

ภาคผนวกที่ 5  
เอกสารสอบเทียบเครื่องมือตรวจวัด

ภาคผนวกที่ 5-1  
เอกสารสอบเทียบคุณภาพอากาศในบรรยากาศ

## CERTIFICATE OF CALIBRATION

Certificate No. : COF-017-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice  
MANUFACTURER : TISCH  
MODEL/TYPE : TE-5025A  
SERIAL NUMBER : 710725  
ID NUMBER : -  
CONDITION AS-RECEIVED : Used item  
CUSTOMER : Pacific Laboratory Co., Ltd.  
14/5358 Moo14, T.Bang Bua Thong, A.Bang Bua Thong,  
Nonthaburi 11110, Thailand.

RECEIVED DATE : 28 May 2024  
MEASUREMENT DATE : 31 May 2024  
ISSUE DATE : 31 May 2024

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

|                      |                   |     |
|----------------------|-------------------|-----|
| Temperature          | : $23.0 \pm 3.0$  | °C  |
| Relative Humidity    | : $55.0 \pm 15.0$ | %RH |
| Atmospheric Pressure | : $1010 \pm 10$   | hPa |

### CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.  
Measurement Condition : The average values during measurement are 23.1 °C and 50.4 %RH.

**NOTED:** The certificate is valid only to the item calibrated on date and place of calibration.

### TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thachalad  
☐ Miss Jitraporn Lertsomphol



Approved signatory: .....

Mr. Parinya Booncharoen  
Calibration Department Manager

**MEASUREMENT RESULTS:**

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The Humid air was used as a medium in the system. The standard conditions are 25°C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

**Table 1:** The results of  $Q$  Standard calibration data

| Plate | Flow rate<br>$m^3/min$ | Pressure<br>[Pa]<br>mmHg | Temperature<br>[Ta]<br>°C | Temperature<br>[Tm]<br>°C | $\Delta p_{meter}$<br>mmHg | $\Delta p_{Orifice}$<br>inH <sub>2</sub> O | $\gamma$ | Standard Flow [ $Q_s$ ]<br>$m^3/min$ |
|-------|------------------------|--------------------------|---------------------------|---------------------------|----------------------------|--------------------------------------------|----------|--------------------------------------|
| 1     | 0.702                  | 752.536                  | 23.17                     | 22.37                     | 49.860                     | 1.691                                      | 1.298    | 0.655                                |
| 2     | 1.002                  | 752.502                  | 23.34                     | 22.68                     | 63.856                     | 3.329                                      | 1.821    | 0.915                                |
| 3     | 1.110                  | 752.584                  | 23.41                     | 22.80                     | 42.943                     | 4.353                                      | 2.082    | 1.044                                |
| 4     | 1.167                  | 752.462                  | 23.62                     | 22.97                     | 32.314                     | 4.956                                      | 2.220    | 1.113                                |
| 5     | 1.423                  | 752.441                  | 23.74                     | 23.07                     | 29.684                     | 7.471                                      | 2.725    | 1.362                                |

Slope ( $m$ ): 2.01598  
 Intercept ( $b$ ): -0.02301  
 Correlation coefficient ( $r$ ): 0.99985  
 Uncertainty ( $k=2$ ): 0.015  $m^3/min$

**Table 2:** The results of  $Q$  actual calibration data

| Plate | Flow rate<br>$m^3/min$ | Pressure<br>[Pa]<br>mmHg | Temperature<br>[Ta]<br>°C | Temperature<br>[Tm]<br>°C | $\Delta p_{meter}$<br>mmHg | $\Delta p_{Orifice}$<br>inH <sub>2</sub> O | $\gamma$ | Standard Flow [ $Q_s$ ]<br>$m^3/min$ |
|-------|------------------------|--------------------------|---------------------------|---------------------------|----------------------------|--------------------------------------------|----------|--------------------------------------|
| 1     | 0.702                  | 752.536                  | 23.17                     | 22.37                     | 49.860                     | 1.691                                      | 0.816    | 0.657                                |
| 2     | 1.002                  | 752.502                  | 23.34                     | 22.68                     | 63.856                     | 3.329                                      | 1.145    | 0.919                                |
| 3     | 1.110                  | 752.584                  | 23.41                     | 22.80                     | 42.943                     | 4.353                                      | 1.310    | 1.049                                |
| 4     | 1.167                  | 752.462                  | 23.62                     | 22.97                     | 32.314                     | 4.956                                      | 1.398    | 1.119                                |
| 5     | 1.423                  | 752.441                  | 23.74                     | 23.07                     | 29.684                     | 7.471                                      | 1.717    | 1.370                                |

Slope ( $m$ ): 1.26266  
 Intercept ( $b$ ): -0.01445  
 Correlation coefficient ( $r$ ): 0.99985  
 Uncertainty ( $k=2$ ): 0.015  $m^3/min$

\*\*\*End of Certificate of Calibration\*\*\*





## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD. 42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 7 August 2024

#### Instruments Information

|                                                                     |                                                                       |
|---------------------------------------------------------------------|-----------------------------------------------------------------------|
| <b>Analyzer Type:</b> SO <sub>2</sub> Analyzer<br><b>Model:</b> 43C | <b>Manufacturer</b> Thermo Environmental<br><b>S/N:</b> 43C-65967-350 |
|---------------------------------------------------------------------|-----------------------------------------------------------------------|

#### Calibration System

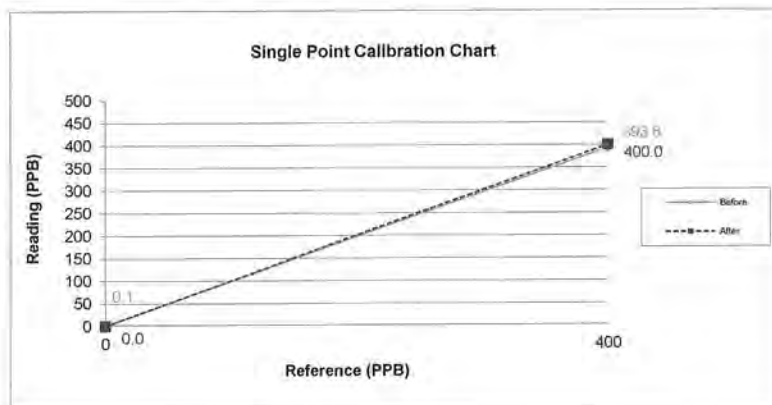
| Calibrator Unit                                                                              | Standard Gas                                                                                          |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Dilutor Model Dasibi Model 5008<br>S/N: 705<br>ZERO AIR Generator API MODEL 701<br>S/N: 1924 | NO Conc 46.05 PPM<br>SO <sub>2</sub> Conc 46.01 PPM<br>CO Conc 4.487 PPM<br>Expire Date: 19 Sep. 2020 |

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

| Status | Zero            |               |             | Span            |               |        |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
|        | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0             | 0.1           | 0.1         | 400.0           | 393.8         | -1.6   |
| After  | 0.0             | 0.0           | 0.0         | 400.0           | 400.0         | 0.0    |



Calibrate By :

Mr.PASAGORN SAMOL



## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD.

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201

42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 7 August 2024

#### Instruments Information

|                                                                     |                                                                     |
|---------------------------------------------------------------------|---------------------------------------------------------------------|
| <b>Analyzer Type:</b> SO <sub>2</sub> Analyzer<br><b>Model:</b> 43C | <b>Manufacturer</b> Thermo Environmental<br><b>S/N:</b> 0601114-787 |
|---------------------------------------------------------------------|---------------------------------------------------------------------|

#### Calibration System

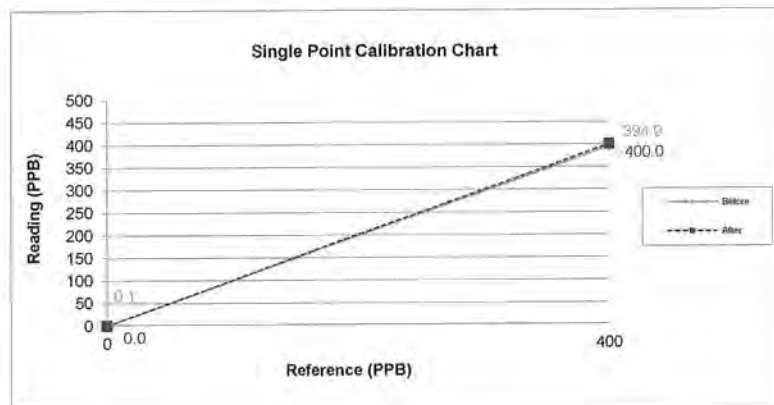
| Calibrator Unit                                                                              | Standard Gas                                                                                          |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Dilutor Model Dasibi Model 5008<br>S/N: 705<br>ZERO AIR Generator API MODEL 701<br>S/N: 1924 | NO Conc 46.05 PPM<br>SO <sub>2</sub> Conc 46.01 PPM<br>CO Conc 4.487 PPM<br>Expire Date: 19 Sep. 2020 |

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

| Status | Zero            |               |             | Span            |               |        |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
|        | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0             | 0.1           | 0.1         | 400.0           | 394.9         | -1.3   |
| After  | 0.0             | 0.0           | 0.0         | 400.0           | 400.0         | 0.0    |



Calibrate By :

Mr.PASAGORN SAMOL



## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD.

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201

42 Ramintra 14 yeak 9, Tha Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 9 August 2024

#### Instruments Information

|                                                                                         |                                                                        |
|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| <b>Analyzer Type:</b> NO/NO <sub>2</sub> /NO <sub>x</sub> Analyzer<br><b>Model:</b> 42C | <b>Manufacturer:</b> Thermo Environmental<br><b>S/N:</b> 42C-69273-362 |
|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------|

#### Calibration System

| Calibrator Unit                                                                              | Standard Gas                                                                                          |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Dilutor Model Dasibi Model 5008<br>S/N: 705<br>ZERO AIR Generator API Model 701<br>S/N: 1924 | NO Conc 46.05 PPM<br>SO <sub>2</sub> Conc 46.01 PPM<br>CO Conc 4.487 PPM<br>Expire Date: 19 Sep. 2020 |

Environment: Temperature 25.5 °C

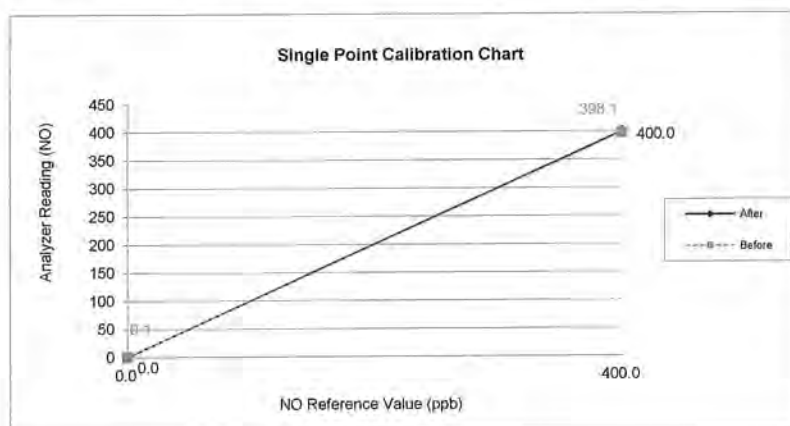
Humidity: 51 %RH

#### Calibration Check ( Before adjust )

| GAS             | Zero                |                      |             | Span                |                      |        |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
|                 | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO              | 0.1                 | 0.0                  | 0.1         | 398.1               | 400.0                | -0.5   |
| NO <sub>x</sub> | 0.1                 | 0.0                  | 0.1         | 400.0               | 400.0                | 0.0    |

#### Calibration Check ( After adjust )

| GAS             | Zero                |                      |             | Span                |                      |        |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
|                 | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO              | 0.0                 | 0.0                  | 0.0         | 400.0               | 400.0                | 0.0    |
| NO <sub>x</sub> | 0.0                 | 0.0                  | 0.0         | 400.0               | 400.0                | 0.0    |



Calibrate By : Mr. Pasagorn Samol



## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

42 รามอินทรา 14 ถนน 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD. 42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel.: 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 9 August 2024

#### Instruments Information

|                                                                           |                                                         |
|---------------------------------------------------------------------------|---------------------------------------------------------|
| Analyzer Type: NO/NO <sub>2</sub> /NO <sub>x</sub> Analyzer<br>Model: 42C | Manufacturer Thermo Environmental<br>S/N: 42C-63476-339 |
|---------------------------------------------------------------------------|---------------------------------------------------------|

#### Calibration System

| Calibrator Unit                                                                              | Standard Gas                                                                                          |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Dilutor Model Dasibi Model 5008<br>S/N: 705<br>ZERO AIR Generator API Model 701<br>S/N: 1924 | NO Conc 46.05 PPM<br>SO <sub>2</sub> Conc 46.01 PPM<br>CO Conc 4,487 PPM<br>Expire Date: 19 Sep. 2020 |

Environment: Temperature 25.5 °C

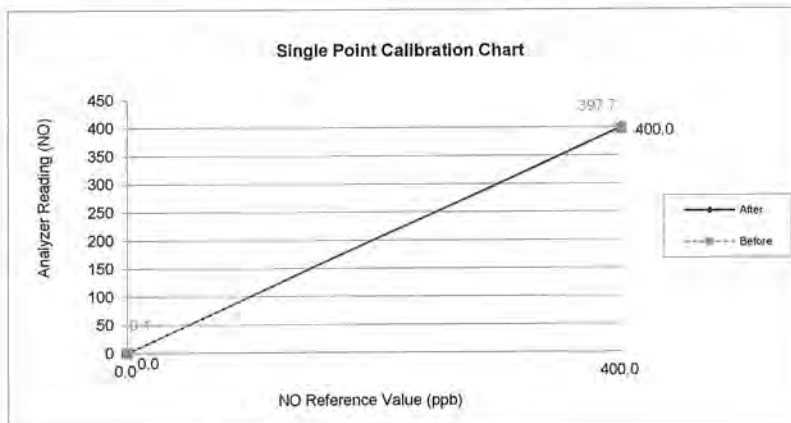
Humidity: 51 %RH

#### Calibration Check ( Before adjust )

| GAS             | Zero                |                      |             | Span                |                      |        |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
|                 | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO              | 0.1                 | 0.0                  | 0.1         | 397.7               | 400.0                | -0.6   |
| NO <sub>x</sub> | 0.1                 | 0.0                  | 0.1         | 400.0               | 400.0                | 0.0    |

#### Calibration Check ( After adjust )

| GAS             | Zero                |                      |             | Span                |                      |        |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
|                 | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO              | 0.0                 | 0.0                  | 0.0         | 400.0               | 400.0                | 0.0    |
| NO <sub>x</sub> | 0.0                 | 0.0                  | 0.0         | 400.0               | 400.0                | 0.0    |



Calibrate By : Mr. Pasagorn Samol



ภาคผนวกที่ 5-2  
เอกสารสอบเทียบ  
ปริมาณสารเจือปนในอากาศที่ระบายออกจากปล่อง

## CERTIFICATE OF CALIBRATION

Customer : Pacific Laboratory Co., Ltd.  
Address : 14/5358 Moo 14, Tambon Bang Bua Thong, Amphoe Bang Bua Thong,  
Nonthaburi 11110

Description of Equipment : Console meter

Manufacturer : Apex Instrument

Model Number : XC-572-OV

Serial Number : 1306033

ID/Control No. : -

Environment Conditions : Temperature (25 ± 2) °C

: Humidity (50 ± 15) % RH

Cal. Date : 08/01/2024

Issue Date : 08/01/2024

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

This certificate is traceable to national standard, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by :

(Mr. Mana Fuekthong)  
Technical Manager

METHOD 5 CONSOLE CALIBRATION  
USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425  
5-POINT METRIC UNIT

| Meter Console Information |           |  | Calibration Conditions    |              |                     | Factors/Conversions |       |       |
|---------------------------|-----------|--|---------------------------|--------------|---------------------|---------------------|-------|-------|
| Console Model Number      | XC-572-OV |  | Date                      | Time         | 08/01/2024 10:45 AM | Std Temp            | 293   | K     |
| Console Serial Number     | 1306033   |  | Calibration Reference No. | SEK24-010002 |                     | Std Press           | 760   | mm Hg |
| DGM Model Number          | SK25EX    |  | Barometric Pressure       | 761.24       |                     | K <sub>1</sub>      | 0.386 |       |
| DGM Serial Number         | 00009149  |  | Calibration Meter Gamma   | 0.999        |                     | Console Leak Check  |       |       |
|                           |           |  |                           |              |                     | PASS                |       |       |

| Calibration Data |                     |                    |                     |                     |                     |                    |                     |                     |                     |  |  |
|------------------|---------------------|--------------------|---------------------|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|--|--|
| Metering Console |                     |                    |                     |                     |                     | Calibration Meter  |                     |                     |                     |  |  |
| Run Time         | DGM Orifice DH      | Volume Initial     | Volume Final        | Outlet Temp Initial | Outlet Temp Final   | Volume Initial     | Volume Final        | Outlet Temp Initial | Outlet Temp Final   |  |  |
| Elapsed (Q)      | (P <sub>at</sub> )  | (V <sub>in</sub> ) | (V <sub>out</sub> ) | (t <sub>in</sub> )  | (t <sub>out</sub> ) | (V <sub>in</sub> ) | (V <sub>out</sub> ) | (t <sub>in</sub> )  | (t <sub>out</sub> ) |  |  |
| min              | mm H <sub>2</sub> O | m <sup>3</sup>     | m <sup>3</sup>      | °C                  | °C                  | m <sup>3</sup>     | m <sup>3</sup>      | °C                  | °C                  |  |  |
| 12.60            | 13.0                | 414.8650           | 415.0050            | 26                  | 26                  | 189.02242          | 189.16326           | 26                  | 26                  |  |  |
| 12.60            | 13.0                | 415.0050           | 415.1450            | 26                  | 26                  | 189.16326          | 189.30454           | 26                  | 26                  |  |  |
| 8.58             | 26.0                | 415.1530           | 415.2930            | 26                  | 26                  | 189.30622          | 189.44564           | 26                  | 26                  |  |  |
| 8.58             | 26.0                | 415.2930           | 415.4330            | 27                  | 27                  | 189.44564          | 189.58478           | 26                  | 26                  |  |  |
| 13.95            | 40.0                | 415.4410           | 415.7210            | 27                  | 27                  | 189.59760          | 189.87728           | 26                  | 26                  |  |  |
| 13.95            | 40.0                | 415.7210           | 416.0010            | 27                  | 27                  | 189.87728          | 190.15784           | 26                  | 26                  |  |  |
| 10.38            | 70.0                | 416.0120           | 416.2920            | 27                  | 27                  | 190.16956          | 190.44818           | 25                  | 25                  |  |  |
| 10.38            | 70.0                | 416.2920           | 416.5720            | 27                  | 27                  | 190.44818          | 190.72676           | 25                  | 25                  |  |  |
| 9.10             | 90.0                | 416.5860           | 416.8660            | 27                  | 27                  | 190.73910          | 191.01656           | 25                  | 25                  |  |  |
| 9.10             | 90.0                | 416.8660           | 417.1460            | 27                  | 27                  | 191.01656          | 191.29332           | 25                  | 25                  |  |  |

**METHOD 5 CONSOLE CALIBRATION  
USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425  
5-POINT METRIC UNIT**

| Meter Console Information |           |         |        | Calibration Conditions    |              |          |  | Factors/Conversions |       |       |  |
|---------------------------|-----------|---------|--------|---------------------------|--------------|----------|--|---------------------|-------|-------|--|
| Console Model Number      | XC-572-OV | 1306033 | SK25EX | Date                      | 08/01/2024   | 10:45 AM |  | Std Temp            | 293   | K     |  |
| Console Serial Number     |           |         |        | Calibration Reference No. | SER24-010002 |          |  | Std Press           | 760   | mm Hg |  |
| DGM Model Number          |           |         |        | Barometric Pressure       | 761.24       | mmHg     |  | K <sub>i</sub>      | 0.386 |       |  |
| DGM Serial Number         |           |         |        | Calibration Meter Gamma   | 0.999        |          |  | Console Leak Check  |       |       |  |
|                           |           |         |        |                           |              |          |  | PASS                |       |       |  |

| Calibration Data Results |                      |                      |                      |                    |                |                         |                           |                     |                         |                     |                     |
|--------------------------|----------------------|----------------------|----------------------|--------------------|----------------|-------------------------|---------------------------|---------------------|-------------------------|---------------------|---------------------|
| Standardized Data        |                      |                      |                      | Dry Gas Meter      |                |                         |                           |                     |                         |                     |                     |
| Dry Gas Meter            |                      | Calibration Meter    |                      | Calibration Factor |                | Flowrate                |                           | Variation           |                         |                     |                     |
| (V <sub>meas</sub> )     | (Q <sub>meas</sub> ) | (V <sub>wstd</sub> ) | (Q <sub>wstd</sub> ) | Value (Y)          | Variation (ΔY) | Std (Q <sub>std</sub> ) | Corr (Q <sub>corr</sub> ) | (ΔH <sub>g</sub> )  | (ΔH <sub>g</sub> )      | (ΔH <sub>g</sub> )  | (ΔH <sub>g</sub> )  |
| m <sup>3</sup>           | m <sup>3</sup> /min  | m <sup>3</sup>       | m <sup>3</sup> /min  |                    |                | m <sup>3</sup> /min     | m <sup>3</sup> /min       | mm H <sub>2</sub> O | mm H <sub>2</sub> O     | mm H <sub>2</sub> O | mm H <sub>2</sub> O |
| 0.138                    | 0.011                | 0.138                | 0.011                | 1.004              | 0.012          | 0.011                   | 0.011                     | 48.015              | 1.998                   |                     |                     |
| 0.138                    | 0.011                | 0.139                | 0.011                | 1.007              | 0.015          | 0.011                   | 0.011                     | 47.717              | 1.700                   |                     |                     |
| 0.138                    | 0.016                | 0.137                | 0.016                | 0.992              | 0.000          | 0.016                   | 0.016                     | 45.590              | -0.427                  |                     |                     |
| 0.138                    | 0.016                | 0.136                | 0.016                | 0.990              | -0.002         | 0.016                   | 0.016                     | 45.774              | -2.43                   |                     |                     |
| 0.276                    | 0.020                | 0.274                | 0.020                | 0.994              | 0.002          | 0.020                   | 0.020                     | 46.163              | 0.146                   |                     |                     |
| 0.276                    | 0.020                | 0.275                | 0.020                | 0.997              | 0.005          | 0.020                   | 0.020                     | 45.874              | -0.143                  |                     |                     |
| 0.278                    | 0.027                | 0.274                | 0.026                | 0.987              | -0.005         | 0.026                   | 0.026                     | 45.207              | -0.810                  |                     |                     |
| 0.278                    | 0.027                | 0.274                | 0.026                | 0.987              | -0.005         | 0.026                   | 0.026                     | 45.220              | -0.797                  |                     |                     |
| 0.278                    | 0.031                | 0.273                | 0.030                | 0.981              | -0.011         | 0.030                   | 0.030                     | 45.190              | -0.827                  |                     |                     |
| 0.278                    | 0.031                | 0.272                | 0.030                | 0.979              | -0.013         | 0.030                   | 0.030                     | 45.419              | -0.598                  |                     |                     |
|                          |                      |                      |                      | 0.992              | Y Average      |                         |                           | 46.017              | ΔH <sub>g</sub> Average |                     |                     |

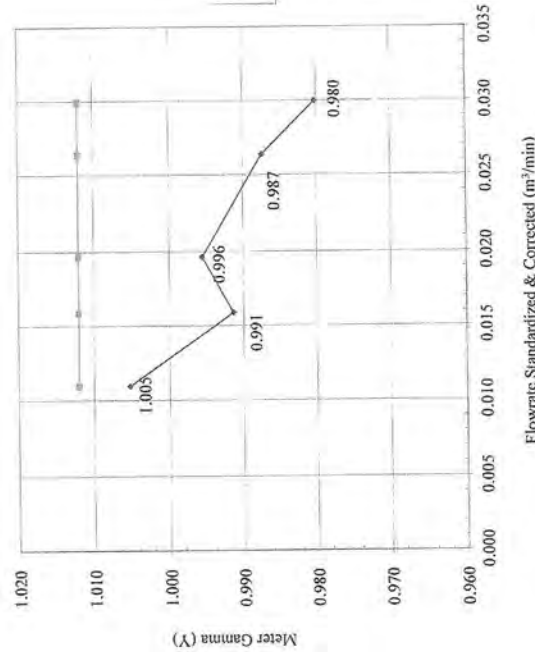
**Note:** For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.  
For ΔH<sub>g</sub>, orifice pressure differential that equates to 0.75 cfm (0.0212 m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2 inches (5.1mm) H<sub>2</sub>O.



| Meter Console Information |           |         |        | Calibration Conditions    |              |          |  | Factors/Conversions |       |       |  |
|---------------------------|-----------|---------|--------|---------------------------|--------------|----------|--|---------------------|-------|-------|--|
| Console Model Number      | XC-572-OV | 1306033 | SK25EX | Date                      | 08/01/2024   | 10:45 AM |  | Std Temp            | 293   | K     |  |
| Console Serial Number     |           |         |        | Calibration Reference No. | SER24-010002 |          |  | Std Press           | 760   | mm Hg |  |
| DGM Model Number          |           |         |        | Barometric Pressure       | 761.24       | mmHg     |  | K <sub>i</sub>      | 0.386 |       |  |
| DGM Serial Number         |           |         |        | Calibration Meter Gamma   | 0.999        |          |  | Console Leak Check  |       |       |  |
|                           |           |         |        |                           |              |          |  | PASS                |       |       |  |

Calibration Date: 8-1-2024 Calibration Reference No: SER24-010009

**Meter Gamma vs Flowrate**



Console Serial: 1306033

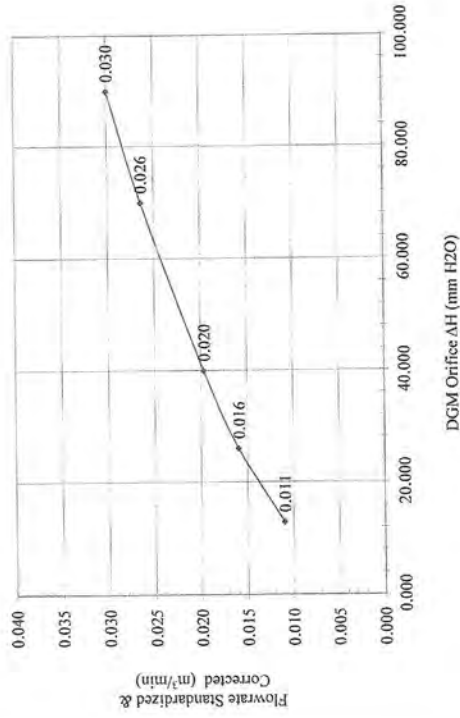
Console Model: XC-572-OV



| Meter Console Information |           | Calibration Conditions    |              |            | Factors/Conversions |                    |           |
|---------------------------|-----------|---------------------------|--------------|------------|---------------------|--------------------|-----------|
| Console Model Number      | XC-572-OV | Date                      | Time         | 08/01/2024 | 10:45 AM            | Std Temp           | 293 K     |
| Console Serial Number     | 1306033   | Calibration Reference No. | SER24-010002 |            |                     | Std Press          | 760 mm Hg |
| DGM Model Number          | SK25EX    | Barometric Pressure       | 761.24       |            |                     | K <sub>i</sub>     | 0.386     |
| DGM Serial Number         | 00009149  | Calibration Meter Gamma   | 0.999        |            |                     | Console Leak Check | PASS      |

Calibration Date: 8-1-2024 Calibration Reference No: SER24-010009

Meter Pressure vs Flowrate



Console Serial: 1306033

Console Model: XC-572-OV



THERMOCOUPLES SYSTEM CALIBRATION

| Sampling System Equipment Information |              | Calibration Conditions    |              |                     |
|---------------------------------------|--------------|---------------------------|--------------|---------------------|
| Console Model Number                  | XC-572-OV    | Date                      | Time         | 08/01/2024 01:25 PM |
| Console Serial Number                 | 1306033      | Calibration Reference No. | SER24-010002 |                     |
| DGM Model Number                      | SK25EX       | Reference Thermometer     | DIGICON      |                     |
| DGM Serial Number                     | 00009149     | Serial Number             | 183169105    |                     |
| Meter Box Model Number                | JENCO 765 KF |                           |              |                     |
| Meter Box Serial Number               | JC 13335     |                           |              |                     |

| Results                        |  |                                            |      |      |      |       |       |       |       |       |       |        |
|--------------------------------|--|--------------------------------------------|------|------|------|-------|-------|-------|-------|-------|-------|--------|
| Console Thermocouple Simulator |  |                                            |      |      |      |       |       |       |       |       |       |        |
| Channel and test point         |  | Meter Box Channel Temperature Reading (°C) |      |      |      |       |       |       |       |       |       |        |
|                                |  | -18.0                                      | 25.0 | 38.0 | 93.0 | 149.0 | 260.0 | 371.0 | 482.0 | 593.0 | 816.0 | 1038.0 |
| Stack                          |  | -19.0                                      | 24.0 | 37.0 | 91.0 | 147.0 | 257.0 | 370.0 | 482.0 | 594.0 | 817.0 | 1040.0 |
| Aux                            |  | -                                          | -    | -    | -    | -     | -     | -     | -     | -     | -     | -      |
| Probe                          |  | -19.0                                      | 24.0 | 37.0 | 91.0 | 147.0 | -     | -     | -     | -     | -     | -      |
| Filter                         |  | -19.0                                      | 24.0 | 37.0 | 91.0 | 147.0 | -     | -     | -     | -     | -     | -      |
| Oven                           |  | -                                          | -    | -    | -    | -     | -     | -     | -     | -     | -     | -      |
| Exit                           |  | -18.0                                      | 24.0 | 37.0 | -    | -     | -     | -     | -     | -     | -     | -      |

Tolerance Range

|        |          |          |       |          |
|--------|----------|----------|-------|----------|
| Stack  | ± 1.50%  | Absolute | Meter | ± 3.0 °C |
| Probe  | ± 3.0 °C |          | Exit  | ± 2.0 °C |
| Filter | ± 3.0 °C |          |       |          |



Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tambon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110

Tel. 098 362 9152, 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. : E24-010011

Page. : 1 of 3

## CERTIFICATE OF CALIBRATION

Customer : Pacific Laboratory Co., Ltd.

Address : 14/5358 Moo 14, Tambon Bang Bua Thong, Amphoe Bang Bua Thong, Nonthaburi 11110

Description of Equipment : Standard Probe Method 5

Manufacturer : Apex Instrument

Model Number : PS-5HV

Serial Number : -

ID/Control No. : -

Environment Conditions : Temperature (25 ± 2) °C

Humidity (50 ± 15) % RH

Cal. Date : 08/01/2024

Issue Date : 08/01/2024

## Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

This certificate is traceable to national standard, which realize the units of measurement according to the International System of Units (SI).

## Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by :

(Mr. Mana Fuekhae)  
Technical Manager

Certificate No. : E24-010011

Page. : 2 of 3

CALIBRATION RESULTS  
S-Type Geometric Pitot Tube Calibration

## Sampling System Equipment Information

Probe Model : PS-5HV

Probe Number : -

Pitot Number : -

Pitot Tube Type : S-type

## Calibration Condition

Date : 8 January 2023

Barometric Pressure : 761.24 mm Hg

Digital Caliper : CD-6" ASX

Serial number : A18008059

| Pitot tube/Probe: # PS-5HV |        |                                        |       |
|----------------------------|--------|----------------------------------------|-------|
| Parameter                  | Value  | Allowable Range                        | Check |
| Assembly level?            | Yes    | Yes                                    | Pass  |
| Ports Damage?              | No     | No                                     | Pass  |
| $\alpha 1$                 | 0      | $-10^{\circ} < \alpha 1 < +10^{\circ}$ | Pass  |
| $\alpha 2$                 | 1      | $-10^{\circ} < \alpha 2 < +10^{\circ}$ | Pass  |
| $\beta 1$                  | 0      | $-5^{\circ} < \beta 1 < +5^{\circ}$    | Pass  |
| $\beta 2$                  | 0      | $-5^{\circ} < \beta 2 < +5^{\circ}$    | Pass  |
| $\gamma$                   | 0      | N/A                                    | -     |
| $\theta$                   | 0      | N/A                                    | -     |
| Dt                         | 0.375  | .188" to .375"                         | Pass  |
| A                          | 0.9125 | 2.1Dt ≤ A ≤ 3Dt                        | Pass  |
| A/2Dt                      | 1.217  | 1.05 ≤ A/Dt ≤ 1.5                      | Pass  |
| Z = A tan $\gamma$         | 0.046  | Z ≤ .125"                              | Pass  |
| W = A tan $\theta$         | 0.019  | W ≤ .031"                              | Pass  |

## Remark:

I certified that probe model: PS-5HV meets or exceeds all specifications, criteria and/or applicable design and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

Certificate No.: E24-010011  
Page.: 3 of 3

# THERMOCOUPLES SYSTEM CALIBRATION

| Sampling System Equipment Information |              |
|---------------------------------------|--------------|
| Probe Model Number                    | PS-5HV       |
| Probe Serial Number                   | -            |
| Meter Box Model Number                | JENCO 765 KF |
| Meter Box Serial Number               | JC 13335     |

| Calibration Conditions    |            |
|---------------------------|------------|
| Date                      | 08/02/2023 |
| Time                      | 03:20 PM   |
| Calibration Reference No. | E24-010002 |
| Reference Thermometer     | DIGICON    |
| Serial Number             | 183169105  |

| Thermocouple of Standard Probe method S = length 5 foot |                        |                    |            |
|---------------------------------------------------------|------------------------|--------------------|------------|
| Set Point                                               | Reference Thermocouple | Probe Thermocouple | Difference |
| 100                                                     | 100.0                  | 98.0               | 0.54       |
| 250                                                     | 250.0                  | 248.0              | 0.38       |
| 300                                                     | 300.0                  | 297.0              | 0.52       |
| 350                                                     | 350.0                  | 347.0              | 0.48       |



Envi Equipment Service Co., Ltd.  
110254 Moo 3, Tambon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110  
Tel. 098 362 9152, 089 478 7885  
E-mail: sales@envi-ees.com

Certificate No.: E24-010010  
Page.: 1 of 2

# CERTIFICATE OF CALIBRATION

Customer : Pacific Laboratory Co., Ltd.  
Address : 14/5358 Moo 14, Tambon Bang Bua Thong, Amphoe Bang Bua Thong, Nonthaburi 11110  
Description of Equipment : Stainless Steel Nozzle  
Manufacturer : Apex Instrument  
Model Number : NS-SET-ODD  
Serial Number : -  
ID./Control No. : -  
Environment Conditions : Temperature (25 ± 2) °C  
Humidity (50 ± 15) % RH  
Cal. Date : 08/01/2024  
Issue Date : 08/01/2024

## Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)  
This certificate is traceable to national standard, which realize the units of measurement according to the International System of Units (IS).

## Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.  
These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by :

(Mr. Mana Fuekhuay)  
Technical Manager



## CALIBRATION RESULTS

### Sampling System Equipment Information

Nozzle Model : NS-SFT-ODD  
Nozzle Number : -  
Nozzle Type : Stainless Steel

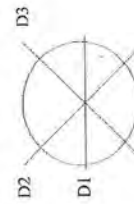
### Calibration Condition

Date : 08 January 2023  
Barometric Pressure : 761.24 mm Hg  
Calibration Device : Vernier, 0-150 mm  
Method Reference : US, EPA Method

| Nozzle ID | Nozzle Diameter |          |          | Different |                  | (D1 + D2 + D3) / 3 |
|-----------|-----------------|----------|----------|-----------|------------------|--------------------|
|           | Size<br>mm      | D1<br>mm | D2<br>mm | D3<br>mm  | $\Delta D$<br>mm | Davg<br>mm         |
| NS-5      | 3.97            | 3.90     | 3.92     | 3.92      | 0.012            | 3.913              |
| NS-7      | 5.55            | 5.40     | 5.40     | 5.40      | 0.000            | 5.400              |
| NS-9      | 7.14            | 7.02     | 7.02     | 7.02      | 0.000            | 7.020              |
| NS-11     | 8.73            | 7.81     | 7.83     | 7.82      | 0.010            | 7.820              |
| NS-13     | 10.31           | 10.18    | 10.20    | 10.19     | 0.010            | 10.190             |
| NS-15     | 11.91           | 11.68    | 11.67    | 11.67     | 0.006            | 11.673             |
| NS-17     | 13.49           | 13.46    | 13.46    | 13.44     | 0.012            | 13.453             |

### Remark:

D1, D2, D3 = There difference nozzle diameters, mm; diameter must be within 0.025 mm  
 $\Delta D$  = Maximum difference between any two diameters, must be  $\leq 0.100$  mm  
 Davg =  $(D1 + D2 + D3) / 3$





## Certificate of Calibration



### CUSTOMER

Name  
**Pacific Laboratory Co., Ltd.**  
Address  
**14/5358 Moo 14, Tambon Bang Bua Thong,  
Amphoe Bang Bua Thong, Nonthaburi 11110**  
Department/ Division/ Vessel  
**N/A**

### UNIT UNDER CALIBRATION (UUC)

Description  
**Flue gas analyzer**  
Manufacturers  
**Testo Model 310**  
S/N.**42891142**  
Measuring Range  
**O2 : 0-21 %Vol, CO : 0-4000 PPM**

Cert. No. **SE-CM24SER633**

Cal. Date : 13-Nov-24  
Cal. Due : 12-Nov-25  
Work Order No. : SE-CM24SER633  
Cal. Temp. : 25.0 ± 1°C  
Cal. Humidity : 55.0 ± 10 %RH

### Reference Standard

| Description                              | Cert. No.            | Expired Date |
|------------------------------------------|----------------------|--------------|
| - TSG Nitrogen = 99.99 %Vol              | DNHQ-44747-169649-10 | 18-Jul-28    |
| - Linde Mixture Gas in Nitrogen          | 3278/22              | 17-Oct-25    |
| Component : CO = 106 PPM,<br>O2 = 18.1 % |                      |              |

### Function Setup

| Items      | O2   | CO   |
|------------|------|------|
| Low alarm  | None | None |
| High alarm | None | None |
| Unit       | %Vol | PPM  |

### Test Result

| Visual Check                  | Criteria | Result | Operation Check | Criteria | Result |
|-------------------------------|----------|--------|-----------------|----------|--------|
| Structure                     | Proper   | Good   | Battery storage | Function | Pass   |
| Indication, Symbol and letter | Proper   | Good   | Suction pump    | Function | Pass   |
| Gas sampling hose & probe     | Proper   | Good   |                 |          |        |


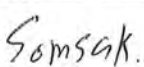

### Calibration Result

| Parameter | Zero |       |        |      |       |      | Span  |       |        |       |       |      | Respond time Sec. |      | Judgment | Note:                                                                           |
|-----------|------|-------|--------|------|-------|------|-------|-------|--------|-------|-------|------|-------------------|------|----------|---------------------------------------------------------------------------------|
|           | Std. | Acc.  | Before | Cal. | After | Err. | Std.  | Acc.  | Before | Cal.  | After | Err. | Acc.              | Read |          | - Respond time must be within 30 sec.<br>to reach to 90% of Std. concentration. |
| O2 (%Vol) | 0.0  | ± 1.5 | 0.0    | 0.0  | 0.0   | 0.0  | 18.1  | ± 1.0 | 18.4   | 18.4  | 18.4  | 0.0  | ≤30               | 13.0 | Pass     |                                                                                 |
| CO (PPM)  | 0.0  | 0.0   | 0.0    | 0.0  | 0.0   | 0.0  | 106.0 | ± 5.0 | 106.0  | 106.0 | 106.0 | 0.0  | ≤30               | 15.0 | Pass     |                                                                                 |

Std. = Standard, Read = Reading, Cal. = Calibrate, Acc. = Acceptance, Err. = Error, Sec. = Second

### Comment/ Suggestion :

This UUC that has been tested and calibrated to meet the manufacturer's published specifications in accordance with our quality control system. The standards used for calibration are on record and traceable to the National Institute of Standard and Technology (NIST), and have accuracies equal to or greater than the UUC being tested. This result of calibration was found accurated as show on date and place of calibration only.

| Engineer Signatory                                                                                                                                           | Approval Signatory                                                                                                                                         | Company Stamp                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <br>Mr.Rattanasak Yunbuapar<br>(Technical Specialist)<br>Date : 13-Nov-24 | <br>Mr.Somsak Wangdeeklang<br>(Engineer Specialist)<br>Date : 13-Nov-24 | <br><b>Call Me</b><br>CALL ME ENGINEER CO.,LTD. |





SCIMET Co., Ltd.  
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Phrakhanong, Bangkok 10260 Thailand  
Email:scimet2022@gmail.com, Tel: 02 460 9239  
https://www.scimet.co.th



Certificate No. C07240096

## Calibration Certificate

### Equipment:

SPECTROPHOTOMETER

Model: DR3900  
Serial No.(or ID): 2076219 (LAB-ST-002)  
Manufacturer: HACH  
Condition: In Condition

Job No.: KSMT2401591  
Received Date: 04 July 2024  
Issued Date: 04 July 2024  
Page: 1 of 3

### Customer

Pacific Laboratory Co., Ltd.  
14/5358 Moo 14, Bang Bua Thong, Bang Bua Thong, Nonthaburi 11110 Thailand

### Calibration Place

Pacific Laboratory Co., Ltd.(ห้องปฏิบัติการทดสอบ (Zone B)  
14/5358 Moo 14, Bang Bua Thong, Bang Bua Thong, Nonthaburi 11110 Thailand

### Calibration Date

04 July 2024

### Environment Condition

Temperature: 28.8 °C  $\pm$  0.5 °C  
Humidity: 60.5 %RH  $\pm$  2.3 %RH

### The Method used

In-house method, WI07, based on ASTM E 275-08 and  
ASTM E 387-04

### Traceability

This certificate is traceable to the CRM maintained by National Institute  
of Standards and Technology (NIST) through Starna Scientific Limited.

The standard for Wavelength Certificate No. 108691 and 108692

The standard for Photometric Certificate No. 109010 , 114655

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

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

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

(Mr. Dumrong Boonsopon)

Person in charge



(Mr. Thalemgkeat Pongngam)

Authorized signatory

### Calibration Results:

#### Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm

| Standard Wavelength<br>(nm) | Unit Under Calibration<br>(nm) | Correction<br>(nm) | Uncertainty of<br>Measurement ( $\pm$ nm) |
|-----------------------------|--------------------------------|--------------------|-------------------------------------------|
| 361.02                      | 360                            | 1.02               | 0.59                                      |
| 417.80                      | 417                            | 0.80               | 0.59                                      |
| 441.29                      | 441                            | 0.29               | 0.59                                      |
| 471.51                      | 471                            | 0.51               | 0.59                                      |
| 479.88                      | 480                            | -0.12              | 0.59                                      |
| 513.75                      | 513                            | 0.75               | 0.59                                      |
| 528.59                      | 528                            | 0.59               | 0.59                                      |
| 537.75                      | 537                            | 0.75               | 0.59                                      |
| 585.56                      | 585                            | 0.56               | 0.59                                      |
| 641.95                      | 641                            | 0.95               | 0.59                                      |
| 684.70                      | 684                            | 0.70               | 0.59                                      |
| 747.61                      | 747                            | 0.61               | 0.59                                      |
| 807.04                      | 807                            | 0.04               | 0.59                                      |
| 879.68                      | 879                            | 0.68               | 0.59                                      |

**Calibration Results:**
**Without Adjustment**
**Photometric Accuracy (Absorbance)**

| Wavelength | Standard absorbance<br>(Abs) | Unit Under Calibration<br>(Abs) | Correction<br>(Abs) | Uncertainty of<br>Measurement( $\pm$ Abs) |
|------------|------------------------------|---------------------------------|---------------------|-------------------------------------------|
| 420 nm     | 0.0000                       | 0.000                           | 0.0000              | 0.0045                                    |
|            | 0.2373                       | 0.236                           | 0.0013              | 0.0045                                    |
|            | 0.5617                       | 0.561                           | 0.0007              | 0.0045                                    |
|            | 0.7392                       | 0.737                           | 0.0022              | 0.0045                                    |
|            | 1.0550                       | 1.054                           | 0.0010              | 0.0045                                    |
| 440 nm     | 0.0000                       | 0.000                           | 0.0000              | 0.0045                                    |
|            | 0.2335                       | 0.232                           | 0.0015              | 0.0045                                    |
|            | 0.5513                       | 0.551                           | 0.0003              | 0.0045                                    |
|            | 0.7230                       | 0.721                           | 0.0020              | 0.0045                                    |
|            | 1.0324                       | 1.031                           | 0.0014              | 0.0045                                    |
| 465 nm     | 0.0000                       | 0.000                           | 0.0000              | 0.0045                                    |
|            | 0.2126                       | 0.213                           | -0.0004             | 0.0045                                    |
|            | 0.5036                       | 0.505                           | -0.0014             | 0.0045                                    |
|            | 0.6735                       | 0.673                           | 0.0005              | 0.0045                                    |
|            | 0.9615                       | 0.964                           | -0.0025             | 0.0045                                    |
| 546,1 nm   | 0.0000                       | 0.000                           | 0.0000              | 0.0045                                    |
|            | 0.2201                       | 0.219                           | 0.0011              | 0.0045                                    |
|            | 0.5176                       | 0.518                           | -0.0004             | 0.0045                                    |
|            | 0.6930                       | 0.691                           | 0.0020              | 0.0045                                    |
|            | 0.9908                       | 0.991                           | -0.0002             | 0.0045                                    |
| 590 nm     | 0.0000                       | 0.000                           | 0.0000              | 0.0045                                    |
|            | 0.2443                       | 0.243                           | 0.0013              | 0.0045                                    |
|            | 0.5530                       | 0.553                           | 0.0000              | 0.0045                                    |
|            | 0.7196                       | 0.717                           | 0.0026              | 0.0045                                    |
|            | 1.0301                       | 1.028                           | 0.0021              | 0.0045                                    |
| 635 nm     | 0.0000                       | 0.000                           | 0.0000              | 0.0045                                    |
|            | 0.2646                       | 0.263                           | 0.0016              | 0.0045                                    |
|            | 0.5370                       | 0.537                           | 0.0000              | 0.0045                                    |
|            | 0.6862                       | 0.684                           | 0.0022              | 0.0045                                    |
|            | 0.9822                       | 0.981                           | 0.0012              | 0.0045                                    |

**The End of Certificate**

**Statements of conformity:**

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

The error of temperature 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, ASTM E 275-08 and ASTM E 387-04. 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. Thalerngkeat Pongngam)

Authorized signatory

### Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm

| Unit Under Calibration | Correction | Guard Band (w) | Tolerance ( $\pm$ ) | Conformity |
|------------------------|------------|----------------|---------------------|------------|
| 360                    | 1.02       | 0.59           | 2                   | Pass       |
| 417                    | 0.80       | 0.59           | 2                   | Pass       |
| 441                    | 0.29       | 0.59           | 2                   | Pass       |
| 471                    | 0.51       | 0.59           | 2                   | Pass       |
| 480                    | -0.12      | 0.59           | 2                   | Pass       |
| 513                    | 0.75       | 0.59           | 2                   | Pass       |
| 528                    | 0.59       | 0.59           | 2                   | Pass       |
| 537                    | 0.75       | 0.59           | 2                   | Pass       |
| 585                    | 0.56       | 0.59           | 2                   | Pass       |
| 641                    | 0.95       | 0.59           | 2                   | Pass       |
| 684                    | 0.70       | 0.59           | 2                   | Pass       |
| 747                    | 0.61       | 0.59           | 2                   | Pass       |
| 807                    | 0.04       | 0.59           | 2                   | Pass       |
| 879                    | 0.68       | 0.59           | 2                   | Pass       |

### Without Adjustment

#### Photometric Accuracy (Absorbance)

| Wavelength | Unit Under Calibration | Correction | Guard Band (w) | Tolerance ( $\pm$ ) | Conformity |
|------------|------------------------|------------|----------------|---------------------|------------|
| 420 nm     | 0.000                  | 0.0000     | 0.0045         | 0.015               | Pass       |
|            | 0.236                  | 0.0013     | 0.0045         | 0.015               | Pass       |
|            | 0.561                  | 0.0007     | 0.0045         | 0.015               | Pass       |
|            | 0.737                  | 0.0022     | 0.0045         | 0.015               | Pass       |
|            | 1.054                  | 0.0010     | 0.0045         | 0.015               | Pass       |
| 440 nm     | 0.000                  | 0.0000     | 0.0045         | 0.015               | Pass       |
|            | 0.232                  | 0.0015     | 0.0045         | 0.015               | Pass       |
|            | 0.551                  | 0.0003     | 0.0045         | 0.015               | Pass       |
|            | 0.721                  | 0.0020     | 0.0045         | 0.015               | Pass       |
|            | 1.031                  | 0.0014     | 0.0045         | 0.015               | Pass       |
| 465 nm     | 0.000                  | 0.0000     | 0.0045         | 0.015               | Pass       |
|            | 0.213                  | -0.0004    | 0.0045         | 0.015               | Pass       |
|            | 0.505                  | -0.0014    | 0.0045         | 0.015               | Pass       |
|            | 0.673                  | 0.0005     | 0.0045         | 0.015               | Pass       |
|            | 0.964                  | -0.0025    | 0.0045         | 0.015               | Pass       |
| 546.1 nm   | 0.000                  | 0.0000     | 0.0045         | 0.015               | Pass       |
|            | 0.219                  | 0.0011     | 0.0045         | 0.015               | Pass       |
|            | 0.518                  | -0.0004    | 0.0045         | 0.015               | Pass       |
|            | 0.691                  | 0.0020     | 0.0045         | 0.015               | Pass       |
|            | 0.991                  | -0.0002    | 0.0045         | 0.015               | Pass       |
| 590 nm     | 0.000                  | 0.0000     | 0.0045         | 0.015               | Pass       |
|            | 0.243                  | 0.0013     | 0.0045         | 0.015               | Pass       |
|            | 0.553                  | 0.0000     | 0.0045         | 0.015               | Pass       |
|            | 0.717                  | 0.0026     | 0.0045         | 0.015               | Pass       |
|            | 1.028                  | 0.0021     | 0.0045         | 0.015               | Pass       |
| 635 nm     | 0.000                  | 0.0000     | 0.0045         | 0.015               | Pass       |
|            | 0.263                  | 0.0016     | 0.0045         | 0.015               | Pass       |
|            | 0.537                  | 0.0000     | 0.0045         | 0.015               | Pass       |
|            | 0.684                  | 0.0022     | 0.0045         | 0.015               | Pass       |
|            | 0.981                  | 0.0012     | 0.0045         | 0.015               | Pass       |

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

### The End of Statements of Conformity

#### บริษัท ชายน์เมท จำกัด (SCIMET CO., LTD.)

1194 Soi Wachirathamsathit 57, Bangchak, Phrakhanong, Bangkok 10260 Thailand  
Email: scimet2022@gmail.com, Tel: 02 460 9239

ภาคผนวกที่ 5-3  
เอกสารสอบเทียบปริมาณความเข้มข้นละอองและสารเคมี  
ในบรรยากาศการทำงาน





PACIFIC

LABORATORY CO., LTD.

Pacific Laboratory Co., Ltd.

14/5358 Moo 14 Tambol Bang Bua Thong

Amphoe Bang Bua Thong, Nonthaburi 11110

Tel. : 0-2045-2446-7 Fax. : 0-2045-3991

## Personal Pump Calibration Report

Calibrate No. : CP409/2567

Calibrate Date : October 10, 2024

Equipment Type : Personal Pump  
Calibration Type : DRYCAL DC-LITE FLOWMETER  
Volume for Calibration : 1.0, 2.0 l/min  
Environment Conditions : 29.0 Deg C.  
Environment Pressure : 758.0 mmHg.  
Customer Name : บริษัท อลูมิเนียม ฉี้อ จิ้น ฮั่ว จำกัด

| Item | Personal Pump<br>Serial Number | Flow Rate | First Time | Second<br>Time | Third<br>Time | Forth<br>Time | Average | Uncertainty  |
|------|--------------------------------|-----------|------------|----------------|---------------|---------------|---------|--------------|
| 1.   | S/N 20220104113                | 1.0 l/min | 1.050      | 1.055          | 1.045         | 1.051         | 1.050   | $\pm 0.0041$ |
|      |                                | 2.0 l/min | 2.064      | 2.062          | 2.066         | 2.068         | 2.065   | $\pm 0.0026$ |
| 2.   | S/N 20210701091                | 1.0 l/min | 1.091      | 1.090          | 1.092         | 1.093         | 1.092   | $\pm 0.0013$ |
|      |                                | 2.0 l/min | 2.037      | 2.040          | 2.034         | 2.038         | 2.037   | $\pm 0.0025$ |
| 3.   | S/N 20210601117                | 1.0 l/min | 1.016      | 1.020          | 1.012         | 1.017         | 1.016   | $\pm 0.0033$ |
|      |                                | 2.0 l/min | 2.072      | 2.067          | 2.077         | 2.073         | 2.072   | $\pm 0.0041$ |
| 4.   | S/N 20220104047                | 2.0 l/min | 2.043      | 2.045          | 2.041         | 2.047         | 2.044   | $\pm 0.0026$ |
| 5.   | S/N 20210905031                | 2.0 l/min | 2.008      | 2.005          | 2.011         | 2.009         | 2.008   | $\pm 0.0025$ |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |
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|      |                                |           |            |                |               |               |         |              |

Calibration By

(Miss Sakuna Supparot)  
Technician





## Certificate of Calibration

### Customer

Name : Pacific Laboratory Co., Ltd.  
Address : 14/5358 Moo.14 Tambol Bang Bua Thong Amphoe Bang Bua Thong  
Nonthaburi 11110

Certificate No : 24-AFM-016

Request No : Req-2024-0078

### Unit Under Calibration Details

Measurement Item : Air Flow Meter  
Manufacturer : Bios  
Model : DCL-M  
Serial Number : 104699  
ID : -  
Location of Calibration : LAB 4 AIR VELOCITY METER

Sensor Model : Low Flow

Sensor Serial Number : 2014010014

### Calibration Environment and Details

Temperature : 23 °C ± 3 °C  
Humidity : 55 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 9 January 2024  
Calibration Date : 26 January 2024  
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator


| Reference Standard | Model                      | Serial Number   | Traceble  | Due Calibration  |
|--------------------|----------------------------|-----------------|-----------|------------------|
| Air Flow Meter     | Gilibrator 3 Low flow      | 18501010006     | Sensidyne | 12 July 2024     |
| Air Flow Meter     | Gilibrator 3 Standard flow | 19031011003     | Sensidyne | 12 July 2024     |
| Temperature meter  | GT 11                      | 08000057        | Qreborn   | 27 February 2024 |
| Pressure meter     | CPG2400                    | 41000KDU/651882 | TPA       | 7 November 2023  |


### Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

### Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k = 2$ , providing a level of confidence approximately 95 %.

Calibration By :   
Mr. Noppadon Luangart  
Service Calibration Engineer

Approved By :   
Mr. Pacit Mathavorn  
Calibration Engineer Supervisor

Issue Date : 26 January 2024

Certificate No : 24-AFM-016

Request No : Req-2024-0078

**Result of Calibration :**

| Temperature<br>(°C) | Pressure<br>(kPa) | STD<br>(l/min) | UUC<br>(l/min) | Error<br>(l/min) | Uncertainty<br>(l/min) |
|---------------------|-------------------|----------------|----------------|------------------|------------------------|
| 23.10               | 101.30            | 0.050          | 0.0496         | -0.0004          | 0.0033                 |
| 23.20               | 101.32            | 0.100          | 0.0994         | -0.0006          | 0.0028                 |
| 23.30               | 101.33            | 0.199          | 0.1981         | -0.0009          | 0.0056                 |
| 23.00               | 101.31            | 1.001          | 1.000          | -0.001           | 0.014                  |
| 23.20               | 101.24            | 2.001          | 1.998          | -0.003           | 0.028                  |
| 23.40               | 101.19            | 3.002          | 3.008          | 0.006            | 0.043                  |

**Note**

STD : Standard

UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{\text{meas}} = Q_{\text{ref}} \times \frac{P_{\text{ref}}}{P_{\text{meas}}} \times \frac{T_{\text{meas}}}{T_{\text{ref}}}$$

where Q = Flow Rate

P = Absolute Pressure

T = Absolute Temperature

Meas = Measurement Condition

ref = Standard Condition

\* Indicates non accredited

**End of Certificate**

# CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

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



NSC-TISI-TIS17025  
CALIBRATION 0030

## Certificate of Calibration

Certificate No. : 67-200273-1

Page : 1 of 2

Submitted by : Pacific Laboratory Co., Ltd.

14/5358 Moo 14, T.Bang Bua Thong, A.Bang Bua Thong, Nonthaburi 11110 Thailand

Equipment : Electronic Balance

Manufacturer : SHIMADZU

Model : AP225WD

Serial No. : D316301828

ID No. : LAB-BL-003

Capacity : 220000 mg

Resolution : 0.01mg/102000mg, 0.1mg/220000mg

Environment : On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd.

Ambient Temperature : (26.2 to 26.4) °C

Relative Humidity : (34.0 to 35.4) %

Air Pressure : 1007.0 mbar

Date of Received : 30 July 2024

Date of Calibration : 30 July 2024

Date of Issue : 31 July 2024

Calibrated by : Akaradath Thippichai

Calibration Method : In-house method CAL-M2001 based on UKAS Publication ref : LAB 14

Edition 7 - November 2022

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

Standard Weights

| ID No.     | Cert. No. | Due Date    | Traceability                                       |
|------------|-----------|-------------|----------------------------------------------------|
| E261-E2624 | C02232088 | 08 Nov 2024 | National Institute of Metrology (Thailand), (NIMT) |

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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



# CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

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

## Certificate of Calibration

Certificate No. : 67-200273-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

| Nominal Value<br>(mg) | Correction<br>(mg) | Uncertainty<br>$\pm$ (mg) |
|-----------------------|--------------------|---------------------------|
| 1                     | 0.01               | 0.012                     |
| 10                    | 0.01               | 0.012                     |
| 50                    | 0.01               | 0.012                     |
| 100                   | 0.01               | 0.014                     |
| 1000                  | 0.00               | 0.026                     |
| 2000                  | 0.01               | 0.034                     |
| 5000                  | 0.00               | 0.043                     |
| 20000                 | 0.00               | 0.071                     |
| 50000                 | 0.01               | 0.11                      |
| 100000                | 0.00               | 0.20                      |
| 150000                | 0.0                | 0.38                      |
| 200000                | 0.0                | 0.38                      |

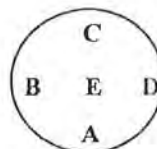
This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2.06$ , providing a level of confidence of approximately 95%

Eccentric error

Load test : 50000 mg

|      |      |      |      |      |    |
|------|------|------|------|------|----|
| A    | B    | C    | D    | E    |    |
| 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | mg |



Repeatability

Load test : 200000 mg

Stdev. : 0.053 mg

A handwritten signature in black ink, appearing to be 'ABJ'.

- o0o -





Document Type Calibration Certificate (CC)  
Description CC for 881 Compact IC pro  
Document ID CC.881 Version 1.3 / 8.681.3005EN

# Metrohm Compliance Service

Calibration Certificate (CC) for  
881 Compact IC pro

## Instrument details

Type: 18810030  
Serial No.: 241394/ME (1881000010137)  
Manufacturer: Metrohm AG  
Ionenstrasse  
CH-9100 Herisau  
Switzerland  
Firmware: 5.850.0114  
Customer Instrument ID: N/A  
System Designation Number: CAL240428/ME

## Customer details

Name of company: EMEX Association Co., Ltd.  
Address: 27, 29 Bang Mot  
Chomthong  
Bangkok 10150

Department: Laboratory  
Responsible person: นายสุวิทย์ สอน  
Calibration place: Laboratory  
EMEX Association Co., Ltd.

Date and time of calibration: 12/06/2024 - 08:00

System Designation Number: CAL240428/ME  
Calibration Certificate (CC) No.: 241394/ME (1881000010137) - 12/06/2024

ใบรับรองการสอบเทียบ “เครื่อง Ion chromatography”  
(Calibration Certificate of Ion chromatography)



หอยงปฏิบติการวิเคราะห์เอกษน  
เลขทะเบียน ว-244



หอยงปฏิบติการวิเคราะห์เอกษน  
เลขทะเบียน ว-244



Document Type Calibration Certificate (CC)  
Description CC for 881 Compact IC pro  
Document ID CC.881 Version 1.3 / 8.881.3005EN



Document Type Calibration Certificate (CC)  
Description CC for 881 Compact IC pro  
Document ID CC.881 Version 1.3 / 8.881.3005EN

## Calibration Certificate (CC)

### Introduction

The instrument stated above has been inspected in accordance with the corresponding test instructions of Metrohm Ltd. Servicing instructions are compiled and checked for correctness with account taken of the technical apparatus and ambient conditions available to the service engineer at the servicing location. This Calibration Certificate (CC) declares the results regarding calibration and operational status obtained when carrying out the test instructions referred to below.

### Calibration status

We certify that the instrument stated above meets or exceeds the electrical specifications at the points tested. Test equipment is calibrated and traceable back to national and/or international standards (ISO 17025, NIST).

### Operational status

We certify that the instrument stated above executes the instrument's specific functions tested except where detailed overleaf.

## Declaration

### Document

Test instructions used: C.1 Test instructions for 881 Compact IC pro, Version 1.3

### Reference standards

| Type / Model            | Manufacturer | Serial No. / Batch No. | Certificate No.  | Due date / Expiry date |
|-------------------------|--------------|------------------------|------------------|------------------------|
| Multimeter              | Fuke         | 9345004                | E110232737       | 02/10/2024             |
| Temperature measurement | Mettler      | 82590101               | TMU2300789       | 21/06/2024             |
| High pressure gauge     | Mettler      | 34864018013            | CAL0252-2300153  | 20/11/2024             |
| Flow meter              | ANALYTAC     | 424152                 | L2624552916-0001 | 15/05/2025             |

### Protocol

Instrument had to be repaired beforehand

If yes, see Calibration Certificate (CC) No.:

Instrument had to be readjusted beforehand

If yes, see Calibration Certificate (CC) No.:

Yes ☐

No ☒

Yes ☐

No ☒

Yes ☐

No ☒

System Designation Number: CAL240428/ME  
Calibration Certificate (CC) No.: 241394/ME (1881000010137) - 12/06/2024 - 09:00



ห้องปฏิบัติการวิเคราะห์เอกชน  
เลขทะเบียน 7-244

System Designation Number: CAL240428/ME  
Calibration Certificate (CC) No.: 241394/ME (1881000010137) - 12/06/2024 - 09:00

### Conclusion of test results

Yes ☒

No ☐

### Instrument satisfies the specified technical requirements

Recommended date for next maintenance:

### Comments

### Metrohm representative

Yes ☒

No ☐

Metrohm representative confirms correct execution of instrument calibration

Date 12/06/2024

Name Mr. Jarasak Samana

Signature

22.6.24

### Customer representative

Yes ☒

No ☐

Customer representative accepts results of instrument calibration

Date 12/06/2024

Name ภาณุพงษ์ ชื่นมณี

Signature

ชื่อนาม



ห้องปฏิบัติการวิเคราะห์เอกชน  
เลขทะเบียน 7-244

เลขทะเบียน 7-244

System Designation Number: CAL240428/ME  
Calibration Certificate (CC) No.: 241394/ME (1881000010137) - 12/06/2024 - 09:00



Document Type Calibration Certificate (CC)  
Description CC for 881 Compact IC pro  
Document ID CC 881 Version 1.3 / 8.881.300SEN



Document Type Calibration Certificate (CC)  
Description CC for 881 Compact IC pro  
Document ID CC 881 Version 1.3 / 8.881.300SEN

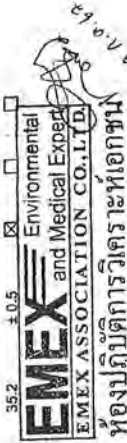
## Test results

| No. | Title                 | Comments | Pass                                |                          |
|-----|-----------------------|----------|-------------------------------------|--------------------------|
|     |                       |          | Yes                                 | No                       |
| 100 | Visual test           |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 101 | Safety test           |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 102 | LED                   |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 103 | Fan                   |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 104 | Communication         |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 105 | Leak detector         |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 106 | MSB interface         |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 107 | USB interface         |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 108 | Column plug interface |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| No. | Title                 | Comments | Pass                                |                          |
|     |                       |          | Yes                                 | No                       |
| 109 | Column heater         |          |                                     | <input type="checkbox"/> |

### 109.1 Temperature absolute

| Nominal value [°C] | Measured value [°C] | Tolerance [°C] |
|--------------------|---------------------|----------------|
| 35.0               | 35.2                | ± 0.5          |

Set temperature



ห้องปฏิบัติการวิเคราะห์เอกสาร  
เลขทะเบียน จ-244  
12/06/2024 08:00

System Designation Number: CAL240428/ME  
Calibration Certificate (CC) No.: 241394/ME (1881000010137) - 12/06/2024 - 08:00

| No. | Title | Comments | Yes | No |
|-----|-------|----------|-----|----|
|-----|-------|----------|-----|----|

### 109.2 Temperature stability

| Maximum t [°C] | Minimum t [°C] | Difference [°C] |
|----------------|----------------|-----------------|
| 35.045         | 35.005         | <0.05           |

| No. | Title   | Comments | Yes | No                       |
|-----|---------|----------|-----|--------------------------|
| 110 | IC pump |          |     | <input type="checkbox"/> |

### 110.1 Installation

|                                     |                          |
|-------------------------------------|--------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|-------------------------------------|--------------------------|

### 110.2 Pump head detection

|                                     |                          |
|-------------------------------------|--------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|-------------------------------------|--------------------------|

### 110.3 Dearate

|                                     |                          |
|-------------------------------------|--------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|-------------------------------------|--------------------------|

### 110.4 Pump dynamics

|                                     |                          |
|-------------------------------------|--------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|-------------------------------------|--------------------------|

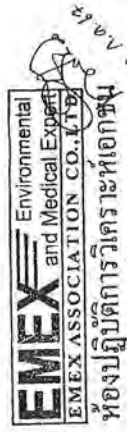
### 110.5 Pulsation

| Maximum [MPa] | Minimum [MPa] | Difference [%] |
|---------------|---------------|----------------|
| 11.10         | 10.65         | <5.0           |
| N/A           | N/A           | <10.0          |

Standard pump head  
Macro pump head

### 110.6 Pressure transducer

| Nominal value [MPa] | Measured value [MPa] | Tolerance [%] |
|---------------------|----------------------|---------------|
| 10.53               | 11                   | ± 10.0        |



ห้องปฏิบัติการวิเคราะห์เอกสาร  
เลขทะเบียน จ-244  
12/06/2024 09:00

System Designation Number: CAL240428/ME  
Calibration Certificate (CC) No.: 241394/ME (1881000010137) - 12/06/2024 - 09:00



Document Type  
Description  
Document ID

Calibration Certificate (CC)  
CC for 881 Compact IC pro  
CC.881 Version 1.3 / 8.881.3005EN



Document Type  
Description  
Document ID

Calibration Certificate (CC)  
CC for 881 Compact IC pro  
CC.881 Version 1.3 / 8.881.3005EN

| No. | Title           | Comments | Pass |     |
|-----|-----------------|----------|------|-----|
|     | 110.7 Flow rate |          | Yes  | No  |
|     |                 |          |      | N/A |
|     |                 |          |      |     |
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ห้องปฏิบัติการวิเคราะห์องค์ประกอบ  
เลขทะเบียน 7-244

System Designation Number: CAL240428/ME  
Calibration Certificate (CC) No.: 241394/ME (1881000010137) - 12/06/2024 - 09:00

| No.                              | Title                     | Comments              | Yes                                 | No                       | N/A                      | Pass |
|----------------------------------|---------------------------|-----------------------|-------------------------------------|--------------------------|--------------------------|------|
| 113                              | MSM (option)              |                       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |      |
| 113.1 Switching operation        |                           |                       |                                     |                          |                          |      |
| No.                              | Title                     | Comments              | Yes                                 | No                       | N/A                      | Pass |
| 114                              | Peristaltic pump (option) |                       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |      |
| 114.1 Rotation CW                |                           |                       |                                     |                          |                          |      |
| 114.2 Rotation CCW               |                           |                       |                                     |                          |                          |      |
| 114.3 Speed control              |                           |                       |                                     |                          |                          |      |
| No.                              | Title                     |                       | Yes                                 | No                       | N/A                      | Pass |
| 115                              | MCS (option)              |                       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |      |
| 115.1 Vacuum build-up            |                           |                       |                                     |                          |                          |      |
| 115.2 Air flow without cartridge |                           |                       |                                     |                          |                          |      |
|                                  | Nominal value [sccm]      | Measured value [sccm] | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |      |
|                                  | 10.0 – 15.0               | 14.71                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |      |
| 115.3 Air flow with cartridge    |                           |                       |                                     |                          |                          |      |
|                                  | Nominal value [sccm]      | Measured value [sccm] | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |      |
|                                  | >8.0                      | 14.31                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |      |



ห้องปฏิบัติการวิเคราะห์องค์ประกอบ  
เลขทะเบียน 7-244

System Designation Number: CAL240428/ME  
Calibration Certificate (CC) No.: 241394/ME (1881000010137) - 12/06/2024 - 09:00





Document Type  
Description  
Document ID

Calibration Certificate (CC)  
CC for 881 Compact IC pro  
CC.881 Version 1.3 / 8.881.3005EN

## CC.881 Document history

| Date       | Article No.  | Author        | Description/Changes                                         |
|------------|--------------|---------------|-------------------------------------------------------------|
| 16.04.2012 | 8.881.3003EN | Philipp Rüegg | Layout adapted to Metrohm Compliance Service                |
| 20.02.2013 | 8.881.3005EN | Philipp Rüegg | Test step 115.2 tolerance increased according C.3 CRM-10456 |

End of CC Document



ห้องปฏิบัติการวิเคราะห์เอกสาร  
เลขทะเบียน ว-244

System Designation Number: CAL240428/ME  
Calibration Certificate (CC) No.: 241354/ME (18810000101137) - 12/06/2024 - 09/00

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Document Type  
Description  
Document ID

Calibration Certificate (CC)  
CC for 850.9010 Conductivity Detector  
CC.850 Version 1.3 / 8.850.3022EN

## Metrohm Compliance Service

### Calibration Certificate (CC) for 850.9010 Conductivity Detector

#### Instrument details

|                            |                                                          |
|----------------------------|----------------------------------------------------------|
| Type:                      | 18509010                                                 |
| Serial No.:                | 241395/ME (1850901012155)                                |
| Manufacturer:              | Metrohm AG, Ionenstrasse, CH-9100 Herisau<br>Switzerland |
| Customer instrument ID:    | N/A                                                      |
| System Designation Number: | CAL240428/ME                                             |

#### Control device details

|             |               |
|-------------|---------------|
| Type:       | 1.881.0030    |
| Serial No.: | 1881000010137 |
| Firmware:   | 5.850.0114    |

#### Customer details

Name of company:  
Address:  
EMEX Association Co., Ltd.  
27, 29 Bang Mot  
Chomthong  
Bangkok 10150

#### Department:

Responsible person:  
Calibration place:

Laboratory  
กรมการขนส่ง  
Laboratory  
EMEX Association Co., Ltd.

Date and time of calibration:

12/06/2024 - 09:00



ห้องปฏิบัติการวิเคราะห์เอกสาร  
เลขทะเบียน ว-244

System Designation Number: CAL240428/ME  
Calibration Certificate (CC) No.: 241395/ME (1850901012155) - 12/06/2024 - 09:00

Page 1 of 5



Document Type  
Description  
Document ID

Calibration Certificate (CC)  
CC for 850.9010 Conductivity Detector  
CC.850 Version 1.3 / 8.850.3022EN



Document Type  
Description  
Document ID

Calibration Certificate (CC)  
CC for 850.9010 Conductivity Detector  
CC.850 Version 1.3 / 8.850.3022EN

## Calibration Certificate (CC)

### Introduction

The instrument stated above has been inspected in accordance with the corresponding test instructions of Metrohm Ltd. Servicing Instructions are compiled and checked for correctness with account taken of the technical apparatus and ambient conditions available to the service engineer at the servicing location. This Calibration Certificate (CC) declares the results regarding calibration and operational status obtained when carrying out the test instructions referred to below.

### Calibration status

We certify that the instrument stated above meets or exceeds the electrical specifications at the points tested. Test equipment is calibrated and traceable back to national and/or international standards (ISO 17025, NIST).

### Operational status

We certify that the instrument stated above executes the instrument's specific functions tested except where detailed overhead.

## Declaration

### Document

Test instructions used: C.1 Test Instructions for 850.9010 Conductivity Detector, Version 1.3

### Reference standards

| Type / Model                  | Manufacturer | Serial No. / Batch No. | Certificate No. | Due date / Expiry date |
|-------------------------------|--------------|------------------------|-----------------|------------------------|
| Temperature point, 100°C      | Fluke        | 82080101               | 7NUJ230768      | 21/06/2024             |
| Conductivity standard (0.01M) | Mettler      | 21-59024               | 12-0188         | 15/09/2023             |

### Protocol

Instrument had to be repaired beforehand  
If yes, see Calibration Certificate (CC) No.:  
Instrument had to be readjusted beforehand  
If yes, see Calibration Certificate (CC) No.:

Yes No  
☐ ☒  
☐ ☒

### Conclusion of test results

Yes No  
☒ ☐

### Instrument satisfies the specified technical requirements

Recommended date for next maintenance:

### Comments

### Metrohm representative

Metrohm representative confirms correct execution of instrument calibration  
Date Name Signature  
12/06/2024 Mr. Jaratsak Samana

Yes No  
☒ ☐

### Customer representative

Customer representative accepts results of instrument calibration  
Date Name Signature  
12/06/2024 พินิจสุภา รุ่งศรี

Yes No  
☒ ☐



ห้องปฏิบัติการวิเคราะห์เอกชน

System Designation Number: CAL240428ME  
Calibration Certificate (CC) No.: 241395/ME (1850901012155) - 12/06/2024 - 09:00

เลขทะเบียน ว-244

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ห้องปฏิบัติการวิเคราะห์เอกชน

System Designation Number: CAL240428ME  
Calibration Certificate (CC) No.: 241395/ME (1850901012155) - 12/06/2024 - 09:00

เลขทะเบียน ว-244

Page 3 of 5



Document Type  
Description  
Document ID

Calibration Certificate (CC)  
CC for 850.3010 Conductivity Detector  
CC.850 Version 1.3 / 8.850.3022EN



Document Type  
Description  
Document ID

Calibration Certificate (CC)  
CC for 850.3010 Conductivity Detector  
CC.850 Version 1.3 / 8.850.3022EN

## Test results

| No. | Title                 | Comments | Pass                                | No                       | N/A                      |
|-----|-----------------------|----------|-------------------------------------|--------------------------|--------------------------|
| 100 | Communication         |          | Yes                                 | No                       |                          |
|     |                       |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| No. | Title                 |          | Pass                                | No                       | N/A                      |
| 101 | Temperature absolute  |          | Yes                                 | No                       |                          |
|     |                       |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|     |                       |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| No. | Title                 |          | Pass                                | No                       | N/A                      |
| 102 | Temperature stability |          | Yes                                 | No                       |                          |
|     |                       |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|     |                       |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| No. | Title                 |          | Pass                                | No                       | N/A                      |
| 103 | Signal noise          |          | Yes                                 | No                       |                          |
|     |                       |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|     |                       |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| No. | Title                 |          | Pass                                | No                       | N/A                      |
| 104 | Conductivity dry test |          | Yes                                 | No                       |                          |
|     |                       |          | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



ห้องปฏิบัติการวิเคราะห์เอกชน  
เลขทะเบียน ว-244

System Designation Number: CAL240428/ME  
Calibration Certificate (CC) No.: 241395/ME (1850901012155) - 12/06/2024 - 09:00

| No.   | Title                               | Pass                                | No                       | N/A                      |
|-------|-------------------------------------|-------------------------------------|--------------------------|--------------------------|
| 105   | Conductivity cell (optional)        | Yes                                 | No                       |                          |
|       |                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 105.1 | System installation and preparation | Yes                                 | No                       |                          |
|       |                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 105.2 | Write a method                      | Yes                                 | No                       |                          |
|       |                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 105.3 | Measurement                         | Yes                                 | No                       |                          |
|       |                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|       |                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

## CC.850 Document history

| Date               | Article No.  | Author        | Description/Changes                          |
|--------------------|--------------|---------------|----------------------------------------------|
| 26.04.2012         | 8.850.3022EN | Philipp Rüegg | Layout adapted to Metrohm Compliance Service |
| End of CC Document |              |               |                                              |



ห้องปฏิบัติการวิเคราะห์เอกชน  
เลขทะเบียน ว-244

System Designation Number: CAL240428/ME  
Calibration Certificate (CC) No.: 241395/ME (1850901012155) - 12/06/2024 - 09:00

ภาคผนวกที่ 5-4  
เอกสารสอบเทียบระดับความดังเสียง  
(Sound Level Meter)



# Professional Calibration & Services Co., Ltd.

50/888, 50/889 Moo 2, Rungsit-Nakornnayok Rd., Bungyeetho, Thunyaburi,  
Pathumthani 12130 Thailand  
Tel : (+66)2150-6641 (Autoline), (+66)2569-5158  
Email : info@p-cal.com www.p-cal.com



## Certificate of Calibration

Certificate Number : EL41650/24

Page 1 of 3

Control Number : PCAL153035

Customer Control : -

Description : Sound Calibrator

Manufacturer : SOUNDTEK

Model : ST-120

Serial Number : 211203764

Customer : Pacific Laboratory Co., Ltd.

14/5358 Moo 14, Tambol Bang Bua Thong, Amphoe Bang Bua Thong,  
Nonthaburi 11110

Date of Receipt : 22-Aug-24

Date of Calibration : 23-Aug-24

Environment : Temperature  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$   
: Relative Humidity  $50\% \pm 20\%$

Calibration Method : Calibration Procedure Number CP-EL35

Calibration Results : See data attached



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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

*Calibrated By*

*Mr. Nonpawit Wiseschoo*

*Authorized Signature*

*(Mr. Manote Piwnimnual)*

*27-Aug-24*

*Issued Date*

# CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : EL41650/24

Page 2 of 3

## Equipment Standards Used

| Description       | Serial No. | Traceability to        | Certificate No.  | Cal. Due Date |
|-------------------|------------|------------------------|------------------|---------------|
| Sound Level Meter | 030606101  | ANAB : AC-2590         | EL12298/24       | 27-Mar-25     |
| Sound Calibrator  | 125626778  | NSC : Calibration 0037 | EEL.BP. 161/0167 | 04-Feb-25     |

Condition as received : Normal

Definitions :-

- \* ANAB - The ANSI National Accreditation Board
- \* NSC - National Standardization Council of Thailand

# CALIBRATION REPORT

Professional Calibration & Services Co., Ltd.

Certificate No.: ELA1650/24

Page : 3 of 3

**Calibration Results**

**Sound Pressure Level Accuracy**

| Nominal Value | Measured Value | UUC Error | Uncertainty ( ± ) |
|---------------|----------------|-----------|-------------------|
| 94 dB         | 93.97 dB       | 0.03 dB   | 0.17 dB           |
| 114 dB        | 114.30 dB      | -0.30 dB  | 0.17 dB           |

...End...



# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthani 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC240093

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong,  
Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC240093        |
| Manufacturer  | : Scarlet Tech      | Calibration Location | : Laboratory      |
| Model         | : ST-11D            | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 820967            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : N/A               | Received Date        | : 23-Mar-2024     |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability    | Due Date  |
|------------------------|------------|-----------------|-----------------|-----------|
| Sound Level Calibrator | 141011576  | CP20230261EA    | TISI: 22-LB0119 | 05-Jul-24 |

# APTITECH

### Authority of Calibration

Approved Signatory

Calibration Date : 23-Mar-2024

Issued Date : 26-Mar-2024

Calibrated By : Ms. Hathaichanok Kaewsrirai

☐ Mr. Anuwat Simsirawat [ Laboratory Manager ]

☒ Mr. Sompoch Srisunart [ Technical Manager ]

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.



## CALIBRATION REPORT

Certificate Number : SC240093

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment  
Sound Level Calibration  
- Frequency Weighting : A  
- Resolution : 0.1 dB

### Sound Level Measurement (Slow Mode)

| Parameter | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|-----------|-----------|----------------|-------------|-----------|-----------------|
| LFp       | 20-140 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.61 dB         |
|           |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.61 dB         |
| LSp       | 20-140 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.61 dB         |
|           |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.61 dB         |
| LIp       | 20-140 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.61 dB         |
|           |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.61 dB         |

### Sound Level Measurement (Fast Mode)

| Parameter | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|-----------|-----------|----------------|-------------|-----------|-----------------|
| LFp       | 20-140 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.61 dB         |
|           |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.61 dB         |
| LSp       | 20-140 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.61 dB         |
|           |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.61 dB         |
| LIp       | 20-140 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.61 dB         |
|           |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.61 dB         |

--- End of Certificate ---





# Professional Calibration & Services Co., Ltd.

50/888, 50/889 Moo 2, Rungsil-Nakornnayok Rd., Bungyeetho, Thunyaburi,  
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Email : info@p-cal.com www.p-cal.com



## Certificate of Calibration

Page 1 of 3

Certificate Number : EL14068/24  
Control Number : PCAL163759  
Customer Control : -  
Description : Sound Calibrator  
Manufacturer : Tenmars  
Model : TM-100  
Serial Number : 220501964  
Customer : Pacific Laboratory Co., Ltd.  
14/5358 Moo 14, Tambol Bang Bua Thong, Amphoe Bang Bua Thong,  
Nonthaburi 11110

Date of Receipt : 16-Mar-24  
Date of Calibration : 18-Mar-24  
Environment : Temperature  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$   
: Relative Humidity  $50\% \pm 20\%$   
Calibration Method : Calibration Procedure Number CP-EL35  
Calibration Results : See data attached



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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

*Calibrated By*

*Mr. Watcharapol Horasit*

*Authorized Signature*

*(Mr. Jumphong Junphong)*

*28-Mar-24*

*Issued Date*

# CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : EL14068/24

Page 2 of 3

## Equipment Standards Used

| Description            | Serial No. | Traceability to | Certificate No. | Cal. Due Date |
|------------------------|------------|-----------------|-----------------|---------------|
| Sound Level Meter      | 030606101  | ANAB : AC-2590  | EL09782/23      | 29-Mar-24     |
| Sound Level Calibrator | 141208123  | ANAB : AC-2590  | EL12312/24      | 04-Mar-25     |

Condition as received : Normal

Definitions :-

\* ANAB - The ANSI National Accreditation Board

# CALIBRATION REPORT

## Professional Calibration & Services Co., Ltd.

Certificate No.: EL14068/24

Page : 3 of 3

### Calibration Results

#### Sound Calibration

| Nominal | Measured Value | Uncertainty ( $\pm$ ) | Tolerance Limit Values |
|---------|----------------|-----------------------|------------------------|
| 94 dB   | 93.9 dB        | 0.2 dB                | 93.5 ~ 94.5 dB         |
| 114 dB  | 113.9 dB       | 0.2 dB                | 113.0 ~ 115.0 dB       |

#### Notes:

- 1). Tolerances or specifications report in table above are base on the product data sheet Sound Level Calibrator TM-100.

...End...



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## CERTIFICATE OF CALIBRATION

Certificate Number : SC240009

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong,  
Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC240009        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222023            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : N/A               | Received Date        | : 04-Jan-24       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability    | Due Date  |
|------------------------|------------|-----------------|-----------------|-----------|
| Sound Level Calibrator | 141011576  | CP20230261EA    | TISI: 22-LB0119 | 05-Jul-24 |

# APTITECH

### Authority of Calibration

Approved Signatory

Calibration Date : 05-Jan-2024

Issued Date : 12-Jan-2024

Calibrated By : Ms. Hathaichanok Kaewsrisai

- ☒ Ms. Siranalan Lertmaneesetsiri [ Quality Manager ]  
☐ Mr. Sompoch Srisunart [ Technical Manager ]

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.





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## CALIBRATION REPORT

Certificate Number : SC240009

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| LA       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB         |
| LC       | 40-130 dB | 93.86 dB       | 93.9 dB     | 0.04 dB   | 0.60 dB         |
|          |           | 113.87 dB      | 113.9 dB    | 0.03 dB   | 0.60 dB         |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| LA       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.9 dB    | 0.03 dB   | 0.60 dB         |
| LC       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.9 dB    | 0.03 dB   | 0.60 dB         |

--- End of Certificate ---



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## CERTIFICATE OF CALIBRATION

Certificate Number : SC240017

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong,  
Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC240017        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222044            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : N/A               | Received Date        | : 12-Jan-24       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability    | Due Date  |
|------------------------|------------|-----------------|-----------------|-----------|
| Sound Level Calibrator | 141011576  | CP20230261EA    | TISI: 22-LB0119 | 05-Jul-24 |

# APTITECH

### Authority of Calibration

Approved Signatory

Calibration Date : 15-Jan-2024

Issued Date : 18-Jan-2024

Calibrated By : Ms. Hathaichanok Kaewsrisai

- ☒ Ms. Siranalan Lertmaneesetsiri [ Quality Manager ]  
☐ Mr. Sompoch Srisunart [ Technical Manager ]

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## CALIBRATION REPORT

Certificate Number : SC240017

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |

--- End of Certificate ---



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## CERTIFICATE OF CALIBRATION

Certificate Number : SC240004

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong,  
Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC240004        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222017            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : N/A               | Received Date        | : 04-Jan-24       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability    | Due Date  |
|------------------------|------------|-----------------|-----------------|-----------|
| Sound Level Calibrator | 141011576  | CP20230261EA    | TISI: 22-LB0119 | 05-Jul-24 |

# APTITECH

### Authority of Calibration

Approved Signatory

Calibration Date : 05-Jan-2024

Issued Date : 12-Jan-2024

Calibrated By : Ms. Hathaichanok Kaewsrisai

- ☒ Ms. Siranalan Lertmaneesetsiri [ Quality Manager ]  
☐ Mr. Sompoch Srisunart [ Technical Manager ]

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## CALIBRATION REPORT

Certificate Number : SC240004

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| LA       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB         |
| LC       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB         |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| LA       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB         |
| LC       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB         |

--- End of Certificate ---



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## CERTIFICATE OF CALIBRATION

Certificate Number : SC240020

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong,  
Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC240020        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222047            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : N/A               | Received Date        | : 12-Jan-24       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability    | Due Date  |
|------------------------|------------|-----------------|-----------------|-----------|
| Sound Level Calibrator | 141011576  | CP20230261EA    | TISI: 22-LB0119 | 05-Jul-24 |

# APTITECH

### Authority of Calibration

Approved Signatory

Calibration Date : 15-Jan-2024

Issued Date : 18-Jan-2024

Calibrated By : Ms. Hathaichanok Kaewsrisai

☒ Ms. Siranalan Lertmaneesetsiri [ Quality Manager ]

☐ Mr. Sompoch Srisunart [ Technical Manager ]

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## CALIBRATION REPORT

Certificate Number : SC240020

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB               |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |

--- End of Certificate ---





# APTITECH CALIBRATION CO., LTD.

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## CERTIFICATE OF CALIBRATION

Certificate Number : SC240008

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong,  
Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC240008        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222022            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : N/A               | Received Date        | : 04-Jan-24       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability    | Due Date  |
|------------------------|------------|-----------------|-----------------|-----------|
| Sound Level Calibrator | 141011576  | CP20230261EA    | TISI: 22-LB0119 | 05-Jul-24 |

### Authority of Calibration

Approved Signatory

Calibration Date : 05-Jan-2024

Issued Date : 12-Jan-2024

Calibrated By : Ms. Hathaichanok Kaewsrisai

☒ Ms. Siranalan Lertmaneesetsiri [ Quality Manager ]

☐ Mr. Sompoch Srisunart [ Technical Manager ]

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.

## CALIBRATION REPORT

Certificate Number : SC240008

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB               |

--- End of Certificate ---



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## CERTIFICATE OF CALIBRATION

Certificate Number : SC240027

Customer : Pacific Laboratory Co., Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong,  
Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC240027        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222135            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : N/A               | Received Date        | : 19-Feb-24       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability    | Due Date  |
|------------------------|------------|-----------------|-----------------|-----------|
| Sound Level Calibrator | 141011576  | CP20230261EA    | TISI: 22-LB0119 | 05-Jul-24 |

# APTITECH

### Authority of Calibration

Approved Signatory

Calibration Date : 20-Feb-2024

Issued Date : 23-Feb-2024

Calibrated By : Ms. Hathaichanok Kaewsrirai

☒ Ms. Siranalan Lertmaneesetsiri [ Quality Manager ]

☐ Mr. Sompoch Srisunart [ Technical Manager ]

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# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthani 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC240027

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB               |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |

--- End of Certificate ---



APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamukha, Pathumthani 12150

Tel. +66 2103-6290 Fax. +66 2103-6291

Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC240025

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong,  
Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC240025        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222133            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : N/A               | Received Date        | : 19-Feb-24       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability    | Due Date  |
|------------------------|------------|-----------------|-----------------|-----------|
| Sound Level Calibrator | 141011576  | CP20230261EA    | TISI: 22-LB0119 | 05-Jul-24 |

APTITECH

### Authority of Calibration

Approved Signatory

Calibration Date : 20-Feb-2024

Issued Date : 23-Feb-2024

Calibrated By : Ms. Hathaichanok Kaewsrisai

- ☒ Ms. Siranalan Lertmaneesetsiri [ Quality Manager ]  
☐ Mr. Sompoch Srisunart [ Technical Manager ]

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Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC240025

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB               |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB               |

--- End of Certificate ---



# APTITECH CALIBRATION CO., LTD.

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Tel. +66 2103-6290 Fax. +66 2103-6291

Email: sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC240021

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong,  
Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC240021        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222048            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : N/A               | Received Date        | : 12-Jan-24       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability    | Due Date  |
|------------------------|------------|-----------------|-----------------|-----------|
| Sound Level Calibrator | 141011576  | CP20230261EA    | TISI: 22-LB0119 | 05-Jul-24 |

### Authority of Calibration

Approved Signatory

Calibration Date : 15-Jan-2024

Issued Date : 18-Jan-2024

Calibrated By : Ms. Hathaichanok Kaewsrisai

- ☒ Ms. Siranalan Lertmaneesetsiri | Quality Manager |  
☐ Mr. Sompoch Srisunart | Technical Manager |

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.



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Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC240021

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| LA       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB         |
| LC       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB         |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| LA       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB         |
| LC       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB         |

--- End of Certificate ---

ภาคผนวกที่ 5-5  
เอกสารสอบเทียบสภาพความร้อน (Heat Stress)





# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

## Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 29 January, 2024

Certification No. 039/24

Page : 1 of 2

Object : Thermal Environment Monitor

Manufacturer : QUEST TECHNOLOGIES

Type : QUESTemp<sup>o</sup>34

Serial No. : TED060013

Customer : Pacific Laboratory Co.,Ltd.  
14/5358 Moo 14, T. Bang Bua,  
A.Bang Bua Thong, Nonthaburi 11110.

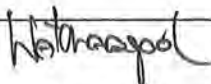
Calibration Condition : Temperature 25.1 °C Barometric Pressure 1016.2 hPa

STANDARD THERMOMETER : Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94

: testo, testo 645 Serial No. 02848057 : Thermoschneider No.6169 , No.6178

: TT-3 Serial 43BE04

Japan Meteorological Agency

Calibrated by : 

Mr. Watcharapol Subwat  
Mechanical Engineer

Signed :

  
Mr. Pisood Promsut

(Authorised Signatory)

for the Chief

Sub-Standard Instrument





# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

## The Result of Calibration

Certification No. 039/24

29 January, 2024

Page : 2 of 2

| Standard<br>Temp.<br>°C | Temperature Sensor Reading |                  |             |                  |                |                  |
|-------------------------|----------------------------|------------------|-------------|------------------|----------------|------------------|
|                         | Dry Bulb<br>°C             | Correction<br>°C | Globe<br>°C | Correction<br>°C | Wet Bulb<br>°C | Correction<br>°C |
| 50.12                   | 50.2                       | -0.08            | 50.1        | 0.02             | 50.2           | -0.08            |
| 40.24                   | 40.3                       | -0.06            | 40.2        | 0.04             | 40.2           | 0.04             |
| 30.18                   | 30.2                       | -0.02            | 30.1        | 0.08             | 30.2           | -0.02            |

Calibrated by :

Mr. Watcharapol Subwat  
Mechanical Engineer







# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

## Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 29 January, 2024

Certification No. 041/24

Page : 1 of 2

Object : Thermal Environment Monitor

Manufacturer : TSI/QUEST

Type : QUESTemp<sup>®</sup>32

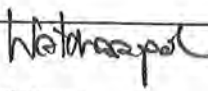
Serial No. : TPW020008

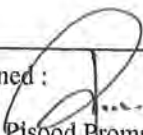
Customer : Pacific Laboratory Co.,Ltd.  
14/5358 Moo 14, T. Bang Bua,  
A.Bang Bua Thong, Nonthaburi 11110.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1016.2 hPa

STANDARD THERMOMETER : Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94  
: testo, testo 645 Serial No. 02848057 : Thermoschneider No.6169 , No.6178  
: TT-3 Serial 43BE04

Japan Meteorological Agency

Calibrated by :   
Mr. Watcharapol Subwat  
Mechanical Engineer

Signed :   
Mr. Pisood Promsut





# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

## The Result of Calibration

Certification No. 041/24

29 January, 2024

Page : 2 of 2

| Standard<br>Temp.<br>°C | Temperature Sensor Reading |                  |             |                  |                |                  |
|-------------------------|----------------------------|------------------|-------------|------------------|----------------|------------------|
|                         | Dry Bulb<br>°C             | Correction<br>°C | Globe<br>°C | Correction<br>°C | Wet Bulb<br>°C | Correction<br>°C |
| 50.12                   | 50.2                       | -0.08            | 50.1        | 0.02             | 50.2           | -0.08            |
| 40.24                   | 40.3                       | -0.06            | 40.2        | 0.04             | 40.2           | 0.04             |
| 30.18                   | 30.1                       | 0.08             | 30.1        | 0.08             | 30.2           | -0.02            |

Calibrated by :

*Watcharapol*

Mr. Watcharapol Subwat  
Mechanical Engineer



ภาคผนวกที่ 5-6  
เอกสารสอบเทียบคุณภาพน้ำทิ้ง

## Certificate of Calibration

**Certificate No. :** 66-420070-2

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co.,Ltd.

14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** pH Meter with electrode

pH meter

Manufacturer : Eutech

Model : pH 700

Range : N/A pH

Resolution : 0.01 pH

Serial No. : 2841305

ID No. : LAB-PH-002

Electrode

Model : N/A

Serial No. : 3052953

ID No. : LAB-PH-002

**Environment :** On site calibration was carried out at the Laboratory Pacific Laboratory Co.,Ltd.

Ambient Temperature : (25.0 to 25.6) °C

Relative Humidity : (45 to 47) %

**Date of Received :** 31 July 2023

**Date of Calibration :** 31 July 2023

**Date of Issue :** 05 August 2023

**Calibrated by :** Bunjerd Masri

**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-00473/64 | 27 Aug 2023 | National Institute of Metrology Thailand (NIMT) |

### 2. Standard Buffer Solution

| pH    | Cert. No. | Lot No. | Exp. Date   | Traceability                                            |
|-------|-----------|---------|-------------|---------------------------------------------------------|
| 4.008 | 61270213  | 915161  | 19 Jul 2025 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |
| 6.985 | 61275614  | 898428  | 28 May 2024 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |
| 9.997 | 61281073  | 915163  | 19 Jul 2024 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |

Approved by :

( Bunjerd Masri )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

**Certificate No. : 66-420070-2**

**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 |        | Correction<br>( mV ) | Uncertainty<br>( $\pm$ mV ) |
|-----------------------------------|---------------------------|-------------------------|-------------|--------|----------------------|-----------------------------|
|                                   |                           |                         | ( pH )      | ( mV ) |                      |                             |
| 4, 7, 10                          | 177.4800                  | 4                       | 4.00        | 177.5  | 0.0                  | 0.12                        |
|                                   | 0.0000                    | 7                       | 7.00        | 0.1    | -0.1                 | 0.086                       |
|                                   | -177.4800                 | 10                      | 10.00       | -177.5 | 0.0                  | 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                      |
|                                   | 6.985                     | 7.00                  | -0.01                | 0.011                       |
|                                   | 9.997                     | 10.01                 | -0.01                | 0.014                       |

Remark

UUC : Unit Under Calibration

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

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

0.00

*B*



## Certificate of Calibration

**Certificate No. :** 66-400424-1

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd  
14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Digital Thermometer with Thermistor probe  
Temperature Indicator

|                  |                |                   |            |
|------------------|----------------|-------------------|------------|
| Manufacturer :   | Eutech         | Model :           | pH 700     |
| Range :          | N/A °C         | Resolution :      | 0.1 °C     |
| Serial No. :     | 2841305        | ID No. :          | LAB-PH-002 |
| Thermistor probe |                |                   |            |
| Model :          | N/A            | Sheath Material : | Stainless  |
| Diameter :       | 3 mm.          | Length :          | 115 mm.    |
| Serial No. :     | PHSTEMB01P 049 | ID No. :          | LAB-PH-002 |

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd

|                       |                      |
|-----------------------|----------------------|
| Ambient Temperature : | (25.0 to 25.6) °C    |
| Relative Humidity :   | (45 to 47) %         |
| Line Voltage :        | (220.0 to 222.0) VAC |

**Date of Received :** 31 July 2023

**Date of Calibration :** 31 July 2023

**Date of Issue :** 05 August 2023

**Calibrated by :** Bunjerd Masri

**Calibration Method :** This instrument was calibrated by In-house method comparison technique CAL-M4003 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

| ID No. | Cert. No.  | Due Date    | Traceability                                    |
|--------|------------|-------------|-------------------------------------------------|
| 400002 | TT-0074-22 | 20 Jun 2024 | National Institute of Metrology Thailand (NIMT) |

2. Standard Digital Thermometer

| ID No. | Cert. No. | Due Date    | Traceability                                    |
|--------|-----------|-------------|-------------------------------------------------|
| 400033 | 22E569    | 22 Feb 2024 | National Institute of Metrology Thailand (NIMT) |

Approved by :



( Bunjerd Masri )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

**Certificate No. :** 66-400424-1

**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 ) |
|----------------------------|----------------------------|-----------------------|----------------------|-------------------------|
| 115                        | 25.005                     | 24.8                  | 0.2                  | 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%

- 000 -

B/



## Certificate of Calibration

**Certificate No. :** 66-420070-1

**Page :** 1 of 2

**Submitted by :** Pacific Laboratory Co.,Ltd.

14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** pH Meter with electrode

pH meter

Manufacturer : Eutech

Model : pH 700

Range : N/A pH

Resolution : 0.01 pH

Serial No. : 2841305

ID No. : LAB-PH-002

Electrode

Model : N/A

Serial No. : 3093341

ID No. : LAB-PH-002

**Environment :** On site calibration was carried out at the Laboratory Pacific Laboratory Co.,Ltd.

Ambient Temperature : (25.0 to 25.6) °C

Relative Humidity : (45 to 47) %

**Date of Received :** 31 July 2023

**Date of Calibration :** 31 July 2023

**Date of Issue :** 05 August 2023

**Calibrated by :** Bunjerd Masri

**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

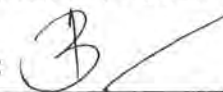
### 1. Multiproduct Calibrator

| ID No. | Cert. No.     | Due Date    | Traceability                                    |
|--------|---------------|-------------|-------------------------------------------------|
| 400005 | SG-E-00473/64 | 27 Aug 2023 | National Institute of Metrology Thailand (NIMT) |

### 2. Standard Buffer Solution

| pH    | Cert. No. | Lot No. | Exp. Date   | Traceability                                            |
|-------|-----------|---------|-------------|---------------------------------------------------------|
| 4.008 | 61270213  | 915161  | 19 Jul 2025 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |
| 6.985 | 61275614  | 898428  | 28 May 2024 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |
| 9.997 | 61281073  | 915163  | 19 Jul 2024 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |

Approved by :



( Bunjerd Masri )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

**Certificate No. : 66-420070-1**

**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 |        | Correction<br>( mV ) | Uncertainty<br>( ± mV ) |
|-----------------------------------|---------------------------|-------------------------|-------------|--------|----------------------|-------------------------|
|                                   |                           |                         | ( pH )      | ( mV ) |                      |                         |
| 4, 7, 10                          | 177.4800                  | 4                       | 4.00        | 177.5  | 0.0                  | 0.12                    |
|                                   | 0.0000                    | 7                       | 7.00        | 0.1    | -0.1                 | 0.086                   |
|                                   | -177.4800                 | 10                      | 10.00       | -177.5 | 0.0                  | 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>( ± pH ) |
|-----------------------------------|---------------------------|-----------------------|----------------------|-------------------------|
| 4, 7, 10                          | 4.008                     | 4.01                  | 0.00                 | 0.0097                  |
|                                   | 6.985                     | 7.00                  | -0.01                | 0.011                   |
|                                   | 9.997                     | 10.01                 | -0.01                | 0.014                   |

**Remark**

UUC : Unit Under Calibration

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

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

- ( ) -



## Certificate of Calibration

**Certificate No. :** 66-200247-2

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd.

14/5358 Moo 14, T.Bang Bua Thong, A.Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Electronic Balance

Manufacturer : SHIMADZU Model : AP225WD

Serial No. : D316301828 ID No. : LAB-BL-003

Capacity : 220 g Resolution : 0.00001g/102g, 0.0001g/220g

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd.

Ambient Temperature : (25.1 to 25.4) °C

Relative Humidity : (62.3 to 64.8) %

Air Pressure : 1007.0 mbar

**Date of Received :** 31 July 2023

**Date of Calibration :** 31 July 2023

**Date of Issue :** 02 August 2023

**Calibrated by :** Akaradath Thippichai

**Calibration Method :** In-house method CAL-M2001 based on UKAS Publication ref: LAB 14  
Edition 5, July 2015

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

Standard Weights

| ID No.     | Cert. No. | Due Date    | Traceability                                       |
|------------|-----------|-------------|----------------------------------------------------|
| E261-E2624 | C02222345 | 10 Nov 2023 | National Institute of Metrology (Thailand), (NIMT) |

Approved by :



( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

**Certificate No. :** 66-200247-2

**Page :** 2 of 2

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

Departure of indication from nominal value

| Nominal Value<br>(g) | Correction<br>(g) | Uncertainty<br>$\pm$ (g) |
|----------------------|-------------------|--------------------------|
| 0.001                | 0.00001           | 0.000020                 |
| 0.01                 | 0.00001           | 0.000021                 |
| 0.05                 | 0.00001           | 0.000019                 |
| 0.1                  | 0.00001           | 0.000024                 |
| 1                    | -0.00001          | 0.000030                 |
| 2                    | 0.00000           | 0.000036                 |
| 5                    | -0.00001          | 0.000046                 |
| 20                   | -0.00002          | 0.000073                 |
| 50                   | -0.00004          | 0.00011                  |
| 100                  | -0.00005          | 0.00020                  |
| 150                  | -0.0001           | 0.00038                  |
| 200                  | -0.0001           | 0.00040                  |

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  $k = 2.52$ , providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g

A B C D E

0.00002 0.00003 0.00001 0.00004 0.00000 g



Repeatability

Load test : 200 g

Stdev. : 0.000048 g

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*Handwritten signature*



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



NSG-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 66-400422-5

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co.,Ltd

14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Air Chamber (Incubator)

Manufacturer : Aqua Lytic

Model : TC 135S

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 0614/000033

ID No. : LAB-IB-001

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd

Ambient Temperature : (23.5 to 24.2) °C

Relative Humidity : (40 to 45) %

Line Voltage : (220.0 to 222.0) V

**Date of Received :** 31 July 2023

**Date of Calibration :** 31 July 2023

**Date of Issue :** 05 August 2023

**Calibrated by :** Permpon Chanpu

**Calibration Method :** CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

**Reference Standard Instruments :** This certification is traceable to the International System of Units  
Standard Digital Thermometer with RTD Probe

ID No.

Cert. No.

Due Date

Traceability

400029 & 400048

66-400067-1

04 Aug 2023

National Institute of Metrology Thailand (NIMT)

Approved by :

( Bunjerd Masri )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

**Certificate No. : 66-400422-5**

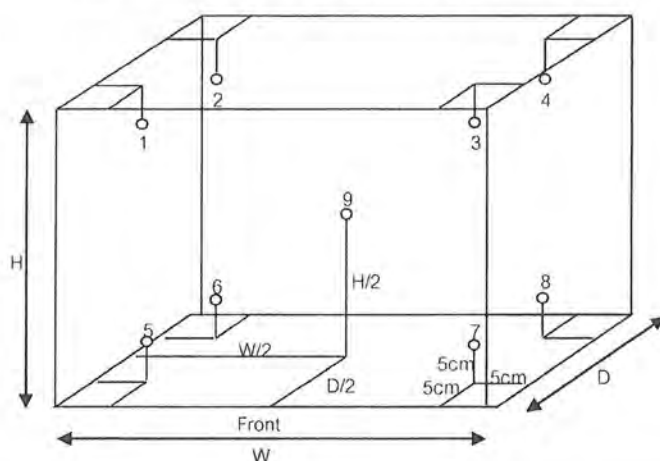
**Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement

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



Inside of Chamber

W = 0.51 m

D = 0.04 m

H = 0.70 m

Capacity = 0.02 m<sup>3</sup>

| 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     |                       |
| 20.0               | 20.5                        | 20.5                           | 20.05                                  | 19.87 | 19.94 | 19.93 | 19.93 | 19.91 | 20.00 | 20.01 | 19.90 | 0.77                  |

| Test Point<br>(°C) | Setting Temperature<br>(°C) | Indicating Temperature<br>(°C) | Measured Uniformity<br>(°C) | Measured Stability<br>(°C) | Overall Variation<br>(°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 20.0               | 20.5                        | 20.5                           | 0.33                        | 0.39                       | 0.8                       |

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

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

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

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# CAL

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7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

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



## Certificate of Calibration

**Certificate No. :** 66-400422-3

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co.,Ltd  
14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Air Chamber (Oven)  
Manufacturer : Memmert  
Range : N/A °C  
Serial No. : B214,1879  
Model : UN 55  
Resolution : 0.1 °C  
ID No. : LAB-OV-001

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd  
Ambient Temperature : (30.0 to 32.0) °C  
Relative Humidity : (50 to 55) %  
Line Voltage : (220.0 to 222.0) V

**Date of Received :** 31 July 2023

**Date of Calibration :** 31 July 2023

**Date of Issue :** 05 August 2023

**Calibrated by :** Permon Chanpu

**Calibration Method :** CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

**Reference Standard Instruments :** This certification is traceable to the International System of Units  
Standard Digital Thermometer with Thermocouple probe

| ID No.          | Cert. No.   | Due Date    | Traceability                                    |
|-----------------|-------------|-------------|-------------------------------------------------|
| 400029 & 400030 | 66-400227-1 | 24 Oct 2023 | National Institute of Metrology Thailand (NIMT) |

Approved by :

( Bunjerd Masri )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03



## Certificate of Calibration

**Certificate No. : 66-400422-3**

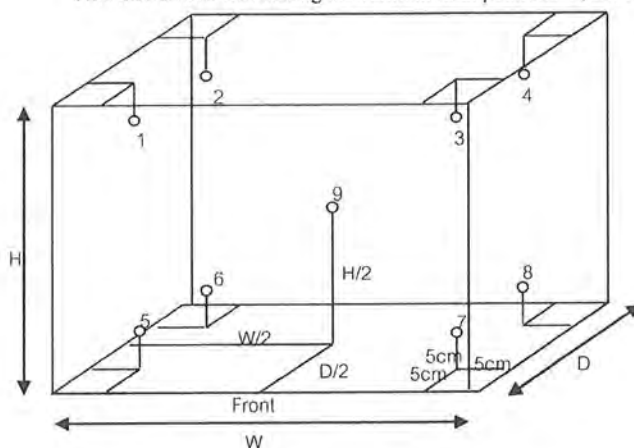
**Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement

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



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.40 m

Capacity = 0.05 m<sup>3</sup>

| 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     |                         |
| 104.0                | 107.0                         | 107.0                            | 104.9                                    | 104.7 | 104.2 | 104.7 | 103.1 | 103.2 | 102.9 | 104.2 | 103.5 | 0.83                    |
| 180.0                | 184.0                         | 184.0                            | 180.5                                    | 180.3 | 179.7 | 180.3 | 176.9 | 176.8 | 177.0 | 180.3 | 179.4 | 1.1                     |

| Test Point<br>( °C ) | Setting Temperature<br>( °C ) | Indicating Temperature<br>( °C ) | Measured Uniformity<br>( °C ) | Measured Stability<br>( °C ) | Overall Variation<br>( °C ) |
|----------------------|-------------------------------|----------------------------------|-------------------------------|------------------------------|-----------------------------|
| 104.0                | 107.0                         | 107.0                            | 1.5                           | 0.3                          | 2.3                         |
| 180.0                | 184.0                         | 184.0                            | 2.8                           | 0.4                          | 4.3                         |

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

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

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

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NSG-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 66-400422-4

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co.,Ltd

14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Water Bath

Manufacturer : Memmert

Model : WNB 22

Range : N/A °C

Resolution : 0.1 °C

Serial No. : L514.0184

ID No. : LAB-WB-001

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd

Ambient Temperature : (30.0 to 32.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (220.0 to 222.0)V

**Date of Received :** 31 July 2023

**Date of Calibration :** 31 July 2023

**Date of Issue :** 05 August 2023

**Calibrated by :** Permpon Chanpu

**Calibration Method :** This instrument was calibrated by In-house method CAL-M4006 based on ASTM E715-80  
The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with RTD probe

ID No.

Cert. No.

Due Date

Traceability

400029 & 400031

66-400225-1

28 Oct 2023

National Institute of Metrology Thailand (NIMT)

Approved by :

( Bunjerd Masri )

Supervisor

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CAL-F0031-03



## Certificate of Calibration

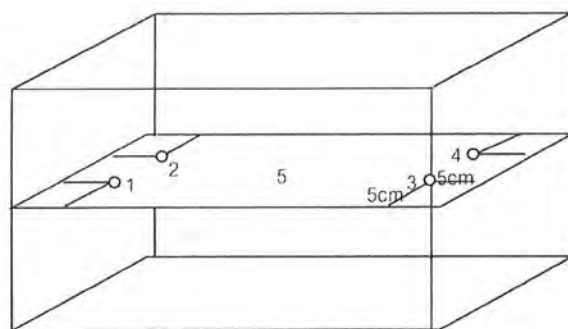
**Certificate No. : 66-400422-4**

**Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement



Front

| Test Point<br>( ° C ) | Setting Temperature<br>( ° C ) | Indicating Temperature<br>( ° C ) | Measured Temperature ( ° C ) @ Sensor |       |       |       |       | Uncertainty<br>( ± ° C ) | Measured Uniformity<br>( ° C ) | Measured Stability<br>( ° C ) |
|-----------------------|--------------------------------|-----------------------------------|---------------------------------------|-------|-------|-------|-------|--------------------------|--------------------------------|-------------------------------|
|                       |                                |                                   | No.                                   |       |       |       |       |                          |                                |                               |
|                       |                                |                                   | 1                                     | 2     | 3     | 4     | 5     |                          |                                |                               |
| 95.0                  | 95.0                           | 95.0                              | 94.46                                 | 94.37 | 94.38 | 94.38 | 94.41 | 0.18                     | 0.08                           | 0.04                          |

**Remark** The uncertainty is not combine uniformity of the water bath

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

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

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## Certificate of Calibration

**Certificate No. :** 67-420078-1

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd.

14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** pH Meter with electrode

pH meter

Manufacturer : Eutech

Model : pH 700

Range : N/A pH

Resolution : 0.01 pH

Serial No. : 2841305

ID No. : LAB-PH-002

Electrode

Model : N/A

Serial No. : 3172493

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd

Ambient Temperature : (25.0 to 26.0)<sup>o</sup> C

Relative Humidity : (40 to 45) %

**Date of Received :** 30 July 2024

**Date of Calibration :** 30 July 2024

**Date of Issue :** 03 August 2024

**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  | 986281  | 25 Apr 2026 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |
| 6.986 | 61281486  | 986283  | 25 Apr 2025 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |
| 9.997 | 61281073  | 986282  | 25 Apr 2025 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |

Approved by :   
( Surachai Promthong )  
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

**Certificate No. : 67-420078-1**

**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 |        | Correction<br>( mV ) | Uncertainty<br>( ± mV ) |
|-----------------------------------|---------------------------|-------------------------|-------------|--------|----------------------|-------------------------|
|                                   |                           |                         | ( pH )      | ( mV ) |                      |                         |
| 4, 7, 10                          | 177.4800                  | 4                       | 4.00        | 177.5  | 0.0                  | 0.12                    |
|                                   | 0.0000                    | 7                       | 7.00        | 0.1    | -0.1                 | 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>( ± pH ) |
|-----------------------------------|---------------------------|-----------------------|----------------------|-------------------------|
| 4, 7, 10                          | 4.008                     | 4.01                  | 0.00                 | 0.0097                  |
|                                   | 6.986                     | 7.00                  | -0.01                | 0.011                   |
|                                   | 9.997                     | 10.01                 | -0.01                | 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%

- 000 -



## Certificate of Calibration

**Certificate No. :** 67-420078-2 **Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd.  
14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** pH Meter with electrode  
pH meter  
Manufacturer : Eutech Model : pH 700  
Range : N/A pH Resolution : 0.01 pH  
Serial No. : 2841305 ID No. : LAB-PH-002  
Electrode  
Model : N/A Serial No. : 3052953

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd  
Ambient Temperature : (25.0 to 26.0)<sup>o</sup> C  
Relative Humidity : (40 to 45) %

**Date of Received :** 30 July 2024  
**Date of Calibration :** 30 July 2024  
**Date of Issue :** 03 August 2024  
**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  | 986281  | 25 Apr 2026 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |
| 6.986 | 61281486  | 986283  | 25 Apr 2025 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |
| 9.997 | 61281073  | 986282  | 25 Apr 2025 | CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025 |

Approved by :   
( Surachai Promthong )  
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

**Certificate No. : 67-420078-2**

**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 |        | Correction<br>( mV ) | Uncertainty<br>( ± mV ) |
|-----------------------------------|---------------------------|-------------------------|-------------|--------|----------------------|-------------------------|
|                                   |                           |                         | ( pH )      | ( mV ) |                      |                         |
| 4, 7, 10                          | 177.4800                  | 4                       | 4.00        | 177.5  | 0.0                  | 0.12                    |
|                                   | 0.0000                    | 7                       | 7.00        | 0.1    | -0.1                 | 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>( ± pH ) |
|-----------------------------------|---------------------------|-----------------------|----------------------|-------------------------|
| 4, 7, 10                          | 4.008                     | 4.01                  | 0.00                 | 0.0097                  |
|                                   | 6.986                     | 7.00                  | -0.01                | 0.011                   |
|                                   | 9.997                     | 10.01                 | -0.01                | 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%

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NSC-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 67-200273-1

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd.

14/5358 Moo 14, T.Bang Bua Thong, A.Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Electronic Balance

Manufacturer : SHIMADZU

Model : AP225WD

Serial No. : D316301828

ID No. : LAB-BL-003

Capacity : 220000 mg

Resolution : 0.01mg/102000mg, 0.1mg/220000mg

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd.

Ambient Temperature : (26.2 to 26.4) °C

Relative Humidity : (34.0 to 35.4) %

Air Pressure : 1007.0 mbar

**Date of Received :** 30 July 2024

**Date of Calibration :** 30 July 2024

**Date of Issue :** 31 July 2024

**Calibrated by :** Akaradath Thippichai

**Calibration Method :** In-house method CAL-M2001 based on UKAS Publication ref : LAB 14  
Edition 7 - November 2022

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

Standard Weights

| ID No.     | Cert. No. | Due Date    | Traceability                                       |
|------------|-----------|-------------|----------------------------------------------------|
| E261-E2624 | C02232088 | 08 Nov 2024 | National Institute of Metrology (Thailand), (NIMT) |

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

**Certificate No. : 67-200273-1**

**Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

Departure of indication from nominal value

| Nominal Value<br>(mg) | Correction<br>(mg) | Uncertainty<br>$\pm$ (mg) |
|-----------------------|--------------------|---------------------------|
| 1                     | 0.01               | 0.012                     |
| 10                    | 0.01               | 0.012                     |
| 50                    | 0.01               | 0.012                     |
| 100                   | 0.01               | 0.014                     |
| 1000                  | 0.00               | 0.026                     |
| 2000                  | 0.01               | 0.034                     |
| 5000                  | 0.00               | 0.043                     |
| 20000                 | 0.00               | 0.071                     |
| 50000                 | 0.01               | 0.11                      |
| 100000                | 0.00               | 0.20                      |
| 150000                | 0.0                | 0.38                      |
| 200000                | 0.0                | 0.38                      |

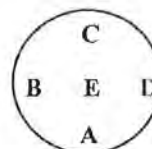
This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2.06$ , providing a level of confidence of approximately 95%

Eccentric error

Load test : 50000 mg

|      |      |      |      |      |    |
|------|------|------|------|------|----|
| A    | B    | C    | D    | E    |    |
| 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | mg |



Repeatability

Load test : 200000 mg

Stdev. : 0.053 mg

*Handwritten signature*

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7/106-7 Moo 2, Sukhaphrachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

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



NSC-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 67-400454-3

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd

14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Temperature controlled enclosure (Incubator)

Manufacturer : Aqua Lytic

Model : TC 135S

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 0614/000033

ID No. : LAB-IB-001

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd

Ambient Temperature : (25.5 to 26.0) °C

Relative Humidity : (40 to 45) %

Line Voltage : (220.0 to 222.0) V

**Date of Received :** 30 July 2024

**Date of Calibration :** 30 July 2024

**Date of Issue :** 03 August 2024

**Calibrated by :** Permpon Chanpu

**Calibration Method :** CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with RTD Probe

| <u>ID No.</u>   | <u>Cert. No.</u> | <u>Due Date</u> | <u>Traceability</u>                             |
|-----------------|------------------|-----------------|-------------------------------------------------|
| 400029 & 400043 | 67-400245-1      | 27 Oct 2024     | National Institute of Metrology Thailand (NIMT) |

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 67-400454-3

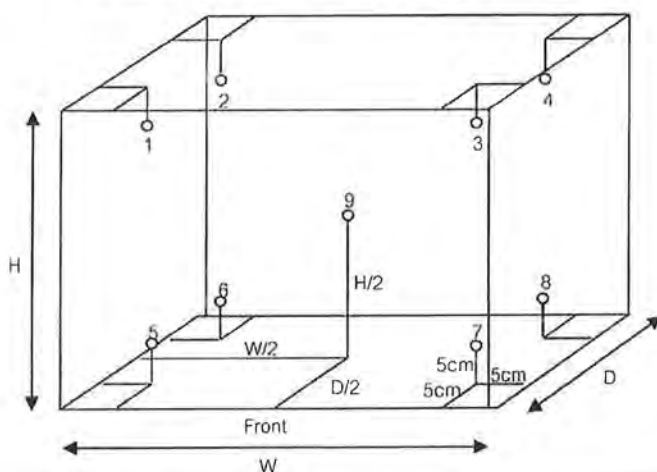
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.51 m

D = 0.04 m

H = 0.70 m

Capacity = 0.02 m<sup>3</sup>

| 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     |                       |
| 20.0               | 20.5                        | 20.5                           | 20.07                                  | 19.92 | 19.95 | 19.93 | 19.93 | 19.92 | 19.92 | 19.96 | 19.88 | 0.67                  |

| Test Point<br>(°C) | Setting Temperature<br>(°C) | Indicating Temperature<br>(°C) | Measured Uniformity<br>(°C) | Measured Stability<br>(°C) | Overall Variation<br>(°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 20.0               | 20.5                        | 20.5                           | 0.41                        | 0.33                       | 0.70                      |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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# CAL

**Calibratech Co.,Ltd.**

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NSG-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 67-400454-1

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd  
14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Temperature controlled enclosure (Oven)  
Manufacturer : Memmert Model : UN 55  
Range : N/A °C Resolution : 0.1 °C  
Serial No. : B214.1879 ID No. : LAB-OV-001

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd  
Ambient Temperature : (30.0 to 31.3) °C  
Relative Humidity : (60 to 65) %  
Line Voltage : (220.0 to 222.0) V

**Date of Received :** 30 July 2024

**Date of Calibration :** 30 July 2024

**Date of Issue :** 03 August 2024

**Calibrated by :** Permpon Chanpu

**Calibration Method :** CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

**Reference Standard Instruments :** This certification is traceable to the International System of Units  
Standard Digital Thermometer with Thermocouple probe

| ID No.          | Cert. No.   | Due Date    | Traceability                                    |
|-----------------|-------------|-------------|-------------------------------------------------|
| 400029 & 400030 | 67-400246-1 | 25 Oct 2024 | National Institute of Metrology Thailand (NIMT) |

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 67-400454-1

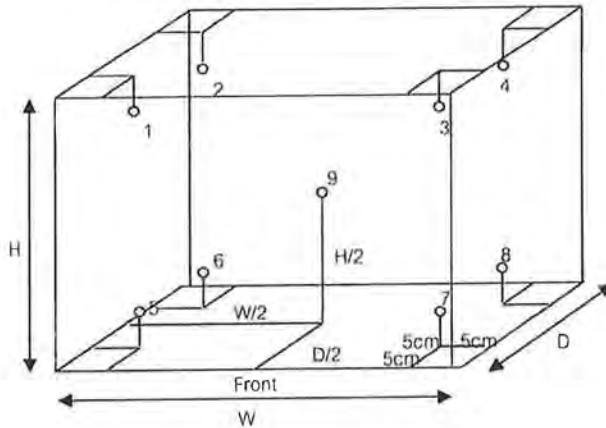
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.40 m

Capacity = 0.05 m<sup>3</sup>

| 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     |                         |
| 104.0                | 107.0                         | 107.0                            | 105.1                                    | 104.9 | 104.8 | 104.8 | 102.9 | 103.6 | 103.7 | 104.1 | 103.9 | 0.84                    |
| 180.0                | 184.0                         | 184.0                            | 180.5                                    | 180.5 | 180.3 | 179.7 | 176.8 | 177.2 | 178.1 | 181.2 | 179.5 | 1.4                     |

| Test Point<br>( "C ) | Setting Temperature<br>( "C ) | Indicating Temperature<br>( "C ) | Measured Uniformity<br>( "C ) | Measured Stability<br>( "C ) | Overall Variation<br>( "C ) |
|----------------------|-------------------------------|----------------------------------|-------------------------------|------------------------------|-----------------------------|
| 104.0                | 107.0                         | 107.0                            | 1.4                           | 0.4                          | 2.5                         |
| 180.0                | 184.0                         | 184.0                            | 3.3                           | 0.7                          | 5.6                         |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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# CAL

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NSC-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 67-400454-2

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd

14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Water Bath

**Manufacturer :** Memmert

**Model :** WNB 22

**Range :** N/A °C

**Resolution :** 0.1 °C

**Serial No. :** L514.0184

**ID No. :** LAB-WB-001

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd

**Ambient Temperature :** (30.0 to 31.3) °C

**Relative Humidity :** (60 to 65) %

**Line Voltage :** (220.0 to 222.0) V

**Date of Received :** 30 July 2024

**Date of Calibration :** 30 July 2024

**Date of Issue :** 03 August 2024

**Calibrated by :** Permpon Chanpu

**Calibration Method :** This instrument was calibrated by In-house method CAL-M4006 based on ASTM E715-80  
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

| <u>ID No.</u>   | <u>Cert. No.</u> | <u>Due Date</u> | <u>Traceability</u>                             |
|-----------------|------------------|-----------------|-------------------------------------------------|
| 400029 & 400031 | 67-400244-1      | 24 Oct 2024     | National Institute of Metrology Thailand (NIMT) |

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

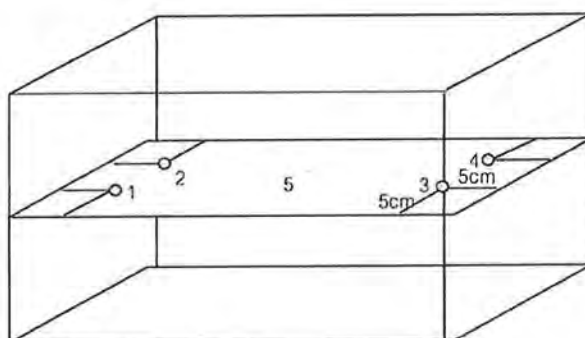
**Certificate No. : 67-400454-2**

**Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement



Front

| Test Point<br>( " C ) | Setting Temperature<br>( " C ) | Indicating Temperature<br>( " C ) | Measured Temperature ( " C ) @ Sensor |       |       |       |       | Uncertainty<br>( ± " C ) | Measured Uniformity<br>( " C ) | Measured Stability<br>( " C ) |
|-----------------------|--------------------------------|-----------------------------------|---------------------------------------|-------|-------|-------|-------|--------------------------|--------------------------------|-------------------------------|
|                       |                                |                                   | No.                                   |       |       |       |       |                          |                                |                               |
|                       |                                |                                   | 1                                     | 2     | 3     | 4     | 5     |                          |                                |                               |
| 65.0                  | 65.0                           | 65.0                              | 64.61                                 | 64.70 | 64.66 | 64.64 | 64.68 | 0.18                     | 0.12                           | 0.05                          |
| 95.0                  | 95.0                           | 95.0                              | 94.60                                 | 94.69 | 94.70 | 94.61 | 94.70 | 0.18                     | 0.15                           | 0.03                          |

Remark The uncertainty is not combine uniformity of the water bath

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

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

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*Signature*

