

ภาคผนวกที่ 4

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สรุปเอกสารสอบเทียบอุปกรณ์เครื่องมือ



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT  
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NSC-TIS-TIS 17025  
CALIBRATION 0119

Certificate No.: CP20250024EB  
Operation No.: CP2025010014

### Certificate of Calibration

This certificate was issued to substitute to Certificate No. CP20250024EA

Equipment: Sound Level Meter  
Manufacturer: ACO  
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)  
Serial No.: 222185 (Meter), 84158 (Microphone), - (Preamplifier)  
ID No.: NS-03-015  
Customer: C.E.M. Technology (Thailand) Co.,Ltd.  
Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran,  
Nakorn Phatom 73210  
Received Date: 13 January 2025  
Calibrated Date: 17 - 20 January 2025  
Issued Date: 25 February 2025  
Calibrated by: Ms. Juntapom Kunhakom

Approved by:

( Mr. Sittichai Swaksuriyawong )  
Group Manager

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ELECTRICAL AND ELECTRONICS INSTITUTE  
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Certificate No.: CP20250024EB

Calibration Report

Equipment: Sound Level Meter  
Manufacturer: ACO  
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)  
Serial No.: 222185 (Meter), 84158 (Microphone), - (Preamplifier)  
ID No.: NS-03-015  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-

IEC61672-3:2013

Condition of this result of calibration

1. Reference standards instrument :-

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

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)
- Electrical and Electronics Institute; NSC Accredited Calibration No.01119
- Reference standards instrument for Electrical function
- National Institute of Metrology (Thailand)
- Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

| Reference<br>Acoustic Signal ( dB ) | Measured value<br>( dB ) | Deviation<br>( dB ) | Acceptance limits<br>( dB ) |
|-------------------------------------|--------------------------|---------------------|-----------------------------|
| -                                   | -                        | -                   | -                           |

Certificate No.: CP20250024EB

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

| Measured value<br>(dB) |
|------------------------|
| 18.8                   |

2.2 Microphone replaced by the electrical input signal device

| Frequency<br>Weighting | Measured value<br>(dB) |
|------------------------|------------------------|
| A-weighting            | 13.6                   |
| C-weighting            | 18.2                   |
| Z-weighting            | 24.4                   |

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

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

| Frequency<br>(Hz) | Deviation from various Frequency Weighting Response Curve |                     |                           |
|-------------------|-----------------------------------------------------------|---------------------|---------------------------|
|                   | C-Weighting<br>(dB)                                       | A-Weighting<br>(dB) | Z-Weighting<br>(dB)       |
| 125               | 0.1                                                       | -0.2                | 0.1                       |
| 1000              | -0.2                                                      | -0.1                | -0.2                      |
| 8000              | 0.6                                                       | 0.7                 | 0.9                       |
|                   |                                                           |                     | Acceptance limits<br>(dB) |
|                   |                                                           |                     | ±1.5                      |
|                   |                                                           |                     | ±1.0                      |
|                   |                                                           |                     | ±5.0                      |

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

| Frequency<br>(Hz) | Deviation from various Frequency Weighting Response Curve |                     |                           |
|-------------------|-----------------------------------------------------------|---------------------|---------------------------|
|                   | C-Weighting<br>(dB)                                       | A-Weighting<br>(dB) | Z-Weighting<br>(dB)       |
| 63                | 0.0                                                       | -0.2                | 0.0                       |
| 125               | 0.0                                                       | -0.1                | 0.0                       |
| 250               | 0.0                                                       | -0.1                | 0.0                       |
| 500               | 0.1                                                       | 0.0                 | 0.0                       |
| 1000              | 0.0                                                       | 0.0                 | 0.0                       |
| 2000              | -0.1                                                      | 0.0                 | 0.0                       |
| 4000              | -0.3                                                      | -0.3                | -0.1                      |
| 8000              | -0.5                                                      | -0.3                | -0.1                      |
|                   |                                                           |                     | Acceptance limits<br>(dB) |
|                   |                                                           |                     | ±2.0                      |
|                   |                                                           |                     | ±1.5                      |
|                   |                                                           |                     | ±1.5                      |
|                   |                                                           |                     | ±1.0                      |
|                   |                                                           |                     | ±2.0                      |
|                   |                                                           |                     | ±3.0                      |
|                   |                                                           |                     | ±5.0                      |



Certificate No.: CP20250024EB

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

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

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

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

Certificate No.: CP20250024EB

Calibration Report

7.2 Level Linearity on the reference level range, Lower

| Anticipated Value (dB) | Measured value (dB) | Deviated value (dB) | Acceptance limits (dB) |
|------------------------|---------------------|---------------------|------------------------|
| 94.0                   | 94.0                | 0.0                 | ±1.1                   |
| 89.0                   | 89.0                | 0.0                 | ±1.1                   |
| 84.0                   | 84.0                | 0.0                 | ±1.1                   |
| 79.0                   | 79.0                | 0.0                 | ±1.1                   |
| 74.0                   | 74.0                | 0.0                 | ±1.1                   |
| 69.0                   | 69.0                | 0.0                 | ±1.1                   |
| 64.0                   | 64.0                | 0.0                 | ±1.1                   |
| 59.0                   | 58.8                | -0.2                | ±1.1                   |
| 54.0                   | 53.8                | -0.2                | ±1.1                   |
| 49.0                   | 48.8                | -0.2                | ±1.1                   |
| 44.0                   | 43.9                | -0.1                | ±1.1                   |
| 39.0                   | 38.8                | -0.2                | ±1.1                   |
| 34.0                   | 33.9                | -0.1                | ±1.1                   |
| 33.0                   | 33.0                | 0.0                 | ±1.1                   |
| 32.0                   | 32.1                | 0.1                 | ±1.1                   |
| 31.0                   | 31.3                | 0.3                 | ±1.1                   |
| 30.0                   | 30.4                | 0.4                 | ±1.1                   |
| 29.0                   | 29.6                | 0.6                 | ±1.1                   |

Function : 8. Level Linearity including level range control

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

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

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

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



Certificate No.: CP20250024EB

### Calibration Report

Function : 9. Tone burst response

| Time Weighting | Tone burst duration, Tb (ms) | Measured value (dB) | Deviated value (dB) | Acceptance limits (dB) |
|----------------|------------------------------|---------------------|---------------------|------------------------|
| Fast           | 200                          | 116.1               | 0.1                 | ±1.0                   |
|                | 2                            | 99.0                | 0.0                 | +1.0 ; -2.5            |
|                | 0.25                         | 89.9                | -0.1                | +1.5 ; -5.0            |
| Slow           | 200                          | 109.5               | -0.1                | ±1.0                   |
|                | 2                            | 89.9                | -0.1                | +1.0 ; -5.0            |
|                | 200                          | 110.0               | 0.0                 | ±1.0                   |
| LAE            | 2                            | 90.0                | 0.0                 | +1.0 ; -2.5            |
|                | 0.25                         | 80.9                | -0.1                | +1.5 ; -5.0            |

Function : 10. Peak C sound level

| Number of cycles in test signal | Anticipated Value (dB) | Measured value (dB) | Deviated value (dB) | Acceptance limits (dB) |
|---------------------------------|------------------------|---------------------|---------------------|------------------------|
| Complete cycle                  | 125.4                  | 125.7               | 0.3                 | ±3.0                   |
| Positive half cycle             | 124.4                  | 124.2               | -0.2                | ±2.0                   |
| Negative half cycle             | 124.4                  | 124.2               | -0.2                | ±2.0                   |

Function : 11. Overload indication

| Positive one-half cycle | Measured value (dB)     |   | Deviated value (dB) | Acceptance limits (dB) |
|-------------------------|-------------------------|---|---------------------|------------------------|
|                         | 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.: CP20250024EB

### Calibration Report

Uncertainty of measurement

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

Remarks: 1. Indication at the calibration check frequency can not measured because customer does not provide

a sound calibrator.

2. Overload indication can not measured because sound level meter can not set to Reference value of the standard calibration.

3. The acceptance limit is for the deviated value.

4. Acceptance limits was IEC61672-3:2013 Class 2.

5. The coverage factor  $k = 2.00$

-- End of Report --



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Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280  
Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240426EA  
Operation No.: CP2024120406

## Certificate of Calibration

Equipment: Sound Level Meter  
Manufacturer: ACO  
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)  
Serial No.: 222197 (Meter), 82953 (Microphone), - (Preamplifier)  
ID No.: NS-03-020  
Customer: C.E.M. Technology (Thailand) Co.,Ltd.  
Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran,  
Nakorn Phatom 73210

Received Date: 16 December 2024  
Calibrated Date: 20 - 23 December 2024  
Issued Date: 24 December 2024  
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:   
( Mr. Sittichai Swaksuriyawong )  
Group Manager

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Certificate No.: CP20240426EA

## Calibration Report

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

1. Reference standards instrument :-

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

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)
- Electrical and Electronics Institute; NSC Accredited Calibration No.01119
- Reference standards instrument for Electrical function
- National Institute of Metrology (Thailand)
- Electrical and Electronics Institute; NSC Accredited Calibration No.01119

## Result of Calibration:-

Function : 1. Indication at the calibration check frequency

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



Certificate No.: CP20240426EA

### Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

| Measured value<br>(dB) |  |
|------------------------|--|
| 21.4                   |  |

2.2 Microphone replaced by the electrical input signal device

| Frequency<br>Weighting | Measured value<br>(dB) |
|------------------------|------------------------|
| A-weighting            | 19.0                   |
| C-weighting            | 26.0                   |
| Z-weighting            | 32.3                   |

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

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

| Frequency<br>(Hz) | Deviation from various Frequency Weighting Response Curve |                     |                     |
|-------------------|-----------------------------------------------------------|---------------------|---------------------|
|                   | C-Weighting<br>(dB)                                       | A-Weighting<br>(dB) | Z-Weighting<br>(dB) |
| 125               | 0.2                                                       | -0.1                | 0.1                 |
| 1000              | 0.0                                                       | 0.0                 | 0.0                 |
| 8000              | -0.5                                                      | -0.3                | -0.3                |

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

| Frequency<br>(Hz) | Deviation from various Frequency Weighting Response Curve |                     |                     |
|-------------------|-----------------------------------------------------------|---------------------|---------------------|
|                   | C-Weighting<br>(dB)                                       | A-Weighting<br>(dB) | Z-Weighting<br>(dB) |
| 63                | -0.3                                                      | -0.2                | 0.0                 |
| 125               | -0.2                                                      | -0.2                | 0.0                 |
| 250               | -0.2                                                      | -0.1                | 0.0                 |
| 500               | -0.1                                                      | -0.1                | 0.0                 |
| 1000              | 0.0                                                       | 0.0                 | 0.0                 |
| 2000              | -0.2                                                      | -0.1                | 0.0                 |
| 4000              | -0.4                                                      | -0.3                | 0.0                 |
| 8000              | -0.6                                                      | -0.3                | -0.1                |

Certificate No.: CP20240426EA

### Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

| Time<br>Weighting | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Apply Signal<br>(min) | SPL<br>Reference<br>(dB) | Record SPL at<br>Conclusion of Time<br>Period (dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Value (dB) | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(dB) |
|---------------------------|------------------------|------------------------|---------------------------|
| 94.0                      | 94.0                   | 0.0                    | ±1.1                      |
| 99.0                      | 99.0                   | 0.0                    | ±1.1                      |
| 104.0                     | 104.0                  | 0.0                    | ±1.1                      |
| 109.0                     | 109.0                  | 0.0                    | ±1.1                      |
| 114.0                     | 114.0                  | 0.0                    | ±1.1                      |
| 119.0                     | 119.0                  | 0.0                    | ±1.1                      |
| 120.0                     | 120.1                  | 0.1                    | ±1.1                      |
| 121.0                     | 121.1                  | 0.1                    | ±1.1                      |
| 122.0                     | 122.1                  | 0.1                    | ±1.1                      |
| 123.0                     | 123.1                  | 0.1                    | ±1.1                      |



Certificate No.: CP20240426EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

| Anticipated Value (dB) | Measured value (dB) | Deviated value (dB) | Acceptance limits (dB) |
|------------------------|---------------------|---------------------|------------------------|
| 94.0                   | 94.0                | 0.0                 | ±1.1                   |
| 89.0                   | 89.0                | 0.0                 | ±1.1                   |
| 84.0                   | 84.0                | 0.0                 | ±1.1                   |
| 79.0                   | 78.9                | -0.1                | ±1.1                   |
| 74.0                   | 73.8                | -0.2                | ±1.1                   |
| 69.0                   | 68.7                | -0.3                | ±1.1                   |
| 64.0                   | 63.7                | -0.3                | ±1.1                   |
| 59.0                   | 58.7                | -0.3                | ±1.1                   |
| 54.0                   | 53.7                | -0.3                | ±1.1                   |
| 49.0                   | 48.7                | -0.3                | ±1.1                   |
| 44.0                   | 43.7                | -0.3                | ±1.1                   |
| 39.0                   | 38.7                | -0.3                | ±1.1                   |
| 34.0                   | 33.7                | -0.3                | ±1.1                   |
| 33.0                   | 32.9                | -0.1                | ±1.1                   |
| 32.0                   | 32.0                | 0.0                 | ±1.1                   |
| 31.0                   | 31.1                | 0.1                 | ±1.1                   |
| 30.0                   | 30.4                | 0.4                 | ±1.1                   |
| 29.0                   | 29.5                | 0.5                 | ±1.1                   |

Function : 8. Level Linearity including level range control

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

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

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

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

Certificate No.: CP20240426EA

Calibration Report

Function : 9. Tone burst response

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

Function : 10. Peak C sound level

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

Function : 11. Overload indication

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

Function : 12. High-Level Stability

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

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



ELECTRICAL AND ELECTRONICS INSTITUTE  
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Certificate No.: CP20240426EA

Calibration Report

Uncertainty of measurement

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

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

-- End of Report --



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Phraek Sai, Mueang Samut Prakan, Samut Prakan 10280  
Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20250138EA  
Operation No.: CP2025040133

Certificate of Calibration

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

Approved by:

( Mr. Sittichai Swaksuriyawong )  
Group Manager

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The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k)  
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Certificate No.: CP20250138EA

Calibration Report

Equipment: Sound Level Meter  
Manufacturer: ACO  
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)  
Serial No.: 222195 (Meter), 84163 (Microphone), - (Preamplifier)  
ID No.: NS-03-025  
Ambient Temperature:  $(23 \pm 2) ^\circ\text{C}$   
Relative Humidity:  $(50 \pm 15) \%$   
Pressure:  $(101.3 \pm 1.5) \text{ kPa}$   
Method of Calibration :-  
IEC61672-3:2013.

Condition of this result of calibration  
1. Reference standards instrument :-

| Instrument                                       | Model   | Serial No. | Cert. No.                    | Due Date                              |
|--------------------------------------------------|---------|------------|------------------------------|---------------------------------------|
| 1) Standard microphone                           | 4180    | 2651000    | AA-1007-24                   | 6 June 2025                           |
| 2) Arbitrary Function Generator                  | AFG2021 | C010063    | CK20240048EA                 | 23 June 2025                          |
| 3) Programmable Attenuator                       | PA5     | 2913       | EF-0021-24                   | 3 June 2025                           |
| 4) 16.5 Digit precision multimeter               | 8846A   | 9639027    | CB20240128EA                 | 31 July 2025                          |
| 5) Pressure humidity and Temperature Transmitter | PTU301  | F0640002   | CL1-P250028<br>CD20240180EA  | 23 March 2025<br>7 August 2025        |
| 6) Performance Audio Analyzer                    | U89038  | MY56510003 | CB20250030EA<br>CK20240069EA | 13 February 2026<br>19 September 2025 |

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

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

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

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

| Reference<br>Acoustic Signal (dB) | Measured value<br>(dB) | Deviation<br>(dB) | Acceptance limits<br>(dB) |
|-----------------------------------|------------------------|-------------------|---------------------------|
| -                                 | -                      | -                 | -                         |



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20250138EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone installed

| Measured value<br>(dB) |
|------------------------|
| 18.7                   |

2.2 Microphone replaced by the electrical input signal device

| Frequency<br>Weighting | Measured value<br>(dB) |
|------------------------|------------------------|
| A-weighting            | 12.2                   |
| C-weighting            | 17.4                   |
| Z-weighting            | 23.5                   |

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

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

| Frequency<br>(Hz) | Deviation from various Frequency Weighting Response Curve |                     |                     |
|-------------------|-----------------------------------------------------------|---------------------|---------------------|
|                   | C-Weighting<br>(dB)                                       | A-Weighting<br>(dB) | Z-Weighting<br>(dB) |
| 125               | 0.2                                                       | -0.1                | 0.2                 |
| 1000              | -0.1                                                      | -0.1                | -0.2                |
| 8000              | -1.6                                                      | -1.5                | -0.8                |
|                   |                                                           |                     | $\pm 5.0$           |

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

| Frequency<br>(Hz) | Deviation from various Frequency Weighting Response Curve |                     |                     |
|-------------------|-----------------------------------------------------------|---------------------|---------------------|
|                   | C-Weighting<br>(dB)                                       | A-Weighting<br>(dB) | Z-Weighting<br>(dB) |
| 63                | 0.0                                                       | -0.1                | -0.1                |
| 125               | 0.0                                                       | -0.1                | -0.1                |
| 250               | 0.0                                                       | 0.0                 | 0.0                 |
| 500               | 0.1                                                       | 0.0                 | 0.0                 |
| 1000              | 0.0                                                       | 0.0                 | 0.0                 |
| 2000              | 0.0                                                       | 0.0                 | 0.0                 |
| 4000              | -0.4                                                      | -0.3                | -0.1                |
| 8000              | -0.3                                                      | -0.4                | -0.2                |
|                   |                                                           |                     | $\pm 5.0$           |



ELECTRICAL AND ELECTRONICS INSTITUTE  
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Certificate No.: CF20250138EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

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

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

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



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7.2 Level Linearity on the reference level range, Lower

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

Function : 8. Level Linearity including level range control

8.1 Level Linearity including the Level Range (Reference Signal)

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

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

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



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Certificate No.: CP20250138EA

Calibration Report

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

Function : 10. Peak C sound level

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

Function : 11. Overload indication

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



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Certificate No.: CF20250138EA

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<br>- Free field sound pressure response level | 0.30             | 0.60 (10Hz to 4kHz)<br>0.70 (>4kHz to 10kHz)      |
| 4) Electrical signal tests of frequency weightings                                               | 0.20             | 0.20                                              |
| 5) Frequency and time weighting at 1 kHz                                                         | 0.20             | 0.20                                              |
| 6) Long-Term Stability                                                                           | 0.10             | 0.10                                              |
| 7) Level Linearity on the reference level range                                                  | 0.30             | 0.30                                              |
| 8) Level Linearity including level range control                                                 | 0.30             | 0.30                                              |
| 9) Tone burst response                                                                           | 0.20             | 0.30                                              |
| 10) Peak C sound level                                                                           | 0.20             | 0.35                                              |
| 11) Overload indication                                                                          | 0.24             | 0.25                                              |
| 12) High-Level Stability                                                                         | 0.10             | 0.10                                              |

Remarks:

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

-- End of Report --



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Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20250254EA  
Operation No.: CP2025080247

## Certificate of Calibration

**Equipment:** Sound Level Meter  
**Manufacturer:** SCARLET TECH  
**Model/Type:** ST11D (Meter), AWA14425 (Microphone), - (Preamplifier)  
**Serial No.:** 820388 (Meter), 79928 (Microphone), - (Preamplifier)  
**ID No.:** NS-12-001  
**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. Juntapom Kunhakom

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

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Certificate No.: CP20250254EA

## Calibration Report

**Equipment:** Sound Level Meter  
**Manufacturer:** SCARLET TECH  
**Model/Type:** ST11D (Meter), AWA14425 (Microphone), - (Preamplifier)  
**Serial No.:** 820388 (Meter), 79928 (Microphone), - (Preamplifier)  
**ID No.:** NS-12-001  
**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  | 10 April 2026     |
| 6) Performance Audio Analyzer                    | U8903B  | MY56510003 | CB20250030EA | 29 March 2026     |
|                                                  |         |            | CK20240069EA | 19 September 2025 |

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

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

- Reference standards instrument for Acoustic function
  - National Institute of Metrology (Thailand)
- 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.: CP20250254EA

### Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

| Measured value<br>(dB) |
|------------------------|
| 15.7                   |

2.2 Microphone replaced by the electrical input signal device

| Frequency<br>Weighting | Measured value<br>(dB) |
|------------------------|------------------------|
| A-weighting            | 11.0                   |
| C-weighting            | 12.1                   |
| Z-weighting            | 14.8                   |

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

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

| Frequency<br>(Hz) | Deviation from various Frequency Weighting Response Curve |                     |                           |
|-------------------|-----------------------------------------------------------|---------------------|---------------------------|
|                   | C-Weighting<br>(dB)                                       | A-Weighting<br>(dB) | Z-Weighting<br>(dB)       |
| 125               | 0.4                                                       | 0.3                 | 0.4                       |
| 1000              | 0.0                                                       | 0.0                 | 0.0                       |
| 8000              | 0.0                                                       | 0.1                 | -0.1                      |
|                   |                                                           |                     | Acceptance limits<br>(dB) |
|                   |                                                           |                     | ±1.0                      |
|                   |                                                           |                     | ±0.7                      |
|                   |                                                           |                     | +1.5; -2.5                |

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

| Frequency<br>(Hz) | Deviation from various Frequency Weighting Response Curve |                     |                           |
|-------------------|-----------------------------------------------------------|---------------------|---------------------------|
|                   | C-Weighting<br>(dB)                                       | A-Weighting<br>(dB) | Z-Weighting<br>(dB)       |
| 63                | 0.0                                                       | -0.1                | 0.0                       |
| 125               | 0.0                                                       | -0.2                | 0.0                       |
| 250               | 0.0                                                       | -0.1                | -0.1                      |
| 500               | 0.0                                                       | -0.1                | 0.0                       |
| 1000              | 0.0                                                       | 0.0                 | 0.0                       |
| 2000              | 0.1                                                       | 0.0                 | -0.1                      |
| 4000              | -0.1                                                      | -0.1                | 0.0                       |
| 8000              | -0.1                                                      | -0.1                | 0.0                       |
| 16000             | -5.3                                                      | -5.2                | 0.1                       |
|                   |                                                           |                     | Acceptance limits<br>(dB) |
|                   |                                                           |                     | ±1.0                      |
|                   |                                                           |                     | ±1.0                      |
|                   |                                                           |                     | +1.5; -2.5                |
|                   |                                                           |                     | +2.5; -16.0               |

Certificate No.: CP20250254EA

### Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

| Frequency<br>Weighting | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Weighting | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Apply Signal<br>(min) | SPL<br>Reference<br>(dB) | Record SPL at<br>Conclusion of Time<br>Period (dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Value (dB) | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Value (dB) | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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                      |



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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                   | 26.0                | 0.0                 | ±0.8                   |
| 25.0                   | 25.0                | 0.0                 | ±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                         | 109.5               | -0.5                | +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                  | 135.2               | -0.2                | ±2.0                   |
| Positive half cycle             | 134.4                  | 134.1               | -0.3                | ±1.0                   |
| Negative half cycle             | 134.4                  | 134.1               | -0.3                | ±1.0                   |

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Calibration Report

Function : 10. Overload indication

| Measured value (dB)     |                         | Deviated value (dB) | Acceptance limits (dB) |
|-------------------------|-------------------------|---------------------|------------------------|
| Positive one-half cycle | Negative one-half cycle |                     |                        |
| 143.0                   | 142.8                   | -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<br>- Free-field sound pressure response level | 0.30             | 0.60 (10Hz to 4kHz)<br>0.70 (>4kHz to 10kHz)      |
| 4) Electrical signal tests of frequency weightings                                               | 0.20             | 0.20                                              |
| 5) Frequency and time weighting at 1 kHz                                                         | 0.20             | 0.20                                              |
| 6) Long-Term Stability                                                                           | 0.10             | 0.10                                              |
| 7) Level Linearity on the reference level range                                                  | 0.30             | 0.30                                              |
| 8) Tone burst response                                                                           | 0.20             | 0.30                                              |
| 9) Peak C sound level                                                                            | 0.20             | 0.35                                              |
| 10) Overload indication                                                                          | 0.24             | 0.25                                              |
| 11) High-Level Stability                                                                         | 0.10             | 0.10                                              |

Remarks: 1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.

2. The acceptance limit is for the deviated value.

3. Acceptance limits was IEC61672-3:2013 Class 1.

4. The coverage factor  $k = 2.00$

-- End of Report --





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### Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone installed

| Measured value<br>(dB) |
|------------------------|
| 15.5                   |

2.2 Microphone replaced by the electrical input signal device

| Frequency<br>Weighting | Measured value<br>(dB) |
|------------------------|------------------------|
| A-weighting            | 5.6                    |
| C-weighting            | 6.5                    |
| Z-weighting            | 12.2                   |

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

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

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

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

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

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### Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

| Frequency<br>Weighting | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Weighting | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Apply Signal<br>(min) | Reference<br>SPL<br>(dB) | Record SPL at<br>Conclusion of Time<br>Period (dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Value (dB) | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(dB) |
|---------------------------|------------------------|------------------------|---------------------------|
| 94.0                      | 94.0                   | 0.0                    | ±0.8                      |
| 99.0                      | 99.0                   | 0.0                    | ±0.8                      |
| 104.0                     | 104.0                  | 0.0                    | ±0.8                      |
| 109.0                     | 109.0                  | 0.0                    | ±0.8                      |
| 114.0                     | 114.0                  | 0.0                    | ±0.8                      |
| 119.0                     | 119.0                  | 0.0                    | ±0.8                      |
| 124.0                     | 124.0                  | 0.0                    | ±0.8                      |
| 129.0                     | 129.0                  | 0.0                    | ±0.8                      |
| 134.0                     | 134.0                  | 0.0                    | ±0.8                      |
| 139.0                     | 139.0                  | 0.0                    | ±0.8                      |
| 140.0                     | 139.9                  | -0.1                   | ±0.8                      |

7.2 Level Linearity on the reference level range, Lower

| Anticipated<br>Value (dB) | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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                      |



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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                 | $\pm 0.8$              |
| 64.0                   | 64.0                | 0.0                 | $\pm 0.8$              |
| 59.0                   | 59.0                | 0.0                 | $\pm 0.8$              |
| 54.0                   | 54.0                | 0.0                 | $\pm 0.8$              |
| 49.0                   | 49.0                | 0.0                 | $\pm 0.8$              |
| 44.0                   | 44.0                | 0.0                 | $\pm 0.8$              |
| 39.0                   | 39.0                | 0.0                 | $\pm 0.8$              |
| 34.0                   | 33.8                | -0.2                | $\pm 0.8$              |
| 29.0                   | 28.8                | -0.2                | $\pm 0.8$              |
| 28.0                   | 27.8                | -0.2                | $\pm 0.8$              |
| 27.0                   | 26.8                | -0.2                | $\pm 0.8$              |
| 26.0                   | 25.8                | -0.2                | $\pm 0.8$              |
| 25.0                   | 24.7                | -0.3                | $\pm 0.8$              |
| 24.0                   | 23.7                | -0.3                | $\pm 0.8$              |
| 23.0                   | 22.7                | -0.3                | $\pm 0.8$              |
| 22.0                   | 21.5                | -0.5                | $\pm 0.8$              |
| 21.0                   | 20.5                | -0.5                | $\pm 0.8$              |
| 20.0                   | 19.3                | -0.7                | $\pm 0.8$              |

Function : 8. Tone burst response

| Time Weighting | Tone burst duration, T <sub>b</sub> (ms) | Measured value (dB) | Deviated value (dB) | Acceptance limits (dB) |
|----------------|------------------------------------------|---------------------|---------------------|------------------------|
| Fast           | 200                                      | 136.0               | 0.0                 | $\pm 0.5$              |
|                | 2                                        | 118.9               | -0.1                | $+1.0 ; -1.5$          |
|                | 0.25                                     | 109.8               | -0.2                | $+1.0 ; -3.0$          |
| Slow           | 200                                      | 129.6               | 0.0                 | $\pm 0.5$              |
|                | 2                                        | 109.9               | -0.1                | $+1.0 ; -3.0$          |
|                | 0.25                                     | 130.0               | 0.0                 | $\pm 0.5$              |
| SEL            | 2                                        | 110.0               | 0.0                 | $+1.0 ; -1.5$          |
|                | 0.25                                     | 100.9               | -0.1                | $+1.0 ; -3.0$          |

Function : 9. Peak C sound level

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



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Calibration Report

Function : 10. Overload indication

| Measured value (dB)     |       | Deviated value (dB) | Acceptance limits (dB) |
|-------------------------|-------|---------------------|------------------------|
| Positive one-half cycle | 142.6 | 0.0                 | $\pm 1.5$              |
| Negative one-half cycle | 142.6 | 0.0                 | $\pm 1.5$              |

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                 | $\pm 0.1$              |

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<br>- Free-field sound pressure response level | 0.30             | 0.60 (10Hz to 4kHz)<br>0.70 (>4kHz to 10kHz)      |
| 4) Electrical signal tests of frequency weightings<br>- Frequency and time weighting at 1 kHz    | 0.20             | 0.20                                              |
| 5) Long-Term Stability                                                                           | 0.10             | 0.10                                              |
| 6) Level Linearity on the reference level range                                                  | 0.30             | 0.30                                              |
| 7) Tone burst response                                                                           | 0.20             | 0.30                                              |
| 8) Peak C sound level                                                                            | 0.20             | 0.35                                              |
| 10) Overload Indication                                                                          | 0.24             | 0.25                                              |
| 11) High-Level Stability                                                                         | 0.10             | 0.10                                              |

Remarks: 1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.

2. The acceptance limit is for the deviated value.

3. Acceptance limits was IEC61672-3:2013 Class 1.

4. The coverage factor  $k = 2.00$

-- End of Report --





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### Calibration Report

Function : 2. Self-generated Noise  
2.1 Microphone Installed

| Measured value<br>(dB) |
|------------------------|
| 15.8                   |

2.2 Microphone replaced by the electrical input signal device

| Frequency<br>Weighting | Measured value<br>(dB) |
|------------------------|------------------------|
| A-weighting            | 7.8                    |
| C-weighting            | 8.2                    |
| Z-weighting            | 14.6                   |

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

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

| Frequency<br>(Hz)         | Deviation from various Frequency Weighting Response Curve |                     |                     |
|---------------------------|-----------------------------------------------------------|---------------------|---------------------|
|                           | C-Weighting<br>(dB)                                       | A-Weighting<br>(dB) | Z-Weighting<br>(dB) |
| 125                       | 0.2                                                       | 0.1                 | 0.1                 |
| 1000                      | 0.1                                                       | 0.1                 | 0.1                 |
| 8000                      | -0.8                                                      | -0.8                | -0.7                |
| Acceptance limits<br>(dB) |                                                           |                     |                     |
| ±1.0                      |                                                           |                     |                     |
| ±0.7                      |                                                           |                     |                     |
| +1.5; -2.5                |                                                           |                     |                     |

Function : 4. Electrical signal tests of frequency weightings

Weighing network response with relative to 1 kHz.

| Frequency<br>(Hz)         | Deviation from various Frequency Weighting Response Curve |                     |                     |
|---------------------------|-----------------------------------------------------------|---------------------|---------------------|
|                           | C-Weighting<br>(dB)                                       | A-Weighting<br>(dB) | Z-Weighting<br>(dB) |
| 63                        | 0.1                                                       | 0.1                 | 0.0                 |
| 125                       | 0.1                                                       | -0.1                | 0.0                 |
| 250                       | 0.0                                                       | 0.0                 | 0.0                 |
| 500                       | 0.0                                                       | 0.0                 | -0.1                |
| 1000                      | 0.0                                                       | 0.0                 | 0.0                 |
| 2000                      | 0.1                                                       | 0.1                 | -0.1                |
| 4000                      | 0.1                                                       | 0.0                 | 0.0                 |
| 8000                      | 0.0                                                       | 0.0                 | -0.1                |
| 15000                     | -5.2                                                      | -5.1                | -0.1                |
| Acceptance limits<br>(dB) |                                                           |                     |                     |
| ±1.0                      |                                                           |                     |                     |
| ±0.7                      |                                                           |                     |                     |
| +1.5; -2.5                |                                                           |                     |                     |
| +2.5; -16.0               |                                                           |                     |                     |



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### Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

| Frequency<br>Weighting | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Weighting | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Apply Signal<br>(min) | Reference<br>SPL<br>(dB) | Record SPL at<br>Conclusion of Time<br>Period (dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Value (dB) | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Value (dB) | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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                      |



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Calibration Report

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

| Anticipated Value (dB) | Measured value (dB) | Deviated value (dB) | Acceptance limits (dB) |
|------------------------|---------------------|---------------------|------------------------|
| 69.0                   | 69.0                | 0.0                 | ±0.8                   |
| 64.0                   | 64.0                | 0.0                 | ±0.8                   |
| 59.0                   | 59.0                | 0.0                 | ±0.8                   |
| 54.0                   | 54.0                | 0.0                 | ±0.8                   |
| 49.0                   | 49.0                | 0.0                 | ±0.8                   |
| 44.0                   | 44.0                | 0.0                 | ±0.8                   |
| 39.0                   | 39.0                | 0.0                 | ±0.8                   |
| 34.0                   | 33.8                | -0.2                | ±0.8                   |
| 29.0                   | 28.8                | -0.2                | ±0.8                   |
| 24.0                   | 23.7                | -0.3                | ±0.8                   |
| 19.0                   | 18.3                | -0.7                | ±0.8                   |

Function : 8. Tone burst response

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

Function : 9. Peak C sound level

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

Certificate No.: CP20250054EA

Calibration Report

Function : 10. Overload indication

| Positive one-half cycle | Measured value (dB) | Negative one-half cycle | Deviated value (dB) | Acceptance limits (dB) |
|-------------------------|---------------------|-------------------------|---------------------|------------------------|
| 143.3                   |                     | 143.5                   | 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                                 | 135.0              | 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)<br>0.70 (>4kHz to 10kHz)      |
| 4) Free-field sound pressure response level        |                  |                                                   |
| 5) Electrical signal tests of frequency weightings | 0.20             | 0.20                                              |
| 6) Frequency and time weighting at 1 kHz           | 0.20             | 0.20                                              |
| 7) Long-Term Stability                             | 0.10             | 0.10                                              |
| 8) Level Linearity on the reference level range    | 0.30             | 0.30                                              |
| 9) Tone burst response                             | 0.20             | 0.30                                              |
| 10) Peak C sound level                             | 0.20             | 0.35                                              |
| 11) Overload indication                            | 0.24             | 0.25                                              |
| 12) High-Level Stability                           | 0.10             | 0.10                                              |

Remarks: 1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.  
2. The acceptance limit is for the deviated values.  
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

Certificate No.: CP20250055EA

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                           | Q180    | 2661000    | AA-1007-24   | 6 June 2025      |
| 2) Arbitrary Function Generator                  | AFG2021 | C010063    | CK20240048EA | 23 June 2025     |
| 3) Programmable Attenuator                       | P45     | 2913       | EE-0021-24   | 3 June 2025      |
| 4) 6.5 Digit precision multimeter                | 8846A   | 9609027    | CB20240128EA | 31 July 2025     |
| 5) Pressure humidity and Temperature Transmitter | PTU301  | F0640002   | CD20240180EA | 20 March 2025    |
| 6) Performance Audio Analyzer                    | U89038  | MY56510003 | CB20250030EA | 7 August 2025    |
|                                                  |         |            | CK20240069EA | 13 February 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)
- Electrical and Electronics Institute, NSC Accredited Calibration No.0119
- Reference standards instrument for Electrical function
- National Institute of Metrology (Thailand)
- Electrical and Electronics Institute, NSC Accredited Calibration No.0119

Result of Calibration:

Function : 1. Indication at the calibration check frequency

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



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,  
Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4860 Fax: +66 2324 0917



NSC TR 175 10225  
CALIBRATION 0119

Certificate No.: CP20250055EA  
Operation No.: CP2025020042

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 Phatom 73210

Received Date: 31 January 2025

Calibrated Date: 18 - 19 February 2025

Issued Date: 24 February 2025

Calibrated by: Ms. Juntaporn Kunhakom

Approved by:   
(Mr. Sittichai Swaksuriyawong)  
Group Manager

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



Certificate No.: CP20250055EA

### Calibration Report

Function : 2. Self-generated Noise  
2.1 Microphone Installed

| Measured value<br>(dB) |
|------------------------|
| 15.6                   |

2.2 Microphone replaced by the electrical input signal device

| Frequency<br>Weighting | Measured value<br>(dB) |
|------------------------|------------------------|
| A-weighting            | 8.0                    |
| C-weighting            | 9.0                    |
| Z-weighting            | 15.0                   |

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

| Frequency<br>(Hz) | Deviation from various Frequency Weighting Response Curve<br>Meter free-field acoustic response at a level of 84 dB. |                     |                     |                           |
|-------------------|----------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|---------------------------|
|                   | C-weighting<br>(dB)                                                                                                  | A-weighting<br>(dB) | Z-weighting<br>(dB) | Acceptance limits<br>(dB) |
| 125               | 0.5                                                                                                                  | 0.3                 | 0.4                 | ±1.0                      |
| 1000              | -0.3                                                                                                                 | -0.2                | -0.3                | ±0.7                      |
| 8000              | -0.4                                                                                                                 | -0.3                | -0.3                | +1.5; -2.5                |

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

| Frequency<br>(Hz) | Deviation from various Frequency Weighting Response Curve |                     |                     |                           |
|-------------------|-----------------------------------------------------------|---------------------|---------------------|---------------------------|
|                   | C-weighting<br>(dB)                                       | A-weighting<br>(dB) | Z-weighting<br>(dB) | Acceptance limits<br>(dB) |
| 63                | 0.0                                                       | 0.0                 | 0.0                 | ±1.0                      |
| 125               | 0.0                                                       | -0.1                | 0.0                 | ±1.0                      |
| 250               | 0.0                                                       | -0.1                | 0.0                 | ±1.0                      |
| 500               | 0.0                                                       | -0.1                | 0.0                 | ±1.0                      |
| 1000              | 0.0                                                       | 0.0                 | 0.0                 | ±0.7                      |
| 2000              | 0.1                                                       | 0.0                 | 0.0                 | ±1.0                      |
| 4000              | -0.1                                                      | 0.1                 | 0.0                 | ±1.0                      |
| 8000              | -0.1                                                      | -0.1                | 0.0                 | +1.5; -2.5                |
| 15000             | -5.2                                                      | -5.2                | 0.1                 | +2.5; -16.0               |



Certificate No.: CP20250055EA

### Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

| Time<br>Weighting | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Apply Signal<br>(min) | Reference<br>SPL<br>(dB) | Record SPL at<br>Conclusion of Time<br>Period (dB) | Deviated value<br>(dB) | Acceptance limits<br>(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<br>Value (dB) | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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                     | 113.9                  | -0.1                   | ±0.8                      |
| 119.0                     | 119.1                  | 0.1                    | ±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<br>Value (dB) | Measured value<br>(dB) | Deviated value<br>(dB) | Acceptance limits<br>(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.: CP20250055EA

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

| Anticipated Value (dB) | Measured value (dB) | Deviated value (dB) | Acceptance limits (dB) |
|------------------------|---------------------|---------------------|------------------------|
| 69.0                   | 69.0                | 0.0                 | ±0.8                   |
| 64.0                   | 64.0                | 0.0                 | ±0.8                   |
| 59.0                   | 59.0                | 0.0                 | ±0.8                   |
| 54.0                   | 54.0                | 0.0                 | ±0.8                   |
| 49.0                   | 49.0                | 0.0                 | ±0.8                   |
| 44.0                   | 44.0                | 0.0                 | ±0.8                   |
| 39.0                   | 39.0                | 0.0                 | ±0.8                   |
| 34.0                   | 33.8                | -0.2                | ±0.8                   |
| 29.0                   | 28.8                | -0.2                | ±0.8                   |
| 28.0                   | 27.8                | -0.2                | ±0.8                   |
| 27.0                   | 26.8                | -0.2                | ±0.8                   |
| 26.0                   | 25.8                | -0.2                | ±0.8                   |
| 25.0                   | 24.8                | -0.2                | ±0.8                   |
| 24.0                   | 23.7                | -0.3                | ±0.8                   |
| 23.0                   | 22.7                | -0.3                | ±0.8                   |
| 22.0                   | 21.6                | -0.4                | ±0.8                   |
| 21.0                   | 20.6                | -0.4                | ±0.8                   |
| 20.0                   | 19.6                | -0.4                | ±0.8                   |
| 19.0                   | 18.4                | -0.6                | ±0.8                   |

Function : 8. Tone burst response

| Time Weighting | Tone burst duration, Tb (ms) | Measured value (dB) | Deviated value (dB) | Acceptance limits (dB) |
|----------------|------------------------------|---------------------|---------------------|------------------------|
| Fast           | 200                          | 136.0               | 0.0                 | ±0.5                   |
|                | 2                            | 118.9               | -0.1                | +1.0 ; -1.5            |
|                | 0.25                         | 109.8               | -0.2                | +1.0 ; -3.0            |
| Slow           | 200                          | 129.6               | 0.0                 | ±0.5                   |
|                | 2                            | 110.0               | 0.0                 | +1.0 ; -3.0            |
|                | 200                          | 130.1               | 0.1                 | ±0.5                   |
| SEL            | 2                            | 110.1               | 0.1                 | +1.0 ; -1.5            |
|                | 0.25                         | 100.9               | -0.1                | +1.0 ; -3.0            |

Function : 9. Peak C sound level

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

Certificate No.: CP20250055EA

Calibration Report

Function : 10. Overload indication

| Parameter | Measured value (dB) |                | Deviated value (dB) | Acceptance limits (dB) |
|-----------|---------------------|----------------|---------------------|------------------------|
|           | Positive            | Negative       |                     |                        |
|           | one-half cycle      | one-half cycle |                     |                        |
|           | 143.0               | 143.3          | 0.3                 | ±1.5                   |

Function : 11. High-Level Stability  
High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

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

Uncertainty of measurement

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

- Remarks:
1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
  2. 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 --

**Certificate of Analyzer Performance Testing**

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

**Analyzer Instruments**

Analyzer Type : SO<sub>2</sub> Analyzer Manufacturer : Thermo Environmental  
Model : 43C Serial No. : 43C-62201-234

**Environmental**

Temperature : 25.2 °C  
Humidity : 43.3 %RH

**Calibration System**

**Calibrator Units**

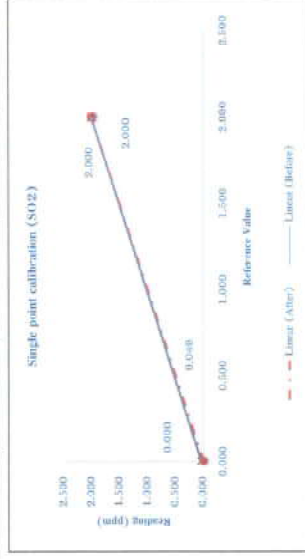
Gas Calibration : Thermo Environmental Zero Air Generator : API  
Model : 146C Model : 761  
Serial No. : 514511458 Serial No. : 179

**Standard Gas**

NO Conc. : 2 ppm Cylinder No. : S07199  
SO<sub>2</sub> Conc. : 2 ppm Expire Date : 10-Oct-25  
CO Conc. : 50 ppm

**Calibration Check**

| Gas             | Zero                |                      |           | Span                |                      |           |
|-----------------|---------------------|----------------------|-----------|---------------------|----------------------|-----------|
|                 | Reading Value (ppm) | Expected Value (ppm) | Drift (s) | Reading Value (ppm) | Expected Value (ppm) | Drift (s) |
| SO <sub>2</sub> | Before              |                      |           |                     |                      |           |
|                 | 0.040               | 0.000                | 0.04      | 2.000               | 2.000                | 0.00      |
| SO <sub>2</sub> | After               |                      |           |                     |                      |           |
|                 | 0.000               | 0.000                | 0.00      | 2.000               | 2.000                | 0.00      |



Calibrated by : *[Signature]*  
(Mr. Long Pichan)

เอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพอากาศในบรรยากาศ

## Certificate of Analyzer Performance Testing

Calibrated Date : 18-Aug-25 Certificate No. : 0825-0022 Page : 1/1

### Analyzer Instruments

Analyzer Type : SO2 Analyzer Manufacturer : Thermo Environmental  
Model : 43C Serial No. : 43C-70453-307

### Environmental

Temperature : 21.0 °C  
Humidity : 42.7 %RH

### Calibration System

#### Calibrator Units

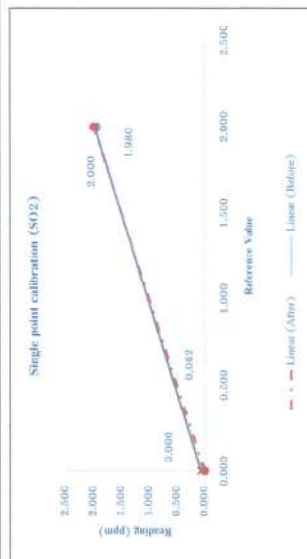
Gas Calibration : Thermo Environmental Zero Air Generator : API  
Model : 144C Model : 701  
Serial No. : 514811458 Serial No. : 179

### Standard Gas

N2 Conc. : 2 ppm Cylinder No. : 307199  
SO2 Conc. : 2 ppm Expire Date : 10-Oct-25  
CO Conc. : 50 ppm

### Calibration Check

| Gas | Zero                |                      |           | Span                |                      |           |
|-----|---------------------|----------------------|-----------|---------------------|----------------------|-----------|
|     | Reading Value (ppm) | Expected Value (ppm) | Drift (%) | Reading Value (ppm) | Expected Value (ppm) | Drift (%) |
| SO2 | 0.043               | 0.000                | 0.03      | 1.98                | 2.000                | -1.00     |
|     |                     |                      |           |                     |                      |           |
| SO2 | 0.040               | 0.000                | 0.00      | 2.000               | 2.000                | 0.00      |



Calibrated by : *Topik*  
(Muhammad Purnama)

## Certificate of Analyzer Performance Testing

Calibrated Date : 23-Sep-25 Certificate No. : 0925-0031 Page : 1/1

### Analyzer Instruments

Analyzer Type : SO2 Analyzer Manufacturer : Thermo Environmental  
Model : 43C Serial No. : CTL63548-340

### Environmental

Temperature : 26.4 °C  
Humidity : 45.2 %RH

### Calibration System

#### Calibrator Units

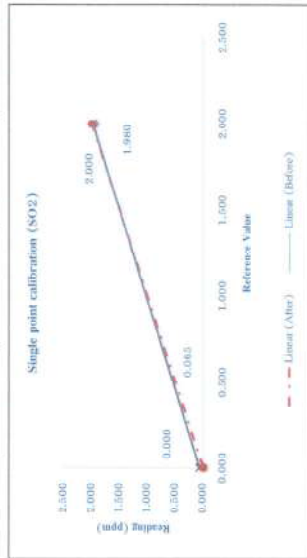
Gas Calibration : Thermo Environmental Zero Air Generator : API  
Model : 144C Model : 701  
Serial No. : 514811458 Serial No. : 179

### Standard Gas

N2 Conc. : 2 ppm Cylinder No. : 307199  
SO2 Conc. : 2 ppm Expire Date : 10-Oct-25  
CO Conc. : 50 ppm

### Calibration Check

| Gas | Zero                |                      |           | Span                |                      |           |
|-----|---------------------|----------------------|-----------|---------------------|----------------------|-----------|
|     | Reading Value (ppm) | Expected Value (ppm) | Drift (%) | Reading Value (ppm) | Expected Value (ppm) | Drift (%) |
| SO2 | 0.045               | 0.000                | 0.07      | 1.98                | 2.000                | -1.00     |
|     |                     |                      |           |                     |                      |           |
| SO2 | 0.040               | 0.000                | 0.00      | 2.000               | 2.000                | 0.00      |



Calibrated by : *Topik*  
(Muhammad Purnama)

## Certificate of Analyzer Performance Testing

Calibrated Date : 20-Aug-20 Certificate No. : 0823-009 Page : 1/1

**Analyzer Instruments**  
 Analyzer Type : NO/NO<sub>2</sub>/NOx Analyzer  
 Model : 60152-351  
 Manufacturer : Thermo Environmental

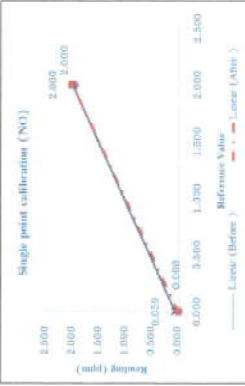
**Environmental**  
 Temperature : 26.3 °C  
 Humidity : 45.0 %RH

**Calibration System**  
 Calibrator Units : Thermo Environmental  
 Gas Calibration : 140C  
 Model : 701  
 Serial No. : 514811458  
 Zero Air Generator : API

**Standard Gas**  
 NO Conc. : 2 ppm  
 NO<sub>2</sub> Conc. : 2 ppm  
 CO Conc. : 5.0 ppm  
 Cylinder No. : 307199  
 Expiry Date : 10-Oct-25

### Calibration Check

| Gas             | Zero                |                      | Drift (%) | Span                |                      | Drift (%) |
|-----------------|---------------------|----------------------|-----------|---------------------|----------------------|-----------|
|                 | Reading Value (ppm) | Expected Value (ppm) |           | Reading Value (ppm) | Expected Value (ppm) |           |
| NO              | 0.059               | 0.050                | 0.0       | 2.00                | 2.00                 | 0.00      |
|                 | 0.054               | 0.050                | 0.0       | 2.00                | 2.00                 | -3.50     |
| NO <sub>2</sub> | 0.000               | 0.050                | 0.0       | 2.00                | 2.00                 | 0.00      |
|                 | 0.000               | 0.050                | 0.0       | 2.00                | 2.00                 | 0.00      |



Calibrated by :

*[Signature]*  
(Mr. Yong Punn)

## Certificate of Analyzer Performance Testing

Calibrated Date : 25-Mar-21 Certificate No. : 0325-003 Page : 1/1

**Analyzer Instruments**  
 Analyzer Type : NO/NO<sub>2</sub>/NOx Analyzer  
 Model : 42C  
 Manufacturer : Thermo Environmental

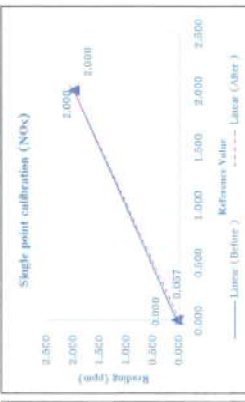
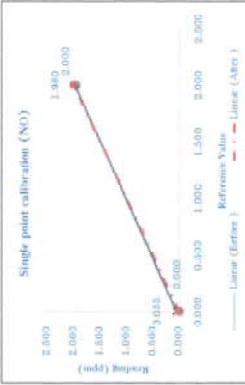
**Environmental**  
 Temperature : 25.1 °C  
 Humidity : 40.2 %RH

**Calibration System**  
 Calibrator Units : Thermo Environmental  
 Gas Calibration : 140C  
 Model : 701  
 Serial No. : 514811458  
 Zero Air Generator : API

**Standard Gas**  
 NO Conc. : 2 ppm  
 NO<sub>2</sub> Conc. : 2 ppm  
 CO Conc. : 5.0 ppm  
 Cylinder No. : 307199  
 Expiry Date : 10-Oct-25

### Calibration Check

| Gas             | Zero                |                      | Drift (%) | Span                |                      | Drift (%) |
|-----------------|---------------------|----------------------|-----------|---------------------|----------------------|-----------|
|                 | Reading Value (ppm) | Expected Value (ppm) |           | Reading Value (ppm) | Expected Value (ppm) |           |
| NO              | 0.055               | 0.050                | 0.06      | 2.00                | 2.00                 | -1.00     |
|                 | 0.057               | 0.050                | 0.06      | 2.00                | 2.00                 | 0.00      |
| NO <sub>2</sub> | 0.000               | 0.050                | 0.00      | 2.00                | 2.00                 | 0.00      |
|                 | 0.000               | 0.050                | 0.00      | 2.00                | 2.00                 | 0.00      |



Calibrated by :

*[Signature]*  
(Mr. Yong Punn)

## Certificate of Analyzer Performance Testing

Calibrated Date : 3-Mar-25 Certificate No. : 0325-001 Page : 1/1

Analyzer Instruments : CO Analyzer Manufacturer : Thermo Environmental  
Model : 48C Serial No. : 63773250

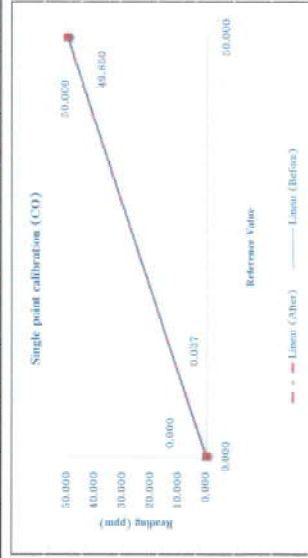
Environmental : Temperature : 25.6 °C Humidity : 42.3 %RH

Calibration System : Calibration Units : Thermo Environmental : Zero Air Generator : API  
Gas Calibration : Model : 146C : 701  
Serial No. : 614811428 : 179

Standard Gas : NO Conc. : 2 ppm Cylinder No. : 307139  
SO2 Conc. : 2 ppm Expire Date : 10-Oct-25  
CO Conc. : 50 ppm

### Calibration Check

| Gas | Zero                |                      |             | Span                |                      |             |
|-----|---------------------|----------------------|-------------|---------------------|----------------------|-------------|
|     | Reading Value (ppm) | Expected Value (ppm) | Drift (ppm) | Reading Value (ppm) | Expected Value (ppm) | Drift (ppm) |
| CO  | 0.037               | 0.000                | 0.04        | Before              |                      |             |
|     |                     |                      |             | Reading Value (ppm) | Expected Value (ppm) | Drift (ppm) |
| CO  | 0.000               | 0.000                | 0.00        | After               |                      |             |
|     |                     |                      |             | Reading Value (ppm) | Expected Value (ppm) | Drift (ppm) |



Calibrated by : *[Signature]*  
(Dr. Tong Panna)

## Certificate of Analyzer Performance Testing

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

Analyzer Instruments : CO Analyzer Manufacturer : Thermo Environmental  
Model : 48C Serial No. : 431304261

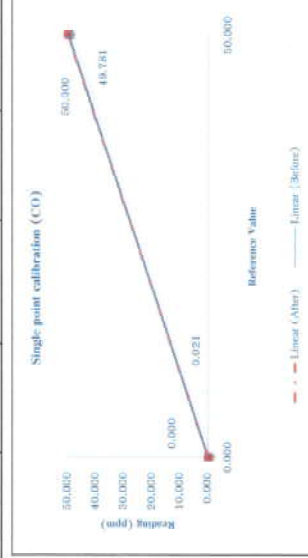
Environmental : Temperature : 20.8 °C Humidity : 46.9 %RH

Calibration System : Calibration Units : Thermo Environmental : Zero Air Generator : API  
Gas Calibration : Model : 146C : 701  
Serial No. : 614811428 : 179

Standard Gas : NO Conc. : 2 ppm Cylinder No. : 307139  
SO2 Conc. : 2 ppm Expire Date : 10-Oct-25  
CO Conc. : 50 ppm

### Calibration Check

| Gas | Zero                |                      |             | Span                |                      |             |
|-----|---------------------|----------------------|-------------|---------------------|----------------------|-------------|
|     | Reading Value (ppm) | Expected Value (ppm) | Drift (ppm) | Reading Value (ppm) | Expected Value (ppm) | Drift (ppm) |
| CO  | 0.021               | 0.000                | 0.02        | Before              |                      |             |
|     |                     |                      |             | Reading Value (ppm) | Expected Value (ppm) | Drift (ppm) |
| CO  | 0.000               | 0.000                | 0.00        | After               |                      |             |
|     |                     |                      |             | Reading Value (ppm) | Expected Value (ppm) | Drift (ppm) |



Calibrated by : *[Signature]*  
(Dr. Tong Panna)

## Certificate of Analyzer Performance Testing

Calibrated Date : 20-Aug-23 Certificate No. : 0825-007 Page : 1/1

**Analyzer Instruments**  
 Analyzer Type : CO Analyzer  
 Model : 4BC  
 Manufacturer : Thermo Environmental  
 Serial No. : E08211064

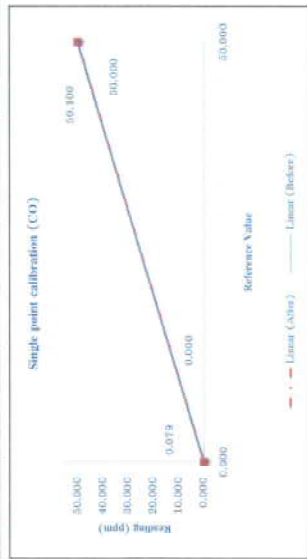
**Environmental**  
 Temperature : 22.4 °C  
 Humidity : 40.5 %RH

**Calibration System**  
**Calibrator Units**  
 Gas Calibration : Thermo Environmental  
 Model : 144C  
 Serial No. : 514811458  
 Zero Air Generator : API  
 Model : 701  
 Serial No. : 179

**Standard Gas**  
 NO Conc. : 2 ppm  
 O2 Conc. : 2 ppm  
 CO Conc. : 50 ppm  
 Cylinder No. : 307189  
 Expiry Date : 10-Oct-25

### Calibration Check

| Gas | Zero                |                      |           | Span                |                      |           |
|-----|---------------------|----------------------|-----------|---------------------|----------------------|-----------|
|     | Reading Value (ppm) | Expected Value (ppm) | Drift (%) | Reading Value (ppm) | Expected Value (ppm) | Drift (%) |
| CO  | Before              |                      |           | After               |                      |           |
|     | 0.079               | 0.000                | 0.00      | 50.1                | 50.000               | 0.20      |
| CO  | 0.000               | 0.000                | 0.00      | 50.0                | 50.000               | 0.00      |



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

## Certificate of Analyzer Performance Testing

Calibrated Date : 20-Aug-23 Certificate No. : 0825-008 Page : 1/1

**Analyzer Instruments**  
 Analyzer Type : CO Analyzer  
 Model : 4BC  
 Manufacturer : Thermo Environmental  
 Serial No. : E08011064

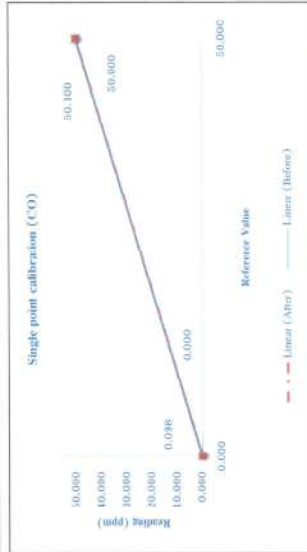
**Environmental**  
 Temperature : 25.7 °C  
 Humidity : 38.7 %RH

**Calibration System**  
**Calibrator Units**  
 Gas Calibration : Thermo Environmental  
 Model : 144C  
 Serial No. : 514811458  
 Zero Air Generator : API  
 Model : 701  
 Serial No. : 179

**Standard Gas**  
 NO Conc. : 2 ppm  
 O2 Conc. : 2 ppm  
 CO Conc. : 50 ppm  
 Cylinder No. : 307189  
 Expiry Date : 10-Oct-25

### Calibration Check

| Gas | Zero                |                      |           | Span                |                      |           |
|-----|---------------------|----------------------|-----------|---------------------|----------------------|-----------|
|     | Reading Value (ppm) | Expected Value (ppm) | Drift (%) | Reading Value (ppm) | Expected Value (ppm) | Drift (%) |
| CO  | Before              |                      |           | After               |                      |           |
|     | 0.018               | 0.000                | 0.10      | 50.1                | 50.000               | 0.20      |
| CO  | 0.000               | 0.000                | 0.00      | 50.0                | 50.000               | 0.00      |



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

# Certificate of Analyzer Performance Testing

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

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

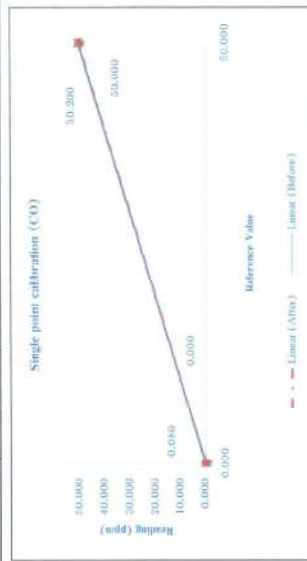
**Environmental**  
 Temperature : 26.2 °C  
 Humidity : 51.8 %RH

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

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

## Calibration Check

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



Calibrated by : *Topu*  
(Mu-Tong Plima)

# Certificate of Analyzer Performance Testing

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

**Analyzer Instruments**  
 Analyzer Type : THC Analyzer  
 Model : 51  
 Manufacturer : Thermo Environmental  
 Serial No. : 0101-73244-375

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

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

**Standard Gas**  
 Propane Conc. : 1.50 ppm  
 Cylinder No. : 21W281046  
 Expiry Date : 26-Sep-25

## Calibration Check

| Gas | Zero                |                      |           | Span                |                      |           |
|-----|---------------------|----------------------|-----------|---------------------|----------------------|-----------|
|     | Reading Value (ppm) | Expected Value (ppm) | Drift (%) | Reading Value (ppm) | Expected Value (ppm) | Drift (%) |
| THC | 0.039               | 0.000                | 0.039     | 1.51                | 1.50                 | 0.657     |
|     |                     |                      |           |                     |                      |           |
| THC | 0.000               | 0.000                | 0.000     | 1.50                | 1.50                 | 0.000     |
|     |                     |                      |           |                     |                      |           |



Calibrated by : *Topu*  
(Mu-Tong Plima)

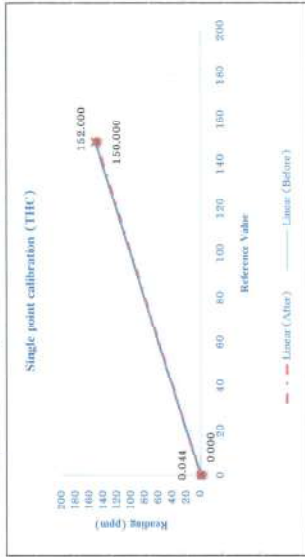


# Certificate of Analyzer Performance Testing

|                      |                      |                    |           |      |     |
|----------------------|----------------------|--------------------|-----------|------|-----|
| Calibration Date     | 13-Jan-23            | Certificate No.    | 0126-082  | Page | 1/1 |
| Analyzer Instruments |                      |                    |           |      |     |
| Analyzer Type        | THC Analyzer         | Manufacturer       | Brooks    |      |     |
| Model                | Series 8600          | Serial No.         | 384       |      |     |
| Environmental        |                      |                    |           |      |     |
| Temperature          | 26.7 °C              |                    |           |      |     |
| Humidity             | 44.0 %RH             |                    |           |      |     |
| Calibration System   |                      |                    |           |      |     |
| Calibrator Units     |                      |                    |           |      |     |
| Gas Calibration      | Thermo Environmental | Zero Air Generator | API       |      |     |
| Model                | 146C                 | Model              | 701       |      |     |
| Serial No.           | 314811438            | Serial No.         | 179       |      |     |
| Standard Gas         |                      |                    |           |      |     |
| Propane Conc.        | 1.50 ppm             | Cylinder No.       | 21W281046 |      |     |
|                      |                      | Expiry Date        | 20-Sep-25 |      |     |

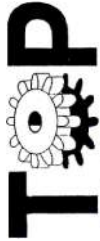
## Calibration Check

| Gas | Zero                |                      |           | Span                |                      |           |
|-----|---------------------|----------------------|-----------|---------------------|----------------------|-----------|
|     | Reading Value (ppm) | Expected Value (ppm) | Drift (%) | Reading Value (ppm) | Expected Value (ppm) | Drift (%) |
| THC | 0.044               | 0.000                | 0.044     | 1.52                | 1.50                 | 1.333     |
| THC | 0.000               | 0.000                | 0.000     | 1.50                | 1.50                 | 0.000     |



Calibrated by :

*[Signature]*  
(D.K. Tong Plima)



# 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 =  $1/m[\text{Sqrt}(H_2O)(Pa/Pstd)(Tstd/Ta))-b]$   
IC =  $1/[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$

Qstd = standard flow rate  
IC = corrected chart response

m = actual chart response  
b = calibrator Qstd slope

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:

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

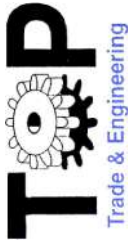
Enter Average I (Chart): 48.4  
Average Flow Calculation m3/min  
1.422065879

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



**TSP High Volume Sampler  
TE-5000 TSP Sampler Verification**

**Site Information**

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

**Site Conditions**

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

**Calibration Orifice**

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

**Calibration Information**

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

**Calculations**

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

Qstd = standard flow rate  
IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

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

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Enter Average I (chart): 48.3

Average Flow Calculation m3/min

1.427813103

Average Flow Calculation in cfm

50.41712868

Sample Time (Hrs): 24.0

Total flow in 24 hours m3/min

2056.050868

Total flow in 24 hours cfm

72600.6653

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



**PM10 High Volume Sampler Verification**

**Site Information**

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

**Site Conditions**

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

**Calibration Orifice**

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

**Calibration Data**

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

# of Observations: 5

**Calculations**

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

$$IC = [I[\text{Sqrt}(Ta/Pa)]]$$

Qa = actual flow rate

IC = corrected chart response

m = calibrator slope

b = calibrator intercept

Ta = actual temperature (deg K)

Pa = actual pressure (mm Hg)

For subsequent calculation of sampler flow:

$$Ps = \text{Average pressure (mm Hg)}$$

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

$$SSP = (m \cdot SFR + b) / (\text{Sqrt}(Pa/Ta))$$

SFR = sampler set point flow rate

SSP = sampler chart set point

m = sampler slope

b = sampler intercept

Ta = actual temperature (deg K)

Pa = actual pressure (mm Hg)

Ts = Average temperature (deg K)

Ps = Average pressure (mm Hg)

Average I (chart): 53.2

Average Flow over Sample (m3/min)

1.121929464

Enter Total Time (Hrs): 24.0

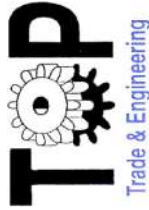
Total flow over sample (m3/min)

1615.578428

Total flow over sample (CFM)

57046.0743

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



PM10 High Volume Sampler Verification

Site Information

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

Site Conditions

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

Calibration Orifice

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

Calibration Data

| Plate or Test # | In H2O | Qa (m3/min) | I (chart) (corrected) | IC    |
|-----------------|--------|-------------|-----------------------|-------|
| 1               | 9.45   | 1.290       | 61.1                  | 40.18 |
| 2               | 7.85   | 1.177       | 57.7                  | 37.94 |
| 3               | 6.55   | 1.076       | 53.4                  | 35.12 |
| 4               | 5.85   | 1.037       | 51.2                  | 33.67 |
| 5               | 5.10   | 1.006       | 46.8                  | 30.78 |

# of Observations: 5

Calculations

$Qa = 1/m(\sqrt{(H2O)(Ta/Pa)}) - b$   
 $IC = 1/(\sqrt{(Ta/Pa)})$   
 $SFR = 1.13(Ps/Pa)(Ta/Ts)$   
 $SSP = (m \cdot SFR + b) / (\sqrt{(Ta/Pa)})$   
 $SFR =$  sampler set point flow rate  
 $SSP =$  sampler chart set point  
 $m =$  sampler slope  
 $b =$  sampler intercept  
 $I =$  chart response  
 $Tav =$  daily average temperature  
 $Pav =$  daily average pressure  
 $Qa =$  actual flow rate  
 $IC =$  corrected chart response  
 $m =$  calibrator slope  
 $b =$  calibrator intercept  
 $Ta =$  actual temperature (deg K)  
 $Pa =$  actual pressure (mm Hg)  
 $Ts =$  Average temperature (deg K)  
 $Ps =$  Average pressure (mm Hg)  
For subsequent calculation of sampler flow:

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

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



PM10 High Volume Sampler Verification

Site Information

Location: - Site ID: - Date: 24 October 2025  
Sampler: TE-6070 PM10 Serial No: 3524 Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 27.20  
Temperature (deg F): 75.8  
Average Press. (in Hg): 26.71  
Average Temp. (deg F): 76.2  
Corrected Pressure (mm Hg): 690.9  
Temperature (deg K): 297.3  
Corrected Average (mm Hg): 678.4  
Average Temp. (deg K): 297.6

Calibration Orifice

Make: Tisch Environmental, Inc.  
Model: TE-5028A  
Serial#: 1179  
Qstd Slope: 1.57894  
Qstd Intercept: -0.01520  
Calibration Due Date: 12 Oct 23

Calibration Data

| Plate or Test # | In H2O | Qa (m3/min) | I (chart) (corrected) | IC    |
|-----------------|--------|-------------|-----------------------|-------|
| 1               | 9.45   | 1.267       | 61.1                  | 40.08 |
| 2               | 7.50   | 1.147       | 56.8                  | 37.26 |
| 3               | 6.25   | 1.048       | 53.5                  | 35.10 |
| 4               | 5.50   | 1.037       | 51.2                  | 33.59 |
| 5               | 4.90   | 1.066       | 48.3                  | 31.69 |

# of Observations: 5

Calculations

$Qa = 1/m(\sqrt{(H2O)(Ta/Pa)}) - b$   
 $IC = 1/(\sqrt{(Ta/Pa)})$   
 $SFR = 1.13(Ps/Pa)(Ta/Ts)$   
 $SSP = (m \cdot SFR + b) / (\sqrt{(Ta/Pa)})$   
 $SFR =$  sampler set point flow rate  
 $SSP =$  sampler chart set point  
 $m =$  sampler slope  
 $b =$  sampler intercept  
 $I =$  chart response  
 $Tav =$  daily average temperature  
 $Pav =$  daily average pressure  
 $Qa =$  actual flow rate  
 $IC =$  corrected chart response  
 $m =$  calibrator slope  
 $b =$  calibrator intercept  
 $Ta =$  actual temperature (deg K)  
 $Pa =$  actual pressure (mm Hg)  
 $Ts =$  Average temperature (deg K)  
 $Ps =$  Average pressure (mm Hg)  
For subsequent calculation of sampler flow:

Average I (chart): 54.2  
Average Flow over Sample (m3/min): 1.117476192  
Enter Total Time (Hrs): 24.0  
Total flow over sample (m3/min): 1669.165157  
Total flow over sample (CFM): 56819.63383

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

## Certificate of Calibration

Calibrated Date : 30-Aug-24 : Certificate No. : 0824-001  
Page : 1/1

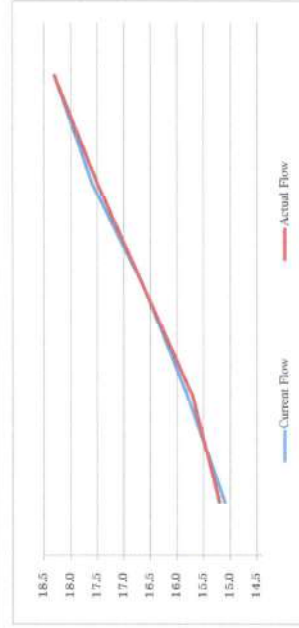
**Instruments**  
Instruments : PM2.5-PM10 Air Sampler : Thermo Scientific  
Model : 2000-D : Serial No. : 2003A2003-0704

**Environmental**  
Temperature : 26.3 °C  
Humidity : 45.5 %RH

**Calibration System**  
Instruments : Dycal : Bios  
Model : DCL-H : Serial No. : 102591  
Calibration due date : 1-Nov-24

### Flow Testing

| Filter | Set Flow Instrument (L/min) | Current Flow Instrument reading (L/min) | Actual Flow Reference Standard (L/min) |
|--------|-----------------------------|-----------------------------------------|----------------------------------------|
| 47 mm. | 16.6                        | 16.6                                    | 16.6                                   |
|        | 17.6                        | 17.6                                    | 17.5                                   |
|        | 15.8                        | 15.8                                    | 15.7                                   |
|        | 18.2                        | 18.3                                    | 18.3                                   |
|        | 15.0                        | 15.1                                    | 15.2                                   |



Calibrated by : *TOP*  
(Mr. Yong Pima)

## Certificate of Calibration

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

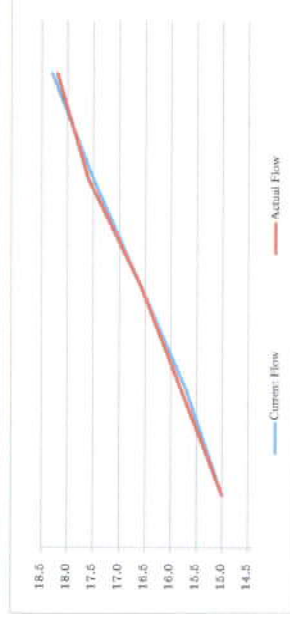
**Instruments**  
Instruments : PM2.5-PM10 Air Sampler : Thermo Scientific  
Model : 2000-H : Serial No. : 2004A20160-9708

**Environmental**  
Temperature : 26.4 °C  
Humidity : 45.2 %RH

**Calibration System**  
Instruments : Dycal : Bios  
Model : DCL-H : Serial No. : 102591  
Calibration due date : 18-Dec-25

### Flow Testing

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



Calibrated by : *TOP*  
(Mr. Yong Pima)

เอกสารการสอบเทียบเครื่องมือตรวจวัดความถี่เสียง



**ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**  
975 Moo 4, Bangpoo Industrial Estate, Sol 8, Sukhumvit Road km 37  
Phraek Sai, Mueang Samut Prakan, Samut Prakan 10280  
Tel: +66 2709 4860 Fax: +66 2524 0917

Certificate No.: CP20250269EA  
Operation No.: CP2025060184

### Certificate of Calibration

|                  |                                                               |
|------------------|---------------------------------------------------------------|
| Equipment:       | Vibration Meter                                               |
| Manufacturer:    | Instanteil                                                    |
| 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.Bai Khing, A.Sam Phran,<br>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:  ( M. Sitticha 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) 1  
providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except  
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ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20250269EA

Calibration Report

Equipment: Vibrat on Meter  
Manufacturer: InstanTel  
Model: UM20453 (Meter), UM6231 (Micromate Geophone)  
Serial No.: VB-01-007  
ID No.:  
Ambient Temperature: ( 23 ± 5 ) °C  
Relative Humidity: ( 50 ± 15 ) %

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

Condition of this result of calibration

1. Reference standards instrument :-
- | Instrument                | Model      | Serial No.  | Cert. No.    | Due Date    |
|---------------------------|------------|-------------|--------------|-------------|
| 1) Standard Accelerometer | 8305-001   | 30120       | AV-0028-25   | 3-Jul-2026  |
| 2) Measuring Amplifier    | 2525       | 301665      | AV-0025AA-25 | 15-Aug-2026 |
| 3) LAN Xi Analyzer        | 3160-4-042 | 3060-106135 | CQ20240016EA | 1-Dec-2025  |
2. This result of calibration was found accurate as shown on date and place of calibration only.
3. This certification is traceable to the international system of unit maintained at :-
- National Institute of Metrology (Thailand)
  - Electrical and Electronics Institute, NSC Accredited Calibration No.0119



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20250269EA

Calibration Report

Result of Calibration:-

Function : Frequency response and Linearity test at 16 Hz

| Frequency (Hz) | Nominal (mmv/s) | Standard (mmv/s) | UUC (mmv/s) | Deviation (mmv/s) | Uncertainty ± (%) | 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          | 10.000           | 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           | 10.493      | 0.492             | 1.5               |                  |
|                | 20.000          | 19.997           | 21.134      | 1.137             | 1.5               |                  |
|                | 30.000          | 29.970           | 31.747      | 1.777             | 1.5               |                  |
| 20.0           | 50.000          | 49.992           | 52.787      | 2.795             | 1.5               |                  |
|                | 10.000          | 10.003           | 10.696      | 0.693             | 1.5               |                  |
|                | 25.0            | 10.000           | 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 ± (%) | 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         | 10.003          | 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          | 10.475     | 0.474            | 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          | 51.941     | 1.949            | 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          | 10.388     | 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               |                |

## Remark

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

-- End of Report --

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 ± (%) | 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 --



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT  
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Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280  
Tel: +66 2709 4860 Fax: +66 2524 0917

Certificate No.: CP20250271EA  
Operation No.: CP2025090264

### Certificate of Calibration

Equipment: Vibration Meter  
Manufacturer: Instantel  
Model/Type: Micromate  
Serial No.: UM21467 (Meter), UM15904 (Micromate Geophone)  
ID No.: VB-01-009  
Customer: C.E.M. Technology (Thailand) Co., Ltd.  
Address: 31/8 Moo 13, T.Rai Khing, A.Sam Phran,  
Nakhon Pathom 73210

Received Date: 22 September 2025  
Calibrated Date: 30 September 2025 - 3 October 2025  
Issued Date: 3 October 2025  
Calibrated by: Ms. Juntaporn Kunhakorn

Approved by:   
( Mr. Sittichai Swaksuryawong )  
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.  
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ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20250271EA

### Calibration Report

Equipment: Vibration Meter  
Manufacturer: Instantel  
Model: Micromate  
Serial No.: UM21467 (Meter), UM15904 (Micromate Geophone)  
ID No.: VB-01-009  
Ambient Temperature: ( 23 ± 5 ) °C  
Relative Humidity: ( 50 ± 15 ) %

Method of Calibration :-  
In-house method :- CC-SVC04 by comparison with standard accelerometer.

#### Condition of this result of calibration

1. Reference standards instrument :-

##### Instrument

| Instrument                | Model      | Serial No.  | Cert. No.    | Due Date    |
|---------------------------|------------|-------------|--------------|-------------|
| 1) Standard Accelerometer | 8305-001   | 30120       | AV-0028-25   | 3-Jul-2026  |
| 2) Measuring Amplifier    | 2525       | 3016651     | AV-0025AA-25 | 15-Aug-2026 |
| 3) LAN XI Analyzer        | 3160-4-042 | 3060-106135 | CQ2024C016EA | 1-Dec-2025  |

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



Certificate No.: CP20250271EA

## Calibration Report

Result of Calibration:

Function : Frequency response and Linearity test at 16 Hz

| Frequency<br>(Hz) | Nominal<br>(mm/s) | Standard<br>(mm/s) | UUC<br>(mm/s) | Deviation<br>(mm/s) | Uncertainty<br>± (%) | Direction        |
|-------------------|-------------------|--------------------|---------------|---------------------|----------------------|------------------|
| 4.0               | 10.000            | 10.013             | 11.029        | 1.016               | 1.5                  | Longitudinal (L) |
| 5.0               | 10.000            | 10.003             | 11.013        | 1.010               | 1.5                  |                  |
| 6.3               | 10.000            | 10.004             | 11.006        | 1.002               | 1.5                  |                  |
| 8.0               | 10.000            | 10.017             | 10.918        | 0.901               | 1.5                  |                  |
| 10.0              | 10.000            | 9.998              | 10.867        | 0.869               | 1.5                  |                  |
| 12.5              | 10.000            | 10.003             | 10.806        | 0.803               | 1.5                  |                  |
| 16.0              | 10.000            | 10.001             | 10.472        | 0.471               | 1.5                  |                  |
|                   | 20.000            | 19.997             | 21.021        | 1.024               | 1.5                  |                  |
|                   | 30.000            | 29.970             | 31.719        | 1.749               | 1.5                  |                  |
|                   | 50.000            | 49.992             | 52.597        | 2.605               | 1.5                  |                  |
| 20.0              | 10.000            | 10.013             | 10.690        | 0.677               | 1.5                  |                  |
| 25.0              | 10.000            | 10.001             | 10.635        | 0.634               | 1.5                  |                  |
| 31.5              | 10.000            | 10.003             | 10.846        | 0.843               | 1.5                  |                  |
| 40.0              | 10.000            | 10.013             | 10.706        | 0.693               | 1.5                  |                  |
| 52.0              | 10.000            | 10.003             | 10.883        | 0.880               | 1.5                  |                  |
| 63.0              | 10.000            | 10.006             | 11.195        | 1.189               | 1.5                  |                  |
| 80.0              | 10.000            | 10.000             | 11.326        | 1.326               | 1.5                  |                  |



Certificate No.: CP20250271EA

## Calibration Report

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

| Frequency<br>(Hz) | Nominal<br>(mm/s) | Standard<br>(mm/s) | UUC<br>(mm/s) | Deviation<br>(mm/s) | Uncertainty<br>± (%) | Direction      |
|-------------------|-------------------|--------------------|---------------|---------------------|----------------------|----------------|
| 4.0               | 10.000            | 10.020             | 11.205        | 1.185               | 1.5                  | Transverse (T) |
| 5.0               | 10.000            | 10.013             | 11.118        | 1.105               | 1.5                  |                |
| 6.3               | 10.000            | 10.010             | 11.134        | 1.124               | 1.5                  |                |
| 8.0               | 10.000            | 9.998              | 10.814        | 0.816               | 1.5                  |                |
| 10.0              | 10.000            | 10.000             | 10.719        | 0.719               | 1.5                  |                |
| 12.5              | 10.000            | 10.017             | 10.585        | 0.568               | 1.5                  |                |
| 16.0              | 10.000            | 10.001             | 10.428        | 0.427               | 1.5                  |                |
|                   | 20.000            | 19.997             | 21.112        | 1.115               | 1.5                  |                |
|                   | 30.000            | 30.010             | 31.853        | 1.843               | 1.5                  |                |
|                   | 50.000            | 49.992             | 52.740        | 2.748               | 1.5                  |                |
| 20.0              | 10.000            | 10.014             | 10.491        | 0.477               | 1.5                  |                |
| 25.0              | 10.000            | 9.997              | 10.562        | 0.565               | 1.5                  |                |
| 31.5              | 10.000            | 10.001             | 10.727        | 0.726               | 1.5                  |                |
| 40.0              | 10.000            | 10.006             | 10.738        | 0.732               | 1.5                  |                |
| 52.0              | 10.000            | 9.998              | 10.856        | 0.858               | 1.5                  |                |
| 63.0              | 10.000            | 10.001             | 11.021        | 1.020               | 1.5                  |                |
| 80.0              | 10.000            | 10.013             | 11.305        | 1.292               | 1.5                  |                |



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20250271EA

Calibration Report

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

| Frequency<br>(Hz) | Nominal<br>(mm/s) | Standard<br>(mm/s) | UUC<br>(mm/s) | Deviation<br>(mm/s) | Uncertainty<br>± (%) | Direction    |
|-------------------|-------------------|--------------------|---------------|---------------------|----------------------|--------------|
| 4.0               | 10.000            | 10.001             | 10.420        | 0.419               | 1.5                  | Vertical (V) |
| 5.0               | 10.000            | 10.006             | 10.467        | 0.461               | 1.5                  |              |
| 6.3               | 10.000            | 9.998              | 10.577        | 0.579               | 1.5                  |              |
| 8.0               | 10.000            | 10.004             | 10.223        | 0.219               | 1.5                  |              |
| 10.0              | 10.000            | 9.998              | 10.317        | 0.319               | 1.5                  |              |
| 12.5              | 10.000            | 10.013             | 10.278        | 0.265               | 1.5                  |              |
| 16.0              | 10.000            | 9.998              | 10.104        | 0.106               | 1.5                  |              |
|                   | 20.000            | 19.997             | 20.406        | 0.409               | 1.5                  |              |
|                   | 30.000            | 29.995             | 30.574        | 0.579               | 1.5                  |              |
| 20.0              | 50.000            | 49.992             | 50.775        | 0.783               | 1.5                  |              |
|                   | 10.000            | 10.003             | 10.506        | 0.503               | 1.5                  |              |
| 25.0              | 10.000            | 10.001             | 10.381        | 0.380               | 1.5                  |              |
| 31.5              | 10.000            | 10.013             | 10.436        | 0.423               | 1.5                  |              |
| 40.0              | 10.000            | 10.008             | 10.491        | 0.483               | 1.5                  |              |
| 52.0              | 10.000            | 9.994              | 10.714        | 0.720               | 1.5                  |              |
| 63.0              | 10.000            | 10.013             | 10.767        | 0.754               | 1.5                  |              |
| 80.0              | 10.000            | 10.006             | 10.924        | 0.918               | 1.5                  |              |

Remark

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

-- End of Report --

เอกสารทดสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำ



ASQ-TIS 17025  
CALIBRATION 0050

## Certificate of Calibration

Page : 1 of 2

Certificate No. : 68-400172-1

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

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

Equipment : Temperature controlled enclosure (Refrigerator)

Manufacturer : Samchai

Range : N/A °C

Serial No. : 85545

Model : LD2 DC 70

Resolution : 1 °C

ID No. : N/A

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

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

Ambient Temperature : (27.0 to 28.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (223.0 to 225.0) V

Date of Received : 21 March 2025

Date of Calibration : 21 March 2025

Date of Issue : 22 March 2025

Calibrated by : Permpon Chumpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with RTD Probe

ID No.

Traceability

Due Date

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

Approved by :

( Permpon Chumpu )

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.



## Certificate of Calibration

Page : 2 of 2

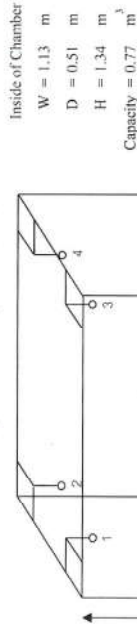
Certificate No. : 68-400172-1

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



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

| Test Point<br>(°C) | Setting Temperature<br>(°C) | Indicating Temperature<br>(°C) | Measured Uniformity<br>(°C) |           | Measured Stability<br>(°C) |           | Overall Variation<br>(°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|-----------|----------------------------|-----------|---------------------------|
|                    |                             |                                | 1,2,3,4                     | 5,6,7,8,9 | 1,2,3,4                    | 5,6,7,8,9 |                           |
| 4                  | 4                           | 4                              | 1.29                        | 0.08      | 0.08                       | 0.08      | 2.55                      |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

-oOo-



## Certificate of Calibration

Certificate No. : 68-400089-2

Page : 1 of 2

Submitted by :

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

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

Equipment :

Temperature Indicator with Thermistor Probe  
Temperature Indicator

Manufacturer : XS Instruments Model : PC 5  
 Range : N/A °C Resolution : 0.1 °C  
 Serial No. : GB 0706/024 ID No. : WW-23-001  
 Thermistor probe  
 Model : N/A Sheath Material : Plastic  
 Diameter : 10 mm. Length : 65 mm.  
 Serial No. : GB 0706/024 ID No. : WW-23-001

Environment :

On site calibration was carried out at the Laboratory,  
C.E.M Technology (Thailand) Co., Ltd.

Ambient Temperature : (26.0 to 27.0) °C  
 Relative Humidity : (45 to 50) %  
 Line Voltage : (224.5 to 226.0) VAC

Date of Received :

11 February 2025

Date of Calibration :

11 February 2025

Date of Issue :

17 February 2025

Calibrated by :

Permpon Chanpu

Calibration Method :

This instrument was calibrated by In-house method comparison technique CAL-M4003

by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

This certification is traceable to the International System of Units

Reference Standard Instruments :

1. Platinum Resistance Thermometer (PRT)

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

2. Standard Digital Thermometer

| ID No. | Cert. No. | Due Date    | Traceability                                    |
|--------|-----------|-------------|-------------------------------------------------|
| 400033 | 24E/633   | 21 Feb 2026 | National Institute of Metrology Thailand (NIMT) |

Approved by :

( Permpon Chanpu )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 68-400089-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

| Immersion Depth<br>( mm. ) | Standard Reading<br>( °C ) | UUC Reading<br>( °C ) | Correction<br>( °C ) | Uncertainty<br>( ± °C ) |
|----------------------------|----------------------------|-----------------------|----------------------|-------------------------|
| 65                         | 15.002                     | 15.1                  | -0.1                 | 0.19                    |
| 65                         | 30.005                     | 30.0                  | 0.0                  | 0.19                    |
| 65                         | 45.004                     | 44.9                  | 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%



## Certificate of Calibration

Certificate No. : 68-430004-1

Page : 1 of 2

Submitted by :

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

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

Equipment :

Digital Conductivity meter (Pocket)

Manufacturer : XS Instruments Model : PC 5

Serial No. : GB 0706/024 ID No. : WW-23-001

Environment :

On site calibration was carried out at the Laboratory.

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

Ambient Temperature (26.0 to 27.0) °C

Relative Humidity (45 to 50) %

Date of Received :

11 February 2025

Date of Calibration :

11 February 2025

Date of Issue :

17 February 2025

Calibrated by :

Pernpon Charpu

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

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

Standard Buffer Solution

Material Lot No.

Exp.Date

Traceability

84 µS/cm 0300 01 June 2027 National Institute of Standards and Technology (NIST), U.S.A., S.R.M.

1413 µS/cm 970986 25 April 2025 CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

12.88 mS/cm 970987 25 April 2025 CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :

( Pernpon Charpu )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 68-430004-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Conductivity measurement

Before Adjustment

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

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

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

Remark

UUC : Unit Under Calibration

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

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

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

-c(0)-



# การดูแลบำรุงรักษาเชิงป้องกัน

## Preventive Maintenance

### เงื่อนไขการให้บริการ Preventive Maintenance

บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้บริการตรวจซ่อมบำรุงของการบริการ เฉพาะ ในวันและเวลา ราชการ หากมีความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักชดถุญ) บริษัทฯ จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

### ขอบข่ายบริการ

- ตรวจซ่อมสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายการผลการตรวจสอบเครื่องมือ

### หมายเหตุ

- ราคาไม่รวมสิ่งค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้รับบริการอยู่นอกเขตที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง เป็นต้น
- บริษัทฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงราคา โดยไม่แจ้งให้ทราบล่วงหน้า



**บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด**

**ฝ่ายบริการหลังการขาย**

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

**ฝ่ายขายและการตลาด**

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

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





#### ช่องทางการติดต่อ

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



Call center 0 2 639 7000



DKSH Scientific



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



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



@dkshscientific

#### Preventive Maintenance Contract

จำนวนในการทำสัญญาบริการ ..L...ครั้งต่อปี  
ครั้งที่ ..L... วันที่ 14/05/2562.....

#### รายละเอียดผู้รับบริการ

|          |                                                                           |       |   |
|----------|---------------------------------------------------------------------------|-------|---|
| หน่วยงาน | บริษัท จี.อี.เอ็ม เทคโนโลยี (ไทยแลนด์) จำกัด                              |       |   |
| ที่อยู่  | 219/43 หมู่12 ถนนพหลโยธิน ตำบลอินทโยธ อำเภอกะขุนบน จังหวัดสมุทรสาคร 74130 |       |   |
| โทรศัพท์ | 0869054664                                                                | แฟกซ์ | - |

#### ผู้ติดต่อ

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

#### รายละเอียดผู้ให้บริการ

|                                                                                                                                                                                                                                       |                                |       |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------|---|
| บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย)(สำนักงานใหญ่)<br>เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260<br>โทรศัพท์ 0 2 693 7000 Email: Jirayut.js@dksh.com<br>เจ้าหน้าที่ประสานงาน : คุณจิรายุช สดอาด |                                |       |   |
| เจ้าหน้าที่ผู้ให้บริการ                                                                                                                                                                                                               | นายจิรายุช สดอาด               |       |   |
| ตำแหน่ง                                                                                                                                                                                                                               | Specialist, Technical Service. |       |   |
| โทรศัพท์                                                                                                                                                                                                                              | 0938138736                     | แฟกซ์ | - |
| E-mail                                                                                                                                                                                                                                | Jirayut.js@dksh.com            |       |   |

|                          |                          |
|--------------------------|--------------------------|
| ลงนามผู้รับบริการ        | ลงนามผู้ให้บริการ        |
| ตัวจริง (.....)          | ตัวจริง                  |
| ตำแหน่ง                  | ตำแหน่ง                  |
| วันที่ / ประทับตราบริษัท | วันที่ / ประทับตราบริษัท |

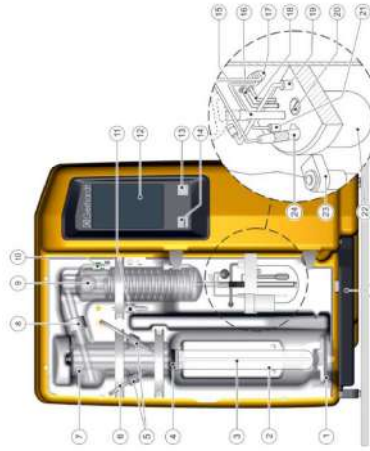
|                                           |
|-------------------------------------------|
| Jirayut Saksay-Aud<br>(นาย จิรายุช สดอาด) |
| Specialist, Technical Service.            |
| 14/05/2025                                |

JOB:W.Q-00070598.....MODEL:VAP.200.....S/N: GERS200180181

Operational Qualification (OQ)

๑57๑๐๐1๐๐1๗๑๓๓๓๓

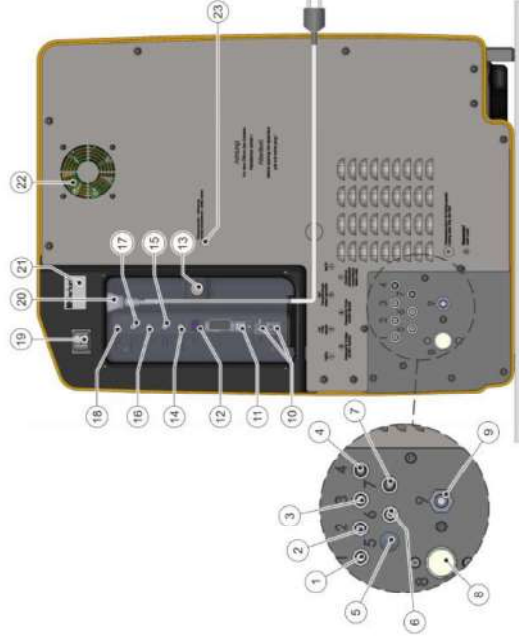
FRONT



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

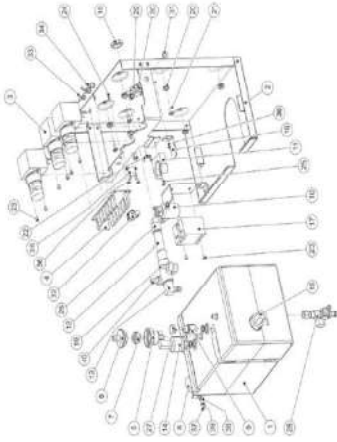
\*\* only VAP 450

REAR



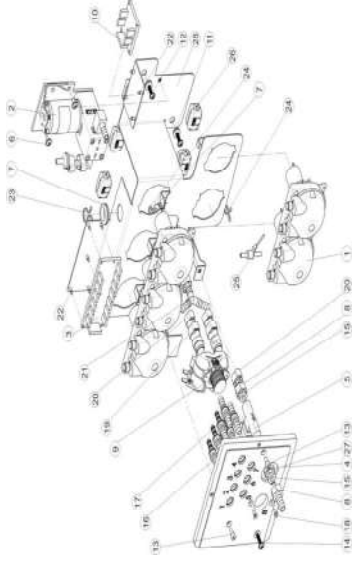
| No |                                                           | PASS                                | FAIL                     | N/A                                 |
|----|-----------------------------------------------------------|-------------------------------------|--------------------------|-------------------------------------|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

Inside Steam generator



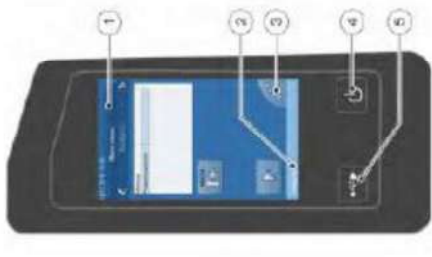
| No |                                                 | PASS                                | FAIL                     | N/A                      |
|----|-------------------------------------------------|-------------------------------------|--------------------------|--------------------------|
| 1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

Module Pump holder VAP200 – 450 V3



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

Control panel



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

รายละเอียดการตรวจสอบ

ขั้นตอนการบริการ

ตรวจสอบระบบไฟฟ้า (Electrical Test)

- ความต้านทานทางไฟฟ้าของเครื่องกับกราวด์
- กระแสไฟฟ้าที่ใช้งาน

ตรวจสอบสภาพเครื่อง (Optical Test)

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

ตรวจสอบ Function การทำงาน (The Function Test)

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



# ข้อมูลสนับสนุนด้านเทคนิค (General Technical Support)

## การบำรุงรักษาทั่วไป ( Basic maintenance)

### Cleaning program

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

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

→ Insert a digestion tube (without sample) and start the program.  
• All liquid carrying parts are cleaned. In the case of strong soiling, approx. 10 ml of sulphuric acid can also be added to the digestion tube.

### General error message

| Fault description                    | Cause                                                                | Remedy                                                                                                                                                                                                                                                                                               |
|--------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cooling water flow volume too low    | Cooling water pressure under 1 bar<br>Check coolant tube             | Open water tap<br>Check correct pressure<br>Program continues automatically once error has been fixed                                                                                                                                                                                                |
| 'Sample tube missing'                | Sample tube missing                                                  | Insert sample tube<br>Continue program or restart                                                                                                                                                                                                                                                    |
| Exhaustion door protective door open | Protection door not closed                                           | Close protection door<br>Program continues automatically once error has been fixed                                                                                                                                                                                                                   |
| Waste storage/ waste                 | One or more storage tanks are empty<br>The sample waste tank is full | Fill storage tank<br>Check correct sealing of the universal sensors.<br>The running program can be continued after rectification of the error<br>Empty sample waste tank<br>Check correct sealing of the universal sensors.<br>The running program can be continued after rectification of the error |

### Analytical errors

| Fault description                    | Cause                                                                                                                                                                                                                                                                                                                                                                                                                                       | Remedy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Analysis results too high            | The chemicals used are contaminated with nitrogen compounds.<br>Replace the chemicals if necessary.<br>Increase of the water additor amount.<br>Violet reaction in the digestion tube and ammonia drops get into the receiver.<br>Cross bridges of the condenser is broken or worn out, sodium hydrosulfide drops get into the receiver.<br>Gases cleaning agents in the digestion tube.<br>Entrapment of ammonia from the previous sample. | Detailed checking of the chemicals.<br>Deformation of a blank value.<br>Replace the chemicals if necessary.<br>Increase of the water additor amount.<br>Replacement of the glass condenser.<br>Clean digestion tube in advance with distilled water.<br>Increase distillation time.<br>Check whether sample was previously sufficiently analyzed.                                                                                                                                                                                                                                                                                                         |
| Analysis result too low or no result | Incomplete distillation; distillation time too short.<br>Ammonia escapes at leaking places.<br>Adding amount of the sodium hydrosulfide too small, no ammonia development.<br>Too low boric acid amount in the receiver; escaping ammonia is not completely bonded.<br>Tube not completely immersed in the acid receiver.<br>Formation of stable ammonia compounds with catalysts destroyed with sodium hydroxide.                          | No quantitative expulsion of the ammonia content.<br>The acidulation amount should be 100 ml.<br>Solder or defective Viton plugs; clean or replace.<br>Check seals (O <sub>2</sub> screw connections) on the digestion tube and receiver.<br>Check valve at the condenser is jammed up; clean or replace.<br>Digestion tube is damaged at the neck; replace.<br>Check the correct flow rate of the HCl/H <sub>2</sub> SO <sub>4</sub> pump (see Technical Data).<br>Increase of the boric acid amount.<br>Increase of the acid amount.<br>This problem only occurs with catalysts destroyed with sodium hydroxide; distillation destroys these compounds. |

# การดูแลบำรุงรักษาเชิงป้องกัน Preventive Maintenance



บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด

ฝ่ายบริการหลังการขาย

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

ฝ่ายขายและการตลาด

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

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

## เงื่อนไขการให้บริการ Preventive Maintenance

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

### ขอบข่ายการบริการ

- ตรวจสอบสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายงานผลการตรวจสอบเครื่องมือ

### หมายเหตุ

- ราคาขึ้นอยู่กับค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้รับบริการอยู่นอกเขตพื้นที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง เป็นต้น
- บริษัทฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงราคา โดยไม่แจ้งให้ทราบล่วงหน้า



### ช่องทางติดต่อ

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



Call center 0 2 639 7000



DKSH Scientific



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



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



@dkshscientific

### Preventive Maintenance Contract

จำนวนใบการทำสัญญาบริการ ...1...ครั้งต่อปี  
ครั้งที่ 1..วันที่ 14.05.2025.....

#### รายละเอียดผู้รับบริการ

|          |                                                                                |       |   |
|----------|--------------------------------------------------------------------------------|-------|---|
| หน่วยงาน | บริษัท ซี.อี.เอ็ม เทคโนโลยี (ไทยแลนด์) จำกัด                                   |       |   |
| ที่อยู่  | 219/43 หมู่ 12 ถนนเพชรเกษม ตำบลอ้อมน้อย อำเภอกระทุ่มแบน จังหวัดสมุทรสาคร 74130 |       |   |
| โทรศัพท์ | 0869054664                                                                     | แฟกซ์ | - |

#### ผู้ติดต่อ

|                |                           |             |           |
|----------------|---------------------------|-------------|-----------|
| ชื่อ - นามสกุล | คุณศิริพร พิมพา           |             |           |
| ตำแหน่ง        | เจ้าหน้าที่ห้องปฏิบัติการ |             |           |
| โทรศัพท์       | 0869054664                | เบอร์มือถือ | - แฟกซ์ - |
| E-mail         | lab.cemtech1@gmail.com    |             |           |

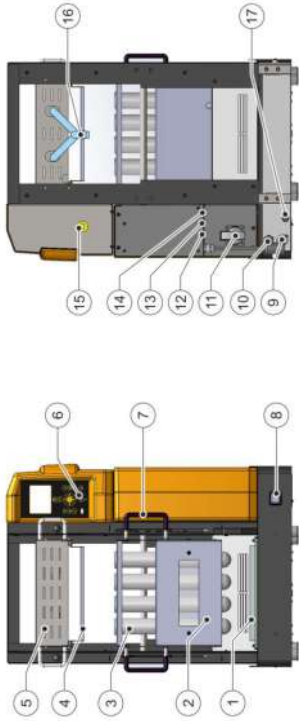
#### รายละเอียดผู้ให้บริการ

|                                                                                                                                                                                                                                                                                |                                |       |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------|---|
| บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่)<br>เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260<br>โทรศัพท์ 0 2 693 7000 Email: <a href="mailto:jkayut.js@dksh.com">jkayut.js@dksh.com</a><br>เจ้าหน้าที่ประสานงาน : คุณจิรายุห์ สลอาด |                                |       |   |
| เจ้าหน้าที่ผู้ให้บริการ                                                                                                                                                                                                                                                        | นายจิรายุห์ สลอาด              |       |   |
| ตำแหน่ง                                                                                                                                                                                                                                                                        | Specialist, Technical Service. |       |   |
| โทรศัพท์                                                                                                                                                                                                                                                                       | 0938138736                     | แฟกซ์ | - |
| E-mail                                                                                                                                                                                                                                                                         | Jirayut.js@dksh.com            |       |   |

|                          |         |                          |                                                |
|--------------------------|---------|--------------------------|------------------------------------------------|
| ลงนามผู้รับบริการ        |         | ลงนามผู้ให้บริการ        |                                                |
| ตัวจริง                  | (.....) | ตัวจริง                  | <i>Jirayut Saly-Ad</i><br>(นาย จิรายุห์ สลอาด) |
| ตำแหน่ง                  |         | ตำแหน่ง                  | Specialist, Technical Service.                 |
| วันที่ / ประทับตราบริษัท |         | วันที่ / ประทับตราบริษัท | 14.05.2025                                     |

Part 3 : ตรวจสอบสภาพเครื่อง

Front and rear view of KT-L version



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

Part 4: จะเขียนและรายงานผลการให้บริการ Preventive Maintenance

4.1 ตรวจสอบไฟฟ้า

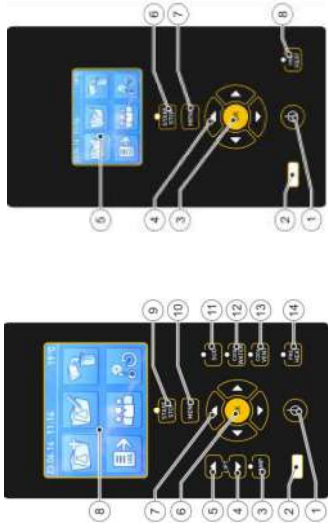
ใช้ไฟ 220 V 50 Hz  
กระแสไฟฟ้าตามพิกัดเครื่อง

4.2 ตรวจสอบสภาพอุปกรณ์ภายนอก

สายไฟของเครื่อง  
ท่อแก๊วรวมไอกรด  
สายยางคอกับท่อแก๊วรวมไอกรด  
สภาพของ Aluminum block  
การขึ้นลงของ Lift  
Light  
Current Switch  
Thermostat

|      |                                     |      |                          |     |                                     |        |            |
|------|-------------------------------------|------|--------------------------|-----|-------------------------------------|--------|------------|
| Pass | <input checked="" type="checkbox"/> | Fail | <input type="checkbox"/> | N/A | <input type="checkbox"/>            | Remark | .....      |
|      | <input checked="" type="checkbox"/> |      | <input type="checkbox"/> |     | <input type="checkbox"/>            |        | .....      |
| Pass | <input checked="" type="checkbox"/> | Fail | <input type="checkbox"/> | N/A | <input type="checkbox"/>            | Remark | .....      |
|      | <input checked="" type="checkbox"/> |      | <input type="checkbox"/> |     | <input type="checkbox"/>            |        | .....      |
|      | <input checked="" type="checkbox"/> |      | <input type="checkbox"/> |     | <input type="checkbox"/>            |        | .....      |
|      | <input checked="" type="checkbox"/> |      | <input type="checkbox"/> |     | <input type="checkbox"/>            |        | เสื่อมสภาพ |
|      | <input type="checkbox"/>            |      | <input type="checkbox"/> |     | <input checked="" type="checkbox"/> |        | .....      |
|      | <input type="checkbox"/>            |      | <input type="checkbox"/> |     | <input checked="" type="checkbox"/> |        | .....      |
|      | <input checked="" type="checkbox"/> |      | <input type="checkbox"/> |     | <input type="checkbox"/>            |        | .....      |
|      | <input checked="" type="checkbox"/> |      | <input type="checkbox"/> |     | <input type="checkbox"/>            |        | .....      |

4.ตรวจเช็คระบบการทำงาน



☐ KT-L

☒ KT

- Switch controller on or off.
- USB port
- LAMP button
- LIFT down button
- LIFT up button
- OK button
- Navigation buttons
- Display
- START/STOP button
- MENU button
- SUC button
- COOL/WATER button (optional)
- COOL VENT button (optional)
- PRE HEAT button
- การขึ้นของอุณหภูมิมานักว่า10องศาต่ออนที่ที่25องศา
- การทำงานของตัวป้องกันอุณหภูมิสูงเกิน
- การทำงานของระบบควบคุมอุณหภูมิ

| Pass                                | Fail                     | N/A                                 | Remark |
|-------------------------------------|--------------------------|-------------------------------------|--------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....  |
| <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | .....  |
| <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | .....  |
| <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | .....  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....  |
| <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | .....  |
| <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | .....  |
| <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | .....  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | .....  |

การบำรุงรักษาทั่วไป (Basic maintenance)

- การย้ายตัวอย่างเกิดที่รุนแรงอื่นเนื่องจากตัวอย่างนั้นสามารถป้องกันได้โดยแนะนำให้ย้ายด้วยการตั้งการเพิ่มอุณหภูมิเป็นระดับเช่น ย่อยที่ระดับอุณหภูมิ 250 C ครบเวลา 15 นาทีจึงเปลี่ยนเป็นอุณหภูมิ 380 C เพื่อป้องกันการล้นออกมา
  - เมื่อใช้เสร็จไม่ควรปล่อยให้ Tube เย็นกับตัวเครื่อง
  - ต้องนำเอาทดลอง ไอการใส่ทุกครั้งหลังจากใช้งานเสร็จ เพื่อป้องกันการหยุดของไอการที่จะหยุดลงทันทีตัวเครื่อง
  - ทำความสะอาดหัวหลอดด้วยน้ำหรือผ้าชุบน้ำในกรณีที่มีคราบครดหยดลงมาติดอยู่ในหลุม
- เพื่อป้องกันไม่ให้เกิดราดังกล่าวก็นำไปกับการแผ่อุณหภูมิ



## Certificate of Calibration

**Equipment:** Cooled Incubator  
**Model:** KB 240  
**Serial No. (or ID):** 2018000012164 ( WW-16-001 )  
**Manufacturer:** Binder  
**Condition:** In Condition  
**Shelves(pc.):** 3

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

**Environment Condition:** Temperature: 22 °C ± 1.8 °C  
Humidity: 61 %RH ± 5.3 %RH  
Voltage: 230 VAC ± 1.5 VAC

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

**Calibration By:** Mr. Tweesong Thaitiang  
**Calibration Date:** 10 February 2025  
**The Method used:** In house method, CAL-WI-16, base on TLAS-G20  
**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10240018

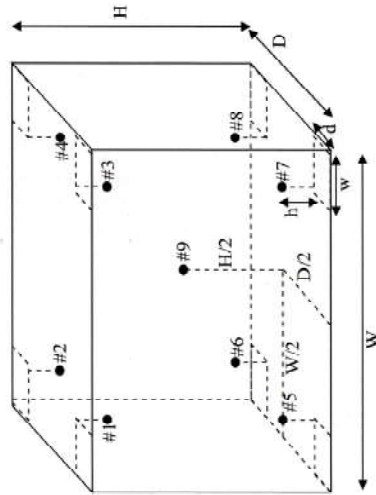
**(Mr. Tweesong Thaitiang)**  
**Person in charge**  
This certificate is issued in the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standards or other recognized national standard laboratories.  
The measurement 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 this Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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CAL-FM-C31-10: 12 Sep 2022

Certificate No.: C31250348 Page: 2 of 3



### Standard Installation Locations

Volume (Calibration Zone)= 122 (Liters)

Inside chamber: W = 65 (cm) D = 50 (cm) H = 76 (cm)  
Standard Locations (#1, #2, #3, #4): w = 7 (cm) d = 5 (cm) h = 8 (cm)  
Standard Locations (#5, #6, #7, #8): w = 7 (cm) d = 5 (cm) h = 8 (cm)  
#9: Geometric center of the chamber

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

### Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.

**Measured Temperature:** The average reading of standards at any positions or location.

**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the

measured temperature at the reference location which are observed at same time or at close observation time as

possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference

probe is preferably located in the geometric center of the chamber.

**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

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Refer to Certificate No.: C31250348 Page: 1 of 1

## Statements of conformity:

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

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

### Tolerance and Decision rules:

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

**Decision rule:** ☐ Choice A Binary Statement for Simple Acceptance Rule ( $w = 0$ ), Specific Risk < 50% PFA.

☒ Choice B Non-binary statement with guard band ( $w = 1$  U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.

☐ Choice C Customer defined, Customers may define arbitrary multiple of  $r$  to have applied as guard band ( $w = r$  U).  
: PFA - Probability of False Accept



(Mr. Udon Srichana)  
Authorized signatory

### Without adjustment

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

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

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

Correction\* = Measured Temperature - Desired Temperature

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

### The End of Statements of Conformity

Udon Srichana on 14/09/2022  
DKSH Technology Limited - Sales & Service Department 10360  
2633 Sukhumvit Road, Bangkok Prathumwan, Bangkok 10260  
Phone: +66 2638 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-holland

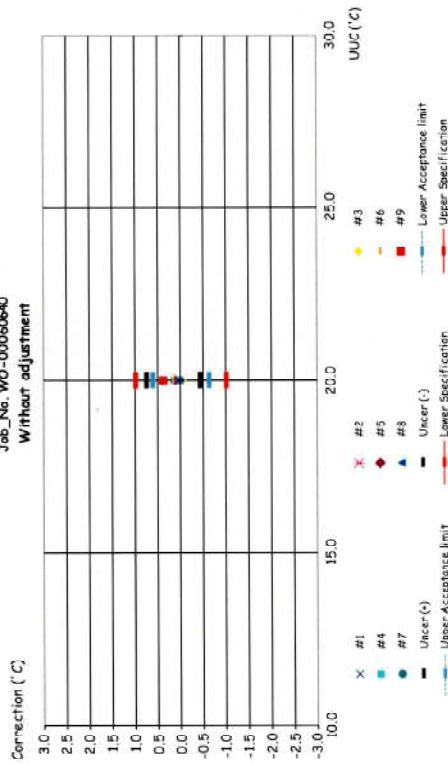
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CAL-FM-C31-10-12 Sep 2022

### Corr. Distribution & Max. Measurement Uncertainty

Job No. WO-00060640

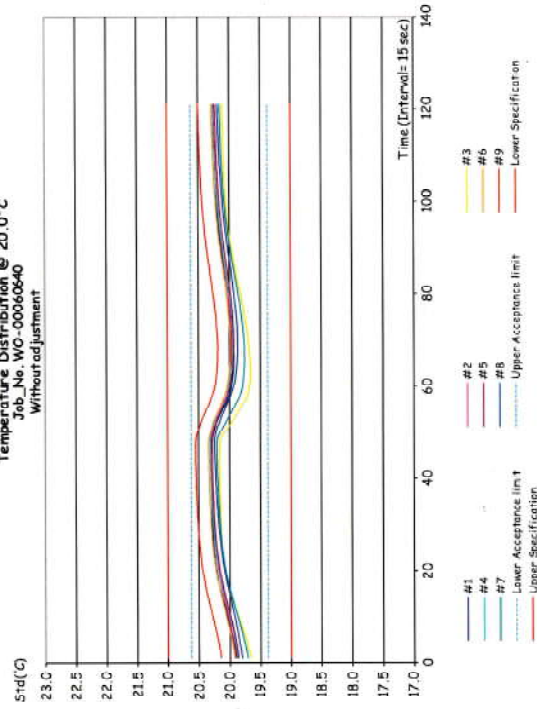
Without adjustment



### Temperature Distribution @ 20.0°C

Job No. WO-00060640

Without adjustment





## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00060640

ชนิดเครื่องมือ: Coded Incubator  
รุ่น: KB 240  
หมายเลขเครื่อง: 20180000012164 ( WW-16-001 )

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

หมายเหตุ:

Mr. Tiewwong Thaitiang  
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10260  
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Certificate No.: C31250348 Page: 3 of 3

## Calibration Results: Without adjustment

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

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

## Temperature Distribution

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

## Chamber Characterization

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

Note: \* Maximum uncertainty of the each position

The End of Certificate

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10260  
โทรศัพท์: +66 2539 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-PM-C31-10-12 Sep 2022



## Certificate of Calibration

**Equipment:** Hot Air Oven  
**Model:** UF 55  
**Serial No.(or ID):** B219.0142 ( WW-05-002 )  
**Manufacturer:** Memmert  
**Condition:** In Condition  
**Shelves(pc.):** 2

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

**Certificate No.:** C31250347  
**Issued Date:** 10 February 2025  
**Job No.:** WO-00060640  
**Page:** 1 of 4  
**Ventilation Valve:** Closed

**Environment Condition:** Temperature: 28 °C ± 1.0 °C  
Humidity: 61 %RH ± 5.3 %RH  
Voltage: 230 VAC ± 1.5 VAC

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

**Calibration By:** Mr. Tweewong Thaitiang  
**Calibration Date:** 10 February 2025  
**The Method used:** In house method, CAL-WI-16, base on TLAS-G20  
**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10240018

**Person in charge**  
(Mr. Tweewong Thaitiang)

**Authorized signatory**  
(Mr. Udon Sritana)

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 the Guide to Expression of Uncertainty in Measurement (GUM).  
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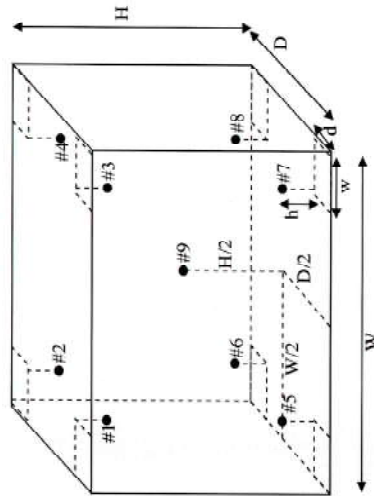
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CAL-FM-C31-10: 12 Sep 2022



Certificate No.: C31250347

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### Standard Installation Locations

Volume (Calibration Zone) = 21 (Liters)

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

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

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

#9: Geometric center of the chamber

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

### Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.

**Measured Temperature:** The average reading of standards at any positions or location.

**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

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### Calibration Results:

#### Without adjustment

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

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

#### Temperature Distribution

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

#### Chamber Characterization

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

Note: \* Maximum uncertainty of the each position



### Without adjustment (Cont.)

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

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

#### Temperature Distribution

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

#### Chamber Characterization

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

Note: \* Maximum uncertainty of the each position

### The End of Certificate



Refer to Certificate No.: C31250347 Page: 1 of 2

## Statements of conformity:

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

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

### Tolerance and Decision rules:

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

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

(Mr. Udon Srichana)  
Authorized signatory

## Without adjustment

Desired Temperature : 104.0°C Tolerances : 1.0°C

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

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

Correction\* = Measured Temperature - Desired Temperature

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

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Refer to Certificate No.: C31250347 Page: 2 of 2

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

Correction\* = Measured Temperature - Desired Temperature

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

## The End of Statements of Conformity

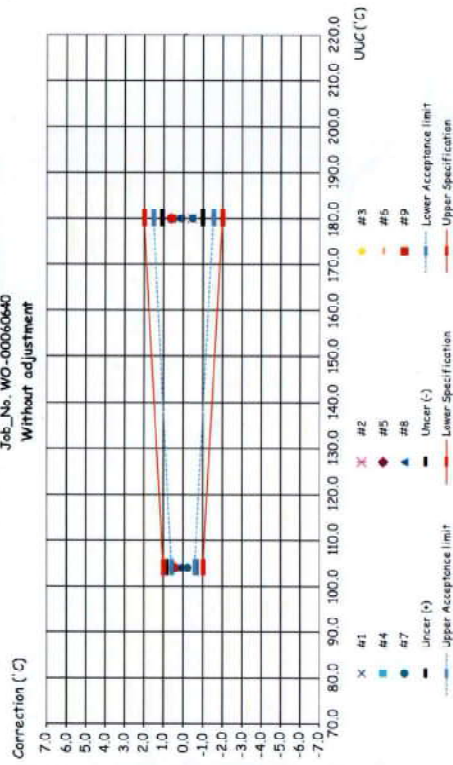
DKSH Measurement Unit Ltd. & Co.  
DKSH Technology Limited  
2533 Suvarnabhumi Expressway, Tower 10, Room 10260  
Bangkok, Thailand 10560  
Phone: +66 2539 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-hailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022

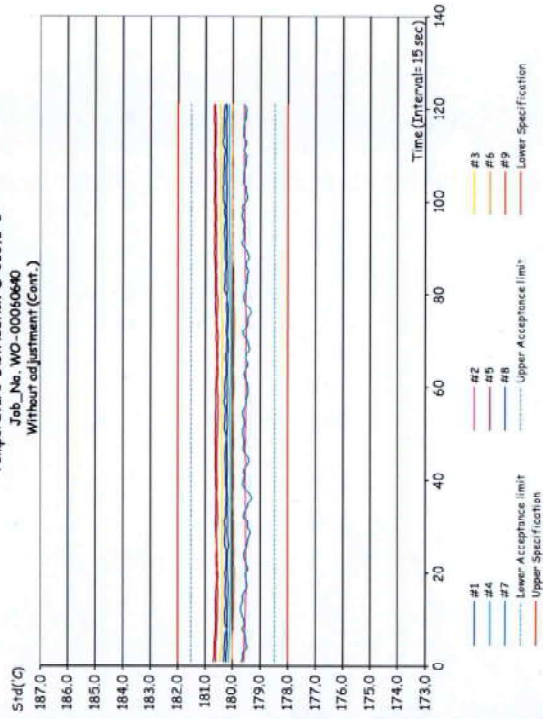
# Corr\_Distribution & Max\_Measurement Uncertainty

Job\_No. WO-00060640  
Without adjustment



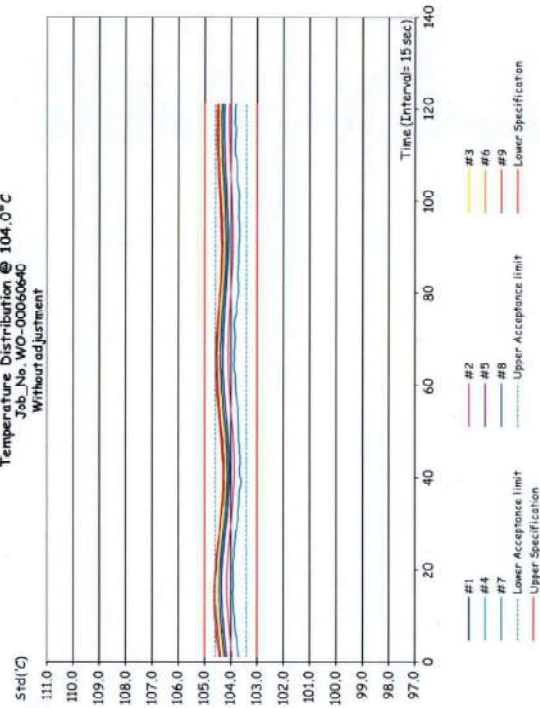
# Temperature Distribution @ 180.0°C

Job\_No. WO-00060640  
Without adjustment (Cont.)



# Temperature Distribution @ 104.0°C

Job\_No. WO-00060640  
Without adjustment





## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00060640

ชนิดเครื่องมือ: Hot Air Oven

รุ่น: UF 55

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

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

ขอแนะนำ:

Mr. Tweewong Thairiang  
Service Engineer

DKSH Calibration (Thailand) Co., Ltd.  
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10600  
2533 Sukhumvit Road, Bangkok, Thailand 10600  
Phone: +66 2037 7020 Email: info.calibration@dksh.com Website: www.dksh-calibration-thailand.com  
Delivering Growth - In Asia and Beyond.

# CAL

Calibratech Co., Ltd.

71/06-7 Moo 2, Sukhprachasan 3 Rd., Bangpoo, Pakkred, Nonthaburi 11120  
Tel.(02) 964-6311 Fax.(02) 964-5155, e-mail: calibratech.co@yahoo.com, calibratech.cal@hotmail.com



NSC-TS1-1817225  
CALIBRATION 0030

## Certificate of Calibration

Certificate No. : 68-400089-3

Page : 1 of 2

Submitted by :

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

219/43 Moo.12 Pachkasem Rd. Omnoi, Krathumburi, 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

Diameter : 4.8 mm.

Serial No. : N/A ID No. : WW-03-002

On site calibration was carried out at the Laboratory,

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

Ambient Temperature : (26.0 to 27.0) °C

Relative Humidity : (45 to 50) %

Line Voltage : (224.5 to 226.0) VAC

Date of Received : 11 February 2025

Date of Calibration : 11 February 2025

Date of Issue : 17 February 2025

Calibrated by : Permpoon Chaiyap

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

400002 TT-0095-24 01 Jul 2026

2. Standard Digital Thermometer

ID No. Cert. No. Due Date

400033 24F-633 21 Feb 2026

Approved by :

( Permpoon Chaiyap )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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



CAL-F0031-03

## Certificate of Calibration

Certificate No. : 68-400089-3

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

| Immersion Depth<br>( mm. ) | Standard Reading<br>( °C ) | UUC Reading<br>( °C ) | Correction<br>( °C ) | Uncertainty<br>( ± °C ) |
|----------------------------|----------------------------|-----------------------|----------------------|-------------------------|
| 100                        | 25.003                     | 25.2                  | -0.2                 | 0.15                    |

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%.

-0.01-



## Certificate of Calibration

Certificate No. : 68-420017-3

Submitted by :

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

219/43 Moo.12 Petchkasem Rd, Omnoi, Kraithumban, Samutsakorn 74130 (Heac 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 : LabSen 211

Serial No. : 2110009/213

ID No. : WW-03-002

Environment :

On site calibration was carried out at the Laboratory,

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

Ambient Temperature : (26.0 to 27.0) °C

Relative Humidity : (45 to 50) %

Date of Received : 11 February 2025

Date of Calibration : 11 February 2025

Date of Issue : 17 February 2025

Calibrated by : Permpoon Chanpu

Calibration Method : In-house method CAL-M4201 direct measurement by using standard voltage calibrator

and using certified reference material (CRM)

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

1. Multiproduct Calibrator

ID No. Cert.No.

Due Date

Traceability

400005 SG-E-00307/66 23 Aug 2025

National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH Cert.No.

Lot No.

Exp. Date

Traceability

4.008 61293328 1027612

15 Sep 2025 CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

6.587 61297593 1027614

15 Sep 2025 CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

10.010 61306165 1027613

15 Sep 2025 CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :

( Permpoon Chanpu )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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



Certificate No. : 68-420017-3

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<br>at nominal pH | Applied Voltage<br>( mV ) | Nominal Value<br>( pH ) | UUC Reading<br>( pH ) ( mV ) | Correction<br>( mV ) | Uncertainty<br>( $\pm$ 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<br>at nominal pH | Standard Buffer<br>( pH ) | UUC Reading<br>( pH ) | Correction<br>( pH ) | Uncertainty<br>( $\pm$ pH ) |
|-----------------------------------|---------------------------|-----------------------|----------------------|-----------------------------|
| 4, 7, 10                          | 4.008                     | 4.00                  | 0.01                 | 0.0067                      |
|                                   | 6.987                     | 7.00                  | -0.01                | 0.011                       |
|                                   | 10.010                    | 10.01                 | 0.00                 | 0.014                       |

## Remark

UUC : Unit Under Calibration

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

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

- cdo -

Certificate No. :

68-430004-2

Page : 1 of 2

Submitted by :

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

21943 Moo.12 Petchkasem Rd. Omnoi, Krathumban, Samutsakorn 74130 (Head Office)

Equipment :

Digital Conductivity meter with probe

Manufacturer : Apera Model : PC 910

Serial No. : PC910X1220811001 ID No. : WW-03-002

Electrode

Model : N/A Serial No. N/A

ID No. : WW-03-002

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

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

Ambient Temperature (26.0 to 27.0) °C

Relative Humidity (45 to 50) %

Date of Received : 11 February 2025

Date of Calibration : 11 February 2025

Date of Issue : 17 February 2025

Calibrated by : Permpon Chanpu

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

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

Standard Buffer Solution

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

Approved by :

( Permpon Chanpu )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 68-430004-2

Page : 2 of 2

## Result of Calibration :

UUC Condition As-Received : Good

Function : Conductivity measurement

Before Adjustment

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

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

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

## Remark

UUC : Unit Under Calibration

\* This parameter 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%



## Certificate of Calibration

Certificate No. : 68-400089-1

Page : 1 of 2

## Submitted by :

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

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

## Equipment :

Temperature Indicator with Thermistor Probe

Temperature Indicator

Manufacturer : Thermo Scientific Model : VERSA STAR PRO

Range : N/A °C Resolution : 0.1 °C

Serial No. : 12260 ID No. : WW-03-001

Thermistor probe

Model : N/A

Sheath Material : Stainless

Diameter : 6.5 mm.

Length : 120 mm.

Serial No. : PT11-18812

ID No. : WW-03-001

On site calibration was carried out at the Laboratory,

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

Ambient Temperature : (26.0 to 27.0) °C

Relative Humidity : (45 to 50) %

Line Voltage : (224.5 to 226.0) VAC

Date of Received : 11 February 2025

Date of Calibration : 11 February 2025

Date of Issue : 17 February 2025

Calibrated by : Permpon Chumpu

Calibration Method :

This instrument was calibrated by in-house method comparison technique CAL-M4003

by compared with PRT in the dry-well calibrator at the constant controlled temperature.

The temperature scale used was based on ITS-90

Reference Standard Instruments :

This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)

ID No. Cert. No. Due Date Traceability

400002 TT-0095-24 01 Jul 2026

National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No. Cert. No. Due Date Traceability

400033 24E633 21 Feb 2026

National Institute of Metrology Thailand (NIMT)

Approved by :

( Permpon Chumpu )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 68-400089-1

Result of Calibration : Without Adjustment

LUUC Condition As-Received : Good

Function : Temperature measurement

| Immersion Depth<br>( mm ) | Standard Reading<br>( °C ) | LUUC Reading<br>( °C ) | Correction<br>( °C ) | Uncertainty<br>( ± °C ) |
|---------------------------|----------------------------|------------------------|----------------------|-------------------------|
| 130                       | 25.004                     | 25.1                   | -0.1                 | 0.19                    |

## Remark

LUUC : 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%

## Certificate of Calibration

Certificate No. : 68-420017-1

Submitted by :

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

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

Equipment :

pH Meter with electrode

pH meter

Manufacturer : Thermo Scientific

Model : VERSA STAR PRO

Range : N/A

pH

Resolution : 0.01

Serial No. : 12260

ID No. : WV-03-001

Electrode

Model : 9156BNWP

Serial No. : VV1-15843

ID No. : WV-03-001

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

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

Ambient Temperature : (26.0 to 27.0) °C

Relative Humidity : (45 to 50) %

Date of Received : 11 February 2025

Date of Calibration : 11 February 2025

Date of Issue : 17 February 2025

Calibrated by : Permpon Chamru

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

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

## 1. Multiproduct Calibrator

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

## 2. Standard Buffer Solution

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

Approved by :

( Permpon Chamru )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 68-420017-1

Page : 2 of 2

## Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

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

| Adjustment Curve<br>at nominal pH | Applied Voltage<br>( mV ) | Nominal Value<br>( pH ) | UUC Reading<br>( pH ) ( mV ) | Correction<br>( mV ) | Uncertainty<br>( $\pm$ mV ) |
|-----------------------------------|---------------------------|-------------------------|------------------------------|----------------------|-----------------------------|
| 4, 7, 10                          | 177.4800                  | 4                       | 4.00 177.4                   | 0.1                  | 0.12                        |
|                                   | 0.0300                    | 7                       | 7.00 0.0                     | 0.0                  | 0.086                       |
|                                   | -177.4800                 | 10                      | 10.00 -177.4                 | -0.1                 | 0.12                        |

## Function :

pH meter with electrode

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

| Adjustment Curve<br>at nominal pH | Standard Buffer<br>( pH ) | UUC Reading<br>( pH ) | Correction<br>( pH ) | Uncertainty<br>( $\pm$ pH ) |
|-----------------------------------|---------------------------|-----------------------|----------------------|-----------------------------|
| 4, 7, 10                          | 4.008                     | 4.01                  | 0.00                 | 0.0097                      |
|                                   | 6.987                     | 7.00                  | -0.01                | 0.011                       |
|                                   | 10.010                    | 10.01                 | 0.00                 | 0.014                       |

## Remark

UUC : Unit Under Calibration

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

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

-cdo-




## Certificate of Calibration

Certificate No. : 68-400089-1

Page : 1 of 2

## Submitted by :

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

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

## Equipment :

Temperature Indicator with Thermistor Probe

Temperature Indicator

Manufacturer : Thermo Scientific Model : VERSA STAR PRO

Range : N/A  $^{\circ}$  C Resolution : 0.1  $^{\circ}$  C

Serial No. : 12260 ID No. : WW-03-001

Thermistor probe

Model : N/A

Sheath Material : Stainless

Diameter : 6.5 mm.

Length : 120 mm.

Serial No. : PT11-18812 ID No. : WW-03-001

## Environment :

On site calibration was carried out at the Laboratory,

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

Ambient Temperature : (26.0 to 27.0)  $^{\circ}$  C

Relative Humidity : (45 to 50) %

Line Voltage : (224.5 to 226.0) VAC

Date of Received :

11 February 2025

Date of Calibration :

11 February 2025

Date of Issue :

17 February 2025

Calibrated by :

Permpon Chumpu

## Calibration Method :

This instrument was calibrated by in-house method comparison technique CAL-M4003

by compared with PRT in the dry-well calibrator at the constant controlled temperature.

The temperature scale used was based on ITS-90

## Reference Standard Instruments :

This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)

ID No. Cert. No. Due Date

400002 TT-0095-24 01 Jul 2026

Traceability

National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No. Cert. No. Due Date

400033 24E633 21 Feb 2026

Traceability

National Institute of Metrology Thailand (NIMT)

Approved by :

( Permpon Chumpu )

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.



## Certificate of Calibration

Certificate No. : 68-400089-1

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

| Immersion Depth<br>( mm ) | Standard Reading<br>( °C ) | UUC Reading<br>( °C ) | Correction<br>( °C ) | Uncertainty<br>( ± °C ) |
|---------------------------|----------------------------|-----------------------|----------------------|-------------------------|
| 130                       | 25.004                     | 25.1                  | -0.1                 | 0.19                    |

## Remark

UUC : Unit Under Calibration

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

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

- (0.1) -



THAI CALIBRATION SERVICES CO., LTD.

19/8 Moo 9 Soi Kalking 30 Puttamonthon 5 Rd., Sampran, Nakornpathom 73210  
Tel. 0-3439-7682-5 Fax: 0-3439-7687

www.thaicai.com E-mail : sale@thaicalibration.com, lab@thaicalibration.com

NSC-TS01-TIS 17126  
CALIBRATION 9119

## CALIBRATION CERTIFICATE

Certificate No.S2503003S

page 1 of 2

## Customer :

C.E.M TECHNOLOGY (THAILAND) CO., LTD.

219/43 Moo 12 Petchkasem Road, Omnoi,

Kradumbun, Samutsakorn 74139

## Equipment :

Non-automatic weighing instrument (Electronic instrument)

## Manufacturer :

Sartorius

## Model :

BSA224S-CW

## Accuracy class :

-

## Capacity :

220 g

## Resolution :

0.0001 g

## Serial No. :

3139614148

## ID No. :

CL-01-003

## Place of calibration : กรุงเทพมหานคร

## Order No. :

68S0877-1

## Ambient temperature :

(20.2 ± 5.0) °C

## Relative humidity :

(54.5 ± 10.0) %

## Received date :

01-Mar-2025

## Date of calibration :

01-Mar-2025

## Date of issue :

01-Mar-2025

## 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 <sup>3</sup> ) |
|-----------------------|---------------|-------------|-----------------|------------|------------------------------|
| 1 Standard weight set | 1 mg to 2 kg  | 15845+15849 | MD4100015       | 5-Oct-2025 | 7990                         |

## Traceability of the reference standard weight

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

Calibrated By :

Sathaporn Rueangpluppha

Technician

Approved Signatory :

Somwang Wongduang

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

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

NO. 42531



# CALIBRATION CERTIFICATE

Certificate No. S2505043S  
 page 1 of 2

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

**Equipment :** Non-automatic weighing instrument (Electronic instrument)  
**Manufacturer :** Sartorius  
**Model :** QUINTX224-1S  
**Order No. :** 68S1799-1  
**Accuracy class :** -  
**Capacity :** 220000 mg  
**Resolution :** 0.1 mg  
**Serial No. :** 0035009070  
**ID No. :** CI-01-002  
**Place of calibration :** ห้องเครื่องวัด

**Ambient temperature :** (23.9 ± 1.0) °C  
**Relative humidity :** (38.9 ± 5.0) %  
**Received date :** 30-Apr-2025  
**Date of calibration :** 30-Apr-2025  
**Date of issue :** 03-May-2025  
**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 <sup>3</sup> ) |
|-----------------------|---------------|-------------|-----------------|------------|------------------------------|
| 1 Standard weight set | 1 mg to 2 kg  | 15885+15849 | M2410001S       | 5-Oct-2025 | 7950                         |

## Traceability of the reference standard weight

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

Calibrated By : Aekhasak Silarut  
 Technician

Approved Signatory :   
 Somwang Wongduang

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

# CALIBRATION CERTIFICATE

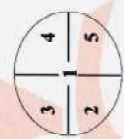
Certificate No. S2503003S  
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## The repeatability of indication

| Nominal Value (g) | Standard Deviation of reading (g) | Maximum difference between successive reading (g) | n |
|-------------------|-----------------------------------|---------------------------------------------------|---|
| 200               | 0.00500                           | 0.0000                                            | 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         | 100.0000            |
| Point 3         | 99.9999             |
| Point 4         | 99.9998             |
| Point 5         | 100.0000            |
| Eccentric Value | 0.0002              |



## The error of indication

| Nominal Value (g) | Value of Reference Standard Weight (g) | Balance Reading (g) | Correction (g) | Uncertainty (±) (g) | k    |
|-------------------|----------------------------------------|---------------------|----------------|---------------------|------|
| Unload            | 0.0000                                 | 0.0000              | 0.0000         | 0.000032            | 2.00 |
| 1                 | 1.0000                                 | 1.0000              | 0.0000         | 0.000085            | 2.00 |
| 2                 | 2.0000                                 | 2.0000              | 0.0000         | 0.000087            | 2.00 |
| 5                 | 5.0000                                 | 5.0001              | -0.0001        | 0.000090            | 2.00 |
| 10                | 10.0000                                | 10.0000             | 0.0000         | 0.000094            | 2.00 |
| 20                | 20.0000                                | 20.0000             | 0.0000         | 0.00011             | 2.00 |
| 50                | 50.0000                                | 50.0000             | 0.0000         | 0.00013             | 2.00 |
| 100               | 100.0000                               | 100.0000            | 0.0000         | 0.00019             | 2.00 |
| 120               | 120.0000                               | 120.0001            | -0.0001        | 0.00024             | 2.00 |
| 150               | 150.0000                               | 150.0000            | 0.0000         | 0.00027             | 2.00 |
| 200               | 200.0002                               | 200.0000            | +0.0002        | 0.00033             | 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--



THAI CALIBRATION SERVICES CO., LTD.

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Tel. 0-3439-7682-5 Fax: 0-3439-7687

www.thaical.com E-mail : sale@thaicalibration.com, lab@thaicalibration.com



NSC-TISI-TIS 17925  
CALIBRATION 0169

## CALIBRATION CERTIFICATE

Certificate No.S2505043S

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### The repeatability of indication

| Nominal Value<br>( mg ) | Standard Deviation of reading<br>( mg ) | Maximum difference between<br>successive readings ( mg ) | n |
|-------------------------|-----------------------------------------|----------------------------------------------------------|---|
| 200000                  | 0.04                                    | 0.1                                                      | 5 |

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

| Position        | Balance Reading<br>( mg ) |
|-----------------|---------------------------|
| Point 1         | 99999.8                   |
| Point 2         | 99999.8                   |
| Point 3         | 99999.8                   |
| Point 4         | 99999.6                   |
| Point 5         | 99999.6                   |
| Eccentric Value | 0.2                       |



### The error of indication

| Nominal Value<br>( mg ) | Value of Reference<br>Standard Weight<br>( mg ) | Balance Reading<br>( mg ) | Correction<br>( mg ) | Uncertainty (±)<br>( mg ) | k    |
|-------------------------|-------------------------------------------------|---------------------------|----------------------|---------------------------|------|
| Unload                  | 0.0                                             | 0.0                       | 0.0                  | 0.14                      | 2.21 |
| 100                     | 100.0                                           | 100.0                     | 0.0                  | 0.14                      | 2.21 |
| 200                     | 200.0                                           | 200.1                     | -0.1                 | 0.14                      | 2.21 |
| 500                     | 500.0                                           | 500.0                     | 0.0                  | 0.14                      | 2.20 |
| 1000                    | 1000.0                                          | 1000.0                    | 0.0                  | 0.14                      | 2.20 |
| 2000                    | 2000.0                                          | 2000.0                    | 0.0                  | 0.14                      | 2.20 |
| 5000                    | 5000.0                                          | 5000.1                    | -0.1                 | 0.14                      | 2.18 |
| 10000                   | 10000.0                                         | 10000.0                   | 0.0                  | 0.14                      | 2.16 |
| 20000                   | 20000.0                                         | 20000.0                   | 0.0                  | 0.15                      | 2.13 |
| 50000                   | 50000.0                                         | 50000.0                   | 0.0                  | 0.16                      | 2.08 |
| 100000                  | 100000.0                                        | 99999.8                   | +0.2                 | 0.21                      | 2.00 |
| 200000                  | 200000.2                                        | 199999.7                  | +0.5                 | 0.34                      | 2.00 |

Remark : Without adjustment

### Uncertainty of measurement

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

This report will certify of the calibrated equipment only.

--Erd--