Unit
Seal Type	Normal Phase
Pressure Units	psi
Connection	USB
Powered On Successfully?	Yes

Flow Rate Repeatability OQ Pump Aquion 1 Test 1

ThermoFisher
SCIENTIFIC

System Information

Model	Aquion	Acquisition Date	N/A
Serial Number	221290114	Sequence	N/A
System Name	N/A	Pump Position	Single Unit
Test Configuration	Default		

Data Entry Mode

Data Entry Mode	Input
-----------------	-------

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

Detector (Aquion CD) Conductivity Detector 1

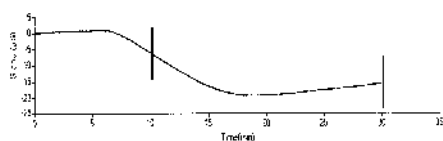
ThermoFisher
SCIENTIFIC

Detector Information

Detector Model	Aquion CD
Serial Number	221290114
Powered On Successfully?	Yes

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

ThermoFisher
SCIENTIFIC



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

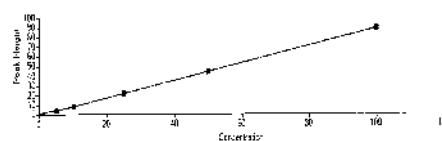
Data Entry Mode	Import
-----------------	--------

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

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

ThermoFisher
SCIENTIFIC



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	4.808	4.983897
Detector Linear	10	9.29	9.945032
Detector Linear	25	22.754	23.050866
Detector Linear	50	49.04	50.903880
Detector Linear	100	89.529	89.569815

Linearity Results

Test	Measured	OQ Limit	Result
R²	1.000	≥ 0.990	PASSED

IC EG Aquion RFIC 1

ThermoFisher
SCIENTIFIC

EG Information

Model	Aquion RFIC
Serial Number	221260114
Firmware Version	5.1.0
Cartridge Type	EGC 11 KGH
Instrument Assigned	Instrument 1
Connection	USB
Powered On Successfully?	Yes

EG Current OQ IC EG Aquion RFIC 1 Test 1

ThermoFisher
SCIENTIFIC

System Information

Model	Aquion RFIC	Acquisition Date	
Serial Number	221260114	Sequence	
System Name			
Test Configuration	KOH Analytical		

Current Results

Std Point	Expected Result	Reading	Deviation	OQ Limit	Result
1.00 mM	1.81 mA	1.9100 mA	0.06 mA	± 0.01 mA	PASSED
5.00 mM	9.34 mA	9.0400 mA	0.06 mA	± 0.05 mA	PASSED
10.00 mM	18.08 mA	16.0800 mA	0.06 mA	± 0.10 mA	PASSED
50.00 mV	20.43 mA	20.4200 mA	0.01 mA	± 0.50 mA	PASSED
100.00 mM	150.81 mA	150.8200 mA	0.02 mA	± 1.00 mA	PASSED

Service Review and Completion

ThermoFisher
SCIENTIFIC

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

Certificate

Certificate of Standards and Instruments for Qualification

ThermoFisher Scientific
QMS-2025 ThermoFisher Scientific
Qualification # 202001091410208

Printed Date: 09-Nov-2025
Page 5 of 11

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 218.2 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

ThermoFisher Scientific
ARCHIMICA LAB CO., LTD.
Tel: 02-014-1119 / 1119 / 1119

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. 078990-01

20-Dec-2011

Learn more at thermofisher.com/documents

Research Use Only. Not for Clinical, Patient or Diagnostic Use. © 2024 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of Thermo Fisher Scientific and its subsidiaries unless otherwise specified. This information is presented as an example of the capabilities of Thermo Fisher Scientific products. It is not intended to encourage use of these products in any manner that might infringe the intellectual property rights of others. Specifications, terms and pricing are subject to change. Not all products are available in all countries. Please contact your local sales representative for details. CDA 90-010106-01

thermoscientific

SYSTRONICS INSLAB COMPANY LIMITED			
1011-12, Sukhumvit Rd., Nongkro, Muang Phayeng, Hoeng 21150, Thailand Tel: +66(0)8 694 145-8, Email: calibration@systronics.co.th			
CERTIFICATE OF CALIBRATION		Certificate No: EL251725 Job No: 25120018 Page: 1 of 5	
Customer Name:	Archimica Lab Co., Ltd.	Received Date:	08 Dec 2025
Customer Address:	39 Soi Sukhumvit 63 (Ekkamai) Sukhumvit Rd., North Bangkok, Watana, Bangkok 10110	Calibrated Date:	09 Dec 2025
Instrument Description:	TRUE RMS MULTIMETER	Issued Date:	09 Dec 2025
Manufacturer:	FLUKE	Tag No:	-
Model No.	289	Service:	-
Serial Number:	32320105	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:			
Reference Standards Instrument.			
Instrument Name	Model	Serial No.	Cert. No.
Multi-Function Calibrator	Fluke 5500A	9395605	E202508317
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
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: Mr. Suttinon Pravegrat		Approved by: () Mr. Phitsanu Wangchul () Mr. Chanon Chanasit	
This certificate may not be reproduced, except in full unless permission is granted in writing from the calibration organization issuing this report.			

SYSTRONICS INSLAB COMPANY LIMITED
19/11-12, Sukhumvit Rd., Nongprue, Muang Rayong, Rayong 21150, Thailand
Tel: +66(0) 894 145-8, Email: calibration@systronics.co.th

CERTIFICATE OF CALIBRATION

Certificate No. BL251725
Page 2 of 5

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
500 mV	50.0000 mV	50.000 mV	0.000 mV	0.0076 mV
500 mV	450.0000 mV	449.96 mV	-0.04 mV	0.023 mV
500 mV	-450.0000 mV	-450.01 mV	-0.01 mV	0.023 mV
5 V	0.500000 V	0.50000 V	0.00000 V	0.00063 V
5 V	4.500000 V	4.4998 V	-0.0002 V	0.00023 V
5 V	-4.500000 V	-4.4995 V	0.0005 V	0.00023 V
50 V	5.000000 V	5.0000 V	0.0000 V	0.00063 V
50 V	-5.000000 V	-5.0000 V	0.0000 V	0.00063 V
50 V	25.000000 V	25.0000 V	0.0000 V	0.0012 V
50 V	45.000000 V	44.999 V	-0.001 V	0.0008 V
50 V	-45.000000 V	-44.998 V	0.002 V	0.0024 V
500 V	50.000000 V	50.000 V	0.000 V	0.0063 V
500 V	450.000000 V	449.99 V	-0.01 V	0.022 V
500 V	-450.000000 V	-449.96 V	0.04 V	0.022 V
1000 V	100.000000 V	100.0 V	0.0 V	0.070 V
1000 V	900.000000 V	899.9 V	-0.1 V	0.070 V
1000 V	-900.000000 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	100.000000 V	100.0 V	0.0 V	0.058 V
1000 V	900.000000 V	900.5 V	0.5 V	0.070 V
1000 V	-900.000000 V	-900.5 V	-0.5 V	0.070 V
Function : AC Voltage Measurement (Without Adjustment)				
50 mV	5.0000 mV	49.993 mV	-0.007 mV	0.022 mV
50 mV	45.0000 mV	44.997 mV	-0.003 mV	0.033 mV
50 mV	450.0000 mV	44.99 mV	-0.01 mV	0.034 mV
500 mV	50.0000 mV	49.99 mV	-0.01 mV	0.036 mV
500 mV	450.0000 mV	449.98 mV	-0.02 mV	0.16 mV
500 mV	450.0000 mV	119.87 mV	-0.13 mV	0.16 mV
5 V	0.500000 V	0.49999 V	-0.00001 V	0.00018 V
5 V	4.500000 V	4.50022 V	0.00022 V	0.00019 V
5 V	4.500000 V	4.50012 V	0.00012 V	0.00019 V
50 V	5.000000 V	5.0009 V	0.0009 V	0.00021 V
50 V	25.000000 V	25.018 V	0.018 V	0.0003 V
50 V	45.000000 V	45.031 V	0.031 V	0.0023 V
50 V	45.000000 V	45.020 V	0.020 V	0.0023 V
500 V	50.000000 V	50.000 V	0.000 V	0.026 V
500 V	450.000000 V	450.26 V	0.26 V	0.24 V
500 V	450.000000 V	450.17 V	0.17 V	0.24 V
1000 V	100.000000 V	100.0 V	0.0 V	0.073 V
1000 V	900.000000 V	900.5 V	0.5 V	0.42 V
Remark : (*) UUC : Unit Under Calibration				

SYSTRONICS INSLAB COMPANY LIMITED
19/11-12, Sukhumvit Rd., Nongprue, Muang Rayong, Rayong 21150, Thailand
Tel: +66(0) 894 145-8, Email: calibration@systronics.co.th

CERTIFICATE OF CALIBRATION

Certificate No. BL251725
Page 3 of 5

Range	Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : AC Voltage Measurement LoZ (Without Adjustment)				
1000 V	100.0000 V	50 Hz	100.3 V	0.3 V
1000 V	900.0000 V	50 Hz	904.2 V	4.2 V
Function : DC Current Measurement (Without Adjustment)				
500 uA	0.00 uA	0.00 uA	0.00 uA	0.060 uA
500 uA	50.00 uA	50.02 uA	0.02 uA	0.015 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	5.0000 mA	0.0000 mA	0.00063 mA
50 mA	45.0000 mA	44.995 mA	-0.005 mA	0.0001 mA
400 mA	40.0000 mA	39.99 mA	-0.01 mA	0.0001 mA
400 mA	200.0000 mA	199.96 mA	-0.04 mA	0.019 mA
400 mA	360.0000 mA	359.96 mA	-0.04 mA	0.12 mA
400 mA	-360.0000 mA	-359.94 mA	0.06 mA	0.12 mA
5 A	0.500000 A	0.49999 A	-0.00001 A	0.00017 A
5 A	4.500000 A	4.50010 A	0.00010 A	0.00024 A
10 A	1.000000 A	1.0000 A	0.0000 A	0.00064 A
10 A	9.000000 A	9.0001 A	0.0001 A	0.00045 A
Function : AC Current Measurement (Without Adjustment)				
500 uA	50.00 uA	50 Hz	49.96 uA	-0.04 uA
500 uA	450.00 uA	50 Hz	449.63 uA	-0.37 uA
500 uA	450.00 uA	1 kHz	449.86 uA	-0.14 uA
5000 uA	500.00 uA	50 Hz	500.0 uA	0.0 uA
5000 uA	4500.0 uA	50 Hz	4499.9 uA	-0.1 uA
5000 uA	4500.0 uA	1 kHz	4500.3 uA	0.3 uA
50 mA	5.0000 mA	50 Hz	4.991 mA	-0.009 mA
50 mA	45.0000 mA	50 Hz	44.955 mA	-0.045 mA
50 mA	45.0000 mA	1 kHz	44.963 mA	-0.037 mA
400 mA	40.0000 mA	50 Hz	40.00 mA	0.00 mA
400 mA	200.0000 mA	50 Hz	199.93 mA	-0.07 mA
400 mA	360.0000 mA	50 Hz	359.92 mA	-0.08 mA
400 mA	360.0000 mA	1 kHz	360.06 mA	0.06 mA
5 A	0.500000 A	50 Hz	0.49991 A	-0.00009 A
5 A	4.500000 A	50 Hz	4.4990 A	-0.0010 A
5 A	4.500000 A	1 kHz	4.4996 A	-0.0004 A
10 A	1.000000 A	50 Hz	1.0000 A	0.0000 A
10 A	9.000000 A	50 Hz	9.0001 A	0.0001 A
10 A	9.000000 A	1 kHz	9.0006 A	0.0006 A
Remark : (*) UUC : Unit Under Calibration				

SYSTRONICS INSLAB COMPANY LIMITED
19/11-12, Sukhumvit Rd., Nongprue, Muang Rayong, Rayong 21150, Thailand
Tel: +66(0) 894 145-8, Email: calibration@systronics.co.th

CERTIFICATE OF CALIBRATION

Certificate No. BL251725
Page 4 of 5

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	500.000 Ω	499.95 Ω	-0.05 Ω	0.079 Ω
5 kΩ	0.50000 kΩ	0.49999 kΩ	-0.00001 kΩ	0.00010 kΩ
5 kΩ	4.50000 kΩ	4.4991 kΩ	-0.0009 kΩ	0.00079 kΩ
50 kΩ	5.00000 kΩ	5.0000 kΩ	0.0000 kΩ	0.0010 kΩ
50 kΩ	45.0000 kΩ	45.000 kΩ	0.000 kΩ	0.0086 kΩ
500 kΩ	50.0000 kΩ	50.01 kΩ	0.01 kΩ	0.011 kΩ
500 kΩ	450.000 kΩ	449.77 kΩ	-0.23 kΩ	0.096 kΩ
5 MΩ	0.50000 MΩ	0.49996 MΩ	-0.00004 MΩ	0.00012 MΩ
5 MΩ	4.50000 MΩ	4.4972 MΩ	-0.0028 MΩ	0.00026 MΩ
30 MΩ	3.00000 MΩ	2.9988 MΩ	-0.0012 MΩ	0.00010 MΩ
30 MΩ	27.00000 MΩ	26.964 MΩ	-0.036 MΩ	0.0022 MΩ
50 MΩ	5.00000 MΩ	4.999 MΩ	-0.001 MΩ	0.00064 MΩ
50 MΩ	45.00000 MΩ	44.92 MΩ	-0.08 MΩ	0.18 MΩ
100 MΩ	10.00000 MΩ	10.0 MΩ	0.0 MΩ	0.058 MΩ
100 MΩ	90.00000 MΩ	89.7 MΩ	-0.3 MΩ	0.36 MΩ
500 MΩ	150.00000 MΩ	149.4 MΩ	-0.6 MΩ	0.60 MΩ
500 MΩ	330.00000 MΩ	327.4 MΩ	-2.6 MΩ	4.4 MΩ
Function : Resistance Measurement LoZ (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	0.0007 Ω
50 Ω	25.000 Ω	25.004 Ω	0.004 Ω	0.001 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	0.0058 nF
1 nF	0.5000 nF	0.499 nF	-0.001 nF	0.012 nF
10 nF	1.0000 nF	1.00 nF	0.00 nF	0.013 nF
10 nF	9.0000 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	90.000 nF	90.1 nF	0.1 nF	0.20 nF
1 μF	0.10000 μF	0.100 μF	0.000 μF	0.00064 μF
1 μF	0.50000 μF	0.5000 μF	0.0000 μF	0.00029 μF
10 μF	1.0000 μF	1.00 μF	0.00 μF	0.0064 μF
10 μF	9.0000 μF	9.00 μF	0.00 μF	0.033 μF
100 μF	10.000 μF	10.0 μF	0.0 μF	0.066 μF
100 μF	90.000 μF	90.3 μF	0.3 μF	0.11 μF
1000 μF	100.000 μF	100 μF	0 μF	0.75 μF
1000 μF	900.000 μF	899 μF	-1 μF	7.3 μF
10 mF	1.0 mF	1.00 mF	0.00 mF	0.0099 mF
Remark : (*) UUC : Unit Under Calibration				

SYSTRONICS INSLAB COMPANY LIMITED
19/11-12, Sukhumvit Rd., Nongprue, Muang Rayong, Rayong 21150, Thailand
Tel: +66(0) 894 145-8, Email: calibration@systronics.co.th

CERTIFICATE OF CALIBRATION

Certificate No. BL251725
Page 5 of 5

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
100 Hz	90.00 Hz	@ 1 V	90.000 Hz	0.000 Hz
1000 Hz	100.00 Hz	@ 1 V	100.000 Hz	0.000 Hz
1000 Hz	900.00 Hz	@ 1 V	900.00 Hz	0.000 Hz
10 kHz	1.0000 kHz	@ 1 V	1.0000 kHz	0.00000 kHz
10 kHz	9.0000 kHz	@ 1 V	9.0000 kHz	0.00000 kHz
100 kHz	10.0000 kHz	@ 1 V	10.0000 kHz	0.00000 kHz
100 kHz	90.0000 kHz	@ 1 V	90.0000 kHz	0.00000 kHz
1000 kHz	100.0000 kHz	@ 1 V	100.0000 kHz	0.00000 kHz
1000 kHz	900.0000 kHz	@ 1 V	900.0000 kHz	0.00000 kHz
Function : Thermocouple Measurement K Type (Without Adjustment)				
-200 to 1350 °C	-5.550 mV	-180.0 °C	-179.5 °C	0.4 °C
-200 to 1350 °C	0.000 mV	0.0 °C	0.2 °C	0.25 °C
-200 to 1350 °C	4.095 mV	100.0 °C	100.2 °C	0.22 °C
-200 to 1350 °C	24.905 mV	600.0 °C	600.2 °C	0.23 °C
-200 to 1350 °C	37.326 mV	900.0 °C	900.2 °C	0.24 °C
-200 to 1350 °C	48.838 mV	1200.0 °C	1200.2 °C	0.26 °C
Remark : (*) UUC : Unit Under Calibration				

END OF CALIBRATION

SYSTRONICS INSLAB COMPANY LIMITED
19/11-12, Sukhumvit Rd., Nongpho, Muang Rayong, Rayong 21150, Thailand
Tel.: +66(34) 694 145-8, Email: calibration@systronics.co.th

CERTIFICATE OF CALIBRATION

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

Customer Name: **Archimex Lab Co., Ltd.**
Customer Address: **30 Soi Sukhumvit 63 (Ekamai) Jakkumvit Rd., North Klongkum, Wattana, Bangkok 10110.**

Received Date: **08 Dec 2025**
Calibrated Date: **11 Dec 2025**
Issued Date: **11 Dec 2025**

Instrument Description: **Digital Thermometer with sensor**
Manufacturer: **FLUXE**
Model No.: **289**
Serial Number: **3230805**

Tag No.: **-**
Service: **-**
Condition As Received: **Used Item**

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

Procedure No.
CP-TL-01

Comments:

Reference Standards Instrument:

Instrument Name	Model	Serial No.	Cert No.	Use Until
Platinum Resistance Thermometer	5615	59832	TT-101925	28 Apr 2027
Thermometer Resistor	1529	82930	236400	22 Dec 2025

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 above 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: **Huttipon Sriwanit**

Approved Signatory:
() Mr. Hitzanu Wangchai
() Mr. Chanan Chansit

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.

SYSTRONICS INSLAB COMPANY LIMITED
19/11-12, Sukhumvit Rd., Nongpho, Muang Rayong, Rayong 21150, Thailand
Tel.: +66(34) 694 145-8, Email: calibration@systronics.co.th

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.: **3230805**
Dimension: Length: **930 mm** Diameter: **1.5 mm**

Immersion Depth mm	Standard Reading °C	UUC Reading °C	Correction Value °C	Uncertainty of Measurement (k)	Coverage Factor
150	0.0041	0.7	-0.7	0.50	2.00
150	50.0053	49.6	0.4	0.50	2.00
150	100.0020	99.4	0.6	0.50	2.00

UUC: Unit Under Calibration

END OF CERTIFICATE

Archimex Lab Co., Ltd.
30 Soi Sukhumvit 63 (Ekamai) Jakkumvit Rd., North Klongkum, Wattana, Bangkok 10110.

Teerapong B. // 19 Feb 26

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: **221000-60001**
Instrument Part Number: **221000-60001**

TEST BOX LOADS AND FUNCTIONS

Load	Function	Specification	Result
[x] AES	1000	±1.5%	1.3KΩ
[x] EGC CAP KOH	1000	±1.5%	1.3KΩ
[x] EGC CAP MSA	1000	±1.5%	1.3KΩ
[x] EGC ANA KOH	1000	±1.5%	1.3KΩ
[x] EGC ANA MSA	1000	±1.5%	1.3KΩ
[x] ERS (CC)	120	±1.5%	1.3KΩ
[x] ERS (CV)	2500	±1.5%	1.3KΩ

Tester: **Lucy Angel Sosa** Date: **1 - March - 2022**
P/N 12000-60001 C

Teerapong B. // 19 Feb 26

ThermoFisher
SCIENTIFIC

The world leader
in leading science

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.

Sincerely,

Thomas Wu
ICSP Product Manager
Thermo Fisher Scientific

Archimex Lab Co., Ltd.
30 Soi Sukhumvit 63 (Ekamai) Jakkumvit Rd., North Klongkum, Wattana, Bangkok 10110.

Teerapong B. // 19 Feb 26

Certificate of Completion

This certifies that

Teerapat Boonla

Has successfully completed

OJT RPG Mentoring: Ion Chromatography System Qualification Service Training



Valid for 3 years from:
Aug 26/2024

Issued electronically and
approved by:

Thermo Fisher University LMS
Certification Management and
Compliance Group
lmc.training@thermofisher.com

Teerapat Boonla Feb 14

● The world leader in serving science

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