

# ภาคผนวกที่ 4

## เอกสารสอบเทียบความถูกต้องของเครื่องมือ

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศในบรรยากาศ

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศจากแหล่งกำเนิด

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำ

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำใต้ดิน

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงทั่วไป

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพอากาศในสถานประกอบการ

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงในสถานประกอบการ

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงสะสมแบบติดตัวบุคคล

เอกสารสอบเทียบเครื่องมือการตรวจการรับสัมผัสสารเคมี

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือวิเคราะห์คุณภาพสิ่งแวดล้อม**

| รายการตรวจวิเคราะห์                     | เครื่องมือเก็บตัวอย่าง                                                     | เครื่องมือตรวจวิเคราะห์  |
|-----------------------------------------|----------------------------------------------------------------------------|--------------------------|
|                                         | ชื่อเครื่องมือ                                                             | ชื่อเครื่องมือ           |
| <b>1. คุณภาพอากาศในบรรยากาศ</b>         |                                                                            |                          |
| Total Suspended Particulate (TSP)       | High Volume Air Sampler<br>Rec No. R05, R08, R09<br>Blow No. R05, R08, R09 | Digital Balance          |
| Nitrogen Dioxide (NO <sub>2</sub> )     | NO <sub>2</sub> Analyzer                                                   | NO <sub>2</sub> Analyzer |
| Sulfur Dioxide (SO <sub>2</sub> )       | SO <sub>2</sub> Analyzer                                                   | SO <sub>2</sub> Analyzer |
| <b>2. คุณภาพอากาศจากแหล่งกำเนิด</b>     |                                                                            |                          |
| Oxides of Nitrogen (NO <sub>x</sub> )   | Vacuum Gauge                                                               | Spectrophotometer        |
| Carbon Monoxide (CO)                    | CO Analyzer                                                                | CO Analyzer              |
| Sulfur Dioxide (SO <sub>2</sub> )       | Personal Pump SKC No. R36<br>Rotameter No. H-R01                           | -                        |
| Chlorine (Cl)                           | Personal Pump SKC No. R06<br>Rotameter No. H-R01                           | IC                       |
| Hydrogen Chloride (HCl)                 | Personal Pump SKC No. R06<br>Rotameter No. H-R01                           | IC                       |
| Total Hydrocarbons (THC)                | THC-Analyzer                                                               | THC-Analyzer             |
| <b>3. คุณภาพน้ำทิ้ง</b>                 |                                                                            |                          |
| pH                                      | -                                                                          | pH Meter                 |
| Temperature                             | -                                                                          | Thermometer              |
| Total Suspended Solids                  | -                                                                          | Digital Balance          |
| Total Dissolved Solids                  | -                                                                          | Digital Balance          |
| BOD <sub>5</sub>                        | -                                                                          | BOD Analyzer             |
| COD                                     | -                                                                          | COD Reactor              |
| Grease & Oil                            | -                                                                          | Digital Balance          |
| <b>4. คุณภาพน้ำใต้ดิน</b>               |                                                                            |                          |
| pH                                      | -                                                                          | pH Meter                 |
| Benzene                                 | -                                                                          | GC/MS                    |
| Toluene                                 | -                                                                          | GC/MS                    |
| Xylene                                  | -                                                                          | GC/MS                    |
| TPH (C <sub>5</sub> -C <sub>8</sub> )   | -                                                                          | GC/MS                    |
| TPH (C <sub>8</sub> -C <sub>16</sub> )  | -                                                                          | GC/MS                    |
| TPH (C <sub>16</sub> -C <sub>35</sub> ) | -                                                                          | GC/MS                    |

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)**

| รายการตรวจวิเคราะห์                                                                 | เครื่องมือเก็บตัวอย่าง                                                                                                                                                 | เครื่องมือตรวจวิเคราะห์ |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|                                                                                     | ชื่อเครื่องมือ                                                                                                                                                         | ชื่อเครื่องมือ          |
| <b>5. ระดับเสียงทั่วไป</b><br><br>$L_{eq}$ 24 hr., $L_{max}$                        | Acoustic Calibrator<br>Sound Level Meter No. ACO-R31, R33,<br>R34, R37                                                                                                 | -                       |
| <b>6. คุณภาพอากาศในสถานประกอบการ</b><br><br>Chlorine                                | Personal Pump SKC No. R30, R37, R45<br>Rotameter No. H-R02, H-R06                                                                                                      | Spectrophotometer       |
| Propylene                                                                           | Personal Pump SKC No. R31, R33, R35<br>Rotameter No. L-R02, L-R06                                                                                                      | GC/MS                   |
| Propane                                                                             | Personal Pump SKC No. R31, R33, R35<br>Rotameter No. L-R02, L-R06                                                                                                      | GC/MS                   |
| Ethane                                                                              | Personal Pump SKC No. R31, R33, R35<br>Rotameter No. L-R02, L-R06                                                                                                      | GC/MS                   |
| Total Hydrocarbons                                                                  | Personal Pump SKC No. R01, R33, R39<br>Rotameter No. L-R02, L-R06                                                                                                      | THC Analyzer            |
| Non Methane Hydrocarbons                                                            | Personal Pump SKC No. R01, R33, R39<br>Rotameter No. L-R02, L-R06                                                                                                      | THC Analyzer            |
| <b>7. ระดับเสียงในสถานประกอบการ</b><br><br>$L_{eq}$ 8 hr, $L_{max}$ และ Octave Band | Acoustic Calibrator<br>Sound Level Meter No. ACO R12, R18,<br>R23, R37, R44                                                                                            | -                       |
| <b>8. ระดับเสียงสะสมแบบติดตัวบุคคล</b><br><br>Noise Dose                            | Acoustic Calibrator<br>Sound Level Meter No. NMD B01, B02,<br>B05, R03, R05, R07, R10, R11, R13, R15,<br>R17, R18, R19, R20, R21, R24, R25, R26,<br>R29, R31, R32, R34 | -                       |

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

| รายการตรวจวิเคราะห์    | เครื่องมือเก็บตัวอย่าง                           | เครื่องมือตรวจวิเคราะห์ |
|------------------------|--------------------------------------------------|-------------------------|
|                        | ชื่อเครื่องมือ                                   | ชื่อเครื่องมือ          |
| 9. การรับสัมผัสสารเคมี |                                                  |                         |
| Benzene                | Personal Pump SKC No. R24<br>Rotameter No. L-R03 | GC/FID                  |
| Toluene                | Personal Pump SKC No. R24<br>Rotameter No. L-R03 | GC/FID                  |
| Xylene                 | Personal Pump SKC No. R24<br>Rotameter No. L-R03 | GC/FID                  |
| Ethylbenzene           | Personal Pump SKC No. R24<br>Rotameter No. L-R03 | GC/FID                  |

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศในบรรยากาศ



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

## High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3440

### Calibration Data

| High Volume Air Sampler Data |            | Calibration Data |                                        |                |
|------------------------------|------------|------------------|----------------------------------------|----------------|
| Recorder No.                 | Blower No. | Date             | Actual Flowrate (ft <sup>3</sup> /min) | R <sup>2</sup> |
| B35                          | B35        | 01/08/2025       | $y = 1.126x - 2.314$                   | 0.997          |
| B36                          | B36        | 01/08/2025       | $y = 1.158x - 3.625$                   | 0.999          |
| B37                          | B37        | 01/08/2025       | $y = 1.071x - 0.714$                   | 0.998          |
| B38                          | B38        | 07/08/2025       | $y = 1.138x - 6.470$                   | 0.999          |
| B39                          | B39        | 07/08/2025       | $y = 1.074x - 2.233$                   | 0.999          |
| B40                          | B40        | 01/08/2025       | $y = 1.137x - 4.281$                   | 0.998          |
| B41                          | B41        | 01/08/2025       | $y = 1.124x - 3.061$                   | 0.999          |
| B42                          | B42        | 01/08/2025       | $y = 1.130x - 3.831$                   | 0.998          |
| B43                          | B43        | 04/08/2025       | $y = 1.098x - 1.647$                   | 0.999          |
| B44                          | B44        | 07/08/2025       | $y = 1.107x - 2.029$                   | 0.997          |
| R01                          | R01        | 01/08/2025       | $y = 1.027x + 1.685$                   | 0.998          |
| R02                          | R02        | 01/08/2025       | $y = 1.154x - 5.444$                   | 0.998          |
| R03                          | R03        | 01/08/2025       | $y = 1.174x - 5.934$                   | 0.999          |
| R04                          | R04        | 04/08/2025       | $y = 1.125x - 3.465$                   | 0.997          |
| R05                          | R05        | 01/08/2025       | $y = 1.097x + 0.437$                   | 0.999          |
| R06                          | R06        | 04/08/2025       | $y = 1.138x - 2.560$                   | 0.997          |
| R07                          | R07        | 01/08/2025       | $y = 1.046x - 0.699$                   | 0.999          |
| R08                          | R08        | 01/08/2025       | $y = 1.109x - 3.582$                   | 0.997          |
| R09                          | R09        | 01/08/2025       | $y = 1.088x - 1.852$                   | 0.999          |
| R10                          | R10        | 01/08/2025       | $y = 1.134x - 4.535$                   | 0.996          |
| R11                          | R11        | 01/08/2025       | $y = 1.170x - 6.929$                   | 0.998          |
| R12                          | R12        | 01/08/2025       | $y = 1.151x - 4.183$                   | 0.999          |
| R13                          | R13        | 01/08/2025       | $y = 1.117x - 4.198$                   | 0.999          |
| R14                          | R14        | 01/08/2025       | $y = 1.109x - 2.662$                   | 0.998          |
| R15                          | R15        | 01/08/2025       | $y = 1.126x - 5.806$                   | 0.996          |
| R16                          | R16        | 01/08/2025       | $y = 1.149x - 7.086$                   | 0.996          |
| R17                          | R17        | 01/08/2025       | $y = 1.120x - 5.050$                   | 0.997          |
| R18                          | R18        | 04/08/2025       | $y = 1.155x - 5.737$                   | 0.997          |
| R19                          | R19        | 04/08/2025       | $y = 1.131x - 5.715$                   | 0.997          |
| R20                          | R20        | 01/08/2025       | $y = 1.152x - 5.912$                   | 0.996          |

Calibrated by :

Adul Dongklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



CERTIFICATE No : 25M2254

REFERENCE No : 76365-1

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : METTLER TOLEDO

**MODEL** : XS105DU

**SERIAL No** : 1126422905

**ID No** : BA05/50

**CONDITION AS RECEIVED** : USED ITEM

**SUBMITTED BY** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,  
JOMPOL, CHATUCHAK, BANGKOK 10900

**CALIBRATED BY** : ATSAWIN Y.

**CALIBRATION DATE** : 07-Mar-25

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 13-Mar-25

**RECEIVED DATE** : 07-Mar-25

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.





CERTIFICATE No : 25M2254

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA05/50 RECEIVED DATE : 07-Mar-25  
AIR PRESSURE : 1009mbar  $\pm$  1mbar CALIBRATION DATE : 07-Mar-25  
AMBIENT TEMPERATURE : 24°C  $\pm$  1°C RELATIVE HUMIDITY : 54 %RH  $\pm$  10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

### 2. REFERENCE STANDARD INSTRUMENTS :-

| INSTRUMENT             | MODEL | SERIAL No | CERTIFICATE No | DUE DATE  |
|------------------------|-------|-----------|----------------|-----------|
| 1) STANDARD WEIGHT SET | E2    | QK-I-151  | C02250116      | 28-Jan-27 |
| 2) STANDARD WEIGHT     | E2    | 15843     | C02250117      | 29-Jan-27 |

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

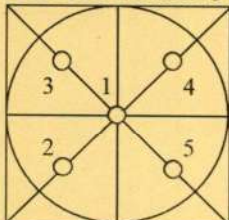
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

| NOMINAL VALUE (g) | BALANCE READING (g) | CORRECTION (g) | UNCERTAINTY ( $\pm$ g) |
|-------------------|---------------------|----------------|------------------------|
| 0.00              | 0.00000             | 0.00000        | 0.000065               |
| 0.02              | 0.01999             | 0.00001        | 0.000065               |
| 0.10              | 0.10001             | -0.00001       | 0.000066               |
| 0.20              | 0.20001             | -0.00001       | 0.000066               |
| 0.50              | 0.50002             | -0.00002       | 0.000065               |
| 1.00              | 1.00003             | -0.00003       | 0.000066               |
| 2.00              | 2.00001             | -0.00001       | 0.000067               |
| 5.00              | 5.00002             | -0.00002       | 0.000068               |
| 10.00             | 10.00000            | 0.00000        | 0.000070               |
| 20.00             | 20.00004            | -0.00004       | 0.000078               |
| 50.00             | 50.00000            | 0.00000        | 0.00013                |
| 100.00            | 100.0001            | -0.0001        | 0.00019                |
| 120.00            | 120.0002            | -0.0002        | 0.00022                |

### 5. OFF CENTER LOADING ERROR



| POINT              | READING (g) |
|--------------------|-------------|
| 1                  | 50.0000     |
| 2                  | 50.0000     |
| 3                  | 50.0000     |
| 4                  | 50.0000     |
| 5                  | 50.0000     |
| OFF-CENTER LOADING | 0.0000      |

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA  
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR  $k=2$ , PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

### CALIBRATION REPORT

#### CHEMILUMINESCENT NO / NO<sub>2</sub> / NO<sub>x</sub> ANALYZER

DATE : 31 August 2025

BRAND : API

MODEL : 200E

NO. NOX-R05

SERIAL NO. 4413

#### Calibrator (Dilution System)

Brand : Teledyne

Model : 700E

Last Cal. Date : 28 October 2024

Serial No. : 201-S

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : A00726SV

Certified Date : 05 January 2023

Expired Date : 05 January 2026

Cylinder Conc. : 48.8 ppm

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 50

#### CALIBRATION SETTING

| Span                 | Initial Reading (Before Adj.), PPB |                        |                   | Final Reading (After Adj.), PPB |       |
|----------------------|------------------------------------|------------------------|-------------------|---------------------------------|-------|
|                      | Set Point                          | Expected Concentration | Analyzer Response | % Dif                           | Slope |
| Zero                 |                                    | 0                      | 0.11              | -                               | 0     |
| NO Span              |                                    | 400                    | 399.7             | -0.075                          | 1.006 |
| NO <sub>x</sub> Span |                                    | 400                    | 400.2             | 0.050                           | 1.009 |

#### API Model 200E NO<sub>x</sub> Analyzer Check List

| Test Values               | Observed Value | Units   | Nominal Range              |
|---------------------------|----------------|---------|----------------------------|
| RANGE                     | 500            | PPB     | 500 standard               |
| STABILITY (Zero Gas)      | 0.1            | PPB     | < 2 with zero air          |
| SAMPLE FLOW               | 505            | cc/min  | 500 ± 50                   |
| OZONE FLOW                | 78             | cc/min  | 80 ± 15                    |
| PMT                       | 103.0          | mV      | -20 - 150                  |
| AZERO                     | 93.7           | mV      | -20 - 150                  |
| HVPS                      | 670            | V       | 420 - 900 constant         |
| RCELL TEMP                | 50.3           | °C      | 50 ± 1                     |
| BOX TEMP                  | 29.5           | °C      | 8 - 48                     |
| PMT TEMP                  | 7.1            | °C      | 7 ± 2                      |
| MOLY TEMP                 | 314.8          | °C      | 315 ± 5                    |
| RCELL PRESS               | 8.3            | IN-Hg-A | 2 - 10 constant            |
| SAMPLE PRESS              | 28.6           | IN-Hg-A | 25 - 30 constant           |
| NO Span Conc              | 400            | PPB     | 20 - 20,000                |
| NO <sub>x</sub> Span Conc | 400            | PPB     | 20 - 20,000                |
| NO Slope                  | 1.006          | -       | 1.0 ± 0.3                  |
| NO <sub>x</sub> Slope     | 1.009          | -       | 1.0 ± 0.3                  |
| NO Offset                 | 1.2            | mV      | -20 to +150                |
| NO <sub>x</sub> Offset    | 0.7            | mV      | -20 to 150                 |
| Stability at Zero         | 0.1            | PPB     | < 0.2                      |
| Stability at Span         | 0.2            | PPB     | < 2 ppb @ 400 ppb span gas |

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)



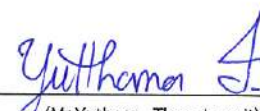
บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

| CALIBRATION REPORT                                               |                                    |                   |                            |                                 |            |
|------------------------------------------------------------------|------------------------------------|-------------------|----------------------------|---------------------------------|------------|
| CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER |                                    |                   |                            |                                 |            |
| DATE :                                                           | 31 August 2025                     | BRAND :           | API                        | MODEL :                         | 200E       |
| NO.                                                              | NOX-R07                            | SERIAL NO.        | 4468                       |                                 |            |
| Calibrator (Dilution System)                                     |                                    |                   |                            |                                 |            |
| Brand                                                            | : Teledyne                         |                   |                            | Model                           | : 700E     |
| Last Cal. Date                                                   | : 28 October 2024                  |                   |                            | Serial No.                      | : 201-S    |
| Reference Standard Gas                                           |                                    |                   |                            |                                 |            |
| Standard Gas                                                     | : Nitric Oxide (NO)                |                   |                            | Cylinder No.                    | : A00726SV |
| Certified Date                                                   | : 05 January 2023                  | Expired Date      | : 05 January 2026          | Cylinder Conc.                  | : 48.8 ppm |
| CALIBRATING CONDITION                                            |                                    |                   |                            |                                 |            |
| Pressure                                                         | 1011                               | mmbar             | Temp.                      | 24.6                            | °C         |
| % RH                                                             | 50                                 |                   |                            |                                 |            |
| CALIBRATION SETTING                                              |                                    |                   |                            |                                 |            |
| Span                                                             | Initial Reading (Before Adj.), PPB |                   |                            | Final Reading (After Adj.), PPB |            |
| Set Point                                                        | Expected Concentration             | Analyzer Response | %Dif                       | Analyzer Response               | Slope      |
| Zero                                                             | 0                                  | -0.10             | -                          | 0                               | -          |
| NO Span                                                          | 400                                | 400.1             | 0.025                      | 400.0                           | 1.009      |
| NO <sub>x</sub> Span                                             | 400                                | 400.3             | 0.075                      | 400.0                           | 1.013      |
| API Model 200E NO <sub>x</sub> Analyzer Check List               |                                    |                   |                            |                                 |            |
| Test Values                                                      | Observed Value                     | Units             | Nominal Range              |                                 |            |
| RANGE                                                            | 500                                | PPB               | 500 standard               |                                 |            |
| STABILITY (Zero Gas)                                             | 0.1                                | PPB               | < 2 with zero air          |                                 |            |
| SAMPLE FLOW                                                      | 513                                | cc/min            | 500 ± 50                   |                                 |            |
| OZONE FLOW                                                       | 79                                 | cc/min            | 80 ± 15                    |                                 |            |
| PMT                                                              | 103.5                              | mV                | -20 - 150                  |                                 |            |
| AZERO                                                            | 94.2                               | mV                | -20 - 150                  |                                 |            |
| HVPS                                                             | 672                                | V                 | 420 - 900 constant         |                                 |            |
| RCCELL TEMP                                                      | 50.1                               | °C                | 50 ± 1                     |                                 |            |
| BOX TEMP                                                         | 29.4                               | °C                | 8 - 48                     |                                 |            |
| PMT TEMP                                                         | 7.2                                | °C                | 7 ± 2                      |                                 |            |
| MOLY TEMP                                                        | 315.2                              | °C                | 315 ± 5                    |                                 |            |
| RCCELL PRESS                                                     | 8.4                                | IN-Hg-A           | 2 - 10 constant            |                                 |            |
| SAMPLE PRESS                                                     | 28.6                               | IN-Hg-A           | 25 - 30 constant           |                                 |            |
| NO Span Conc                                                     | 400                                | PPB               | 20 - 20,000                |                                 |            |
| NO <sub>x</sub> Span Conc                                        | 400                                | PPB               | 20 - 20,000                |                                 |            |
| NO Slope                                                         | 1.009                              | -                 | 1.0 ± 0.3                  |                                 |            |
| NO <sub>x</sub> Slope                                            | 1.013                              | -                 | 1.0 ± 0.3                  |                                 |            |
| NO Offset                                                        | 1.6                                | mV                | -20 to +150                |                                 |            |
| NO <sub>x</sub> Offset                                           | 1.1                                | mV                | -20 to 150                 |                                 |            |
| Stability at Zero                                                | 0.1                                | PPB               | < 0.2                      |                                 |            |
| Stability at Span                                                | 0.2                                | PPB               | < 2 ppb @ 400 ppb span gas |                                 |            |

Calibrated by :

  
(Mr.Kaseam Simaphon)

Approved by :

  
(Mr.Yuthana Thanataranit)



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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

| CALIBRATION REPORT                                               |                                   |                   |                            |                                |            |
|------------------------------------------------------------------|-----------------------------------|-------------------|----------------------------|--------------------------------|------------|
| CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER |                                   |                   |                            |                                |            |
| DATE :                                                           | 31 August 2025                    | BRAND :           | API                        | MODEL :                        | 200E       |
| NO.                                                              | NOX-R10                           | SERIAL NO.        | 1991                       |                                |            |
| Calibrator (Dilution System)                                     |                                   |                   |                            |                                |            |
| Brand                                                            | : Teledyne                        |                   |                            | Model                          | : 700E     |
| Last Cal. Date                                                   | : 28 October 2024                 |                   |                            | Serial No.                     | : 201-5    |
| Reference Standard Gas                                           |                                   |                   |                            |                                |            |
| Standard Gas                                                     | : Nitric Oxide (NO)               |                   |                            | Cylinder No.                   | : A00726SV |
| Certified Date                                                   | : 05 January 2023                 | Expired Date      | : 05 January 2026          | Cylinder Conc.                 | : 48.8 ppm |
| CALIBRATING CONDITION                                            |                                   |                   |                            |                                |            |
| Pressure                                                         | 1011                              | mmbar             | Temp.                      | 24.6                           | °C         |
| % RH                                                             | 50                                |                   |                            |                                |            |
| CALIBRATION SETTING                                              |                                   |                   |                            |                                |            |
| Span                                                             | Initial Reading (Before Adj.),PPB |                   |                            | Final Reading (After Adj.),PPB |            |
| Set Point                                                        | Expected Concentration            | Analyzer Response | %Dif                       | Analyzer Response              | Slope      |
| Zero                                                             | 0                                 | -0.10             | -                          | 0                              | -          |
| NO Span                                                          | 400                               | 400.1             | 0.025                      | 400.0                          | 1.007      |
| NO <sub>x</sub> Span                                             | 400                               | 400.2             | 0.050                      | 400.0                          | 1.010      |
| API Model 200E NO <sub>x</sub> Analyzer Check List               |                                   |                   |                            |                                |            |
| Test Values                                                      | Observed Value                    | Units             | Nominal Range              |                                |            |
| RANGE                                                            | 500                               | PPB               | 500 standard               |                                |            |
| STABILITY (Zero Gas)                                             | 0.1                               | PPB               | < 2 with zero air          |                                |            |
| SAMPLE FLOW                                                      | 511                               | cc/min            | 500 ± 50                   |                                |            |
| OZONE FLOW                                                       | 79                                | cc/min            | 80 ± 15                    |                                |            |
| PMT                                                              | 103.2                             | mV                | -20 - 150                  |                                |            |
| AZERO                                                            | 94.0                              | mV                | -20 - 150                  |                                |            |
| HVPS                                                             | 671                               | V                 | 420 - 900 constant         |                                |            |
| RCELL TEMP                                                       | 50.2                              | °C                | 50 ± 1                     |                                |            |
| BOX TEMP                                                         | 29.3                              | °C                | 8 - 48                     |                                |            |
| PMT TEMP                                                         | 7.5                               | °C                | 7 ± 2                      |                                |            |
| MOLY TEMP                                                        | 315.4                             | °C                | 315 ± 5                    |                                |            |
| RCELL PRESS                                                      | 8.2                               | IN-Hg-A           | 2 - 10 constant            |                                |            |
| SAMPLE PRESS                                                     | 28.5                              | IN-Hg-A           | 25 - 30 constant           |                                |            |
| NO Span Conc                                                     | 400                               | PPB               | 20 - 20,000                |                                |            |
| NO <sub>x</sub> Span Conc                                        | 400                               | PPB               | 20 - 20,000                |                                |            |
| NO Slope                                                         | 1.007                             | -                 | 1.0 ± 0.3                  |                                |            |
| NO <sub>x</sub> Slope                                            | 1.010                             | -                 | 1.0 ± 0.3                  |                                |            |
| NO Offset                                                        | 1.5                               | mV                | -20 to +150                |                                |            |
| NO <sub>x</sub> Offset                                           | 0.9                               | mV                | -20 to 150                 |                                |            |
| Stability at Zero                                                | 0.1                               | PPB               | < 0.2                      |                                |            |
| Stability at Span                                                | 0.2                               | PPB               | < 2 ppb @ 400 ppb span gas |                                |            |

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)



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# CALIBRATION REPORT

## SO<sub>2</sub> FLUORESCENT ANALYZER

DATE : 31 August 2025

BRAND : API

MODEL : 100E

NO. SO<sub>2</sub>-R02

SERIAL NO. 3431

### Calibrator (Dilution System)

Brand : Teledyne

Model : 700E

Last Cal. Date : 28 October 2024

Serial No. : 201-S

### Reference Standard Gas

Standard Gas : Sulphur Dioxide (SO<sub>2</sub>)

Cylinder No. : A00814SK

Certified Date : 21 June 2021

Expired Date : 21 June 2029

Cylinder Conc. : 49.8 ppm

### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 50

### CALIBRATION SETTING

| Span                 | Initial Reading (Before Adj.),PPB |                   |        | Final Reading (After Adj.),PPB |       |
|----------------------|-----------------------------------|-------------------|--------|--------------------------------|-------|
| Set Point            | Expected Concentration            | Analyzer Response | %Dif   | Analyzer Response              | Slope |
| Zero                 | 0                                 | 0.10              | -      | 0                              | -     |
| SO <sub>2</sub> Span | 400.0                             | 399.7             | -0.075 | 400.0                          | 1.008 |

### API Model 100E SO<sub>2</sub> Analyzer Check list

| Test Values               | Observed Value | Units  | Nominal Range                  |
|---------------------------|----------------|--------|--------------------------------|
| RANGE                     | 500            | PPB    | 0-500                          |
| SAMPLE PRESS              | 28.4           | in-Hg  | 25-35                          |
| SAMPLE FLOW               | 654            | cc/min | 650 ± 10%                      |
| PMT                       | 103.5          | mV     | -20-150 with Zero Air          |
| UV LAMP                   | 3054.2         | mV     | 1000-4900                      |
| STR. LGT                  | 61.9           | PPB    | <100                           |
| DRK PMT                   | 63.5           | mV     | -50 - 200                      |
| DRK LMP                   | 58.1           | mV     | -50 - 200                      |
| HVPS                      | 670            | V      | 550-900 constant               |
| DCPS                      | 2517           | mV     | 2500 ± 200                     |
| RCELL TEMP                | 50.2           | °C     | 50 ± 1                         |
| BOX TEMP                  | 29.0           | °C     | 5-40                           |
| PMT TEMP                  | 7.1            | °C     | 7 ± 2.0                        |
| SO <sub>2</sub> Span Conc | 400            | PPB    | 20-20,000                      |
| SO <sub>2</sub> Slope     | 1.008          | -      | 1.0 ± 0.3                      |
| SO <sub>2</sub> Offset    | 21.6           | mV     | <250                           |
| Stability at Zero         | 0.1            | PPB    | <0.2                           |
| Stability at Span         | 0.2            | PPB    | 0.5% of reading (above 50 ppb) |

Calibrated by :

*W. Kaseam*

(Mr.Kaseam Simaphon)

Approved by :

*Yuthana J.*

(Mr.Yuthana Thanataranit)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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# CALIBRATION REPORT

## SO<sub>2</sub> FLUORESCENT ANALYZER

DATE : 31 August 2025

BRAND : API

MODEL : 100E

NO. : SO<sub>2</sub>-R05

SERIAL NO. : 3490

### Calibrator (Dilution System)

Brand : Teledyne

Model : 700E

Last Cal. Date : 28 October 2024

Serial No. : 201-S

### Reference Standard Gas

Standard Gas : Sulphur Dioxide (SO<sub>2</sub>)

Cylinder No. : A00814SK

Certified Date : 21 June 2021

Expired Date : 21 June 2029

Cylinder Conc. : 49.8 ppm

### CALIBRATING CONDITION

Pressure : 1011 mmbar

Temp. : 24.6 °C

% RH : 50

### CALIBRATION SETTING

| Span                 | Initial Reading (Before Adj.), PPB |                   |        | Final Reading (After Adj.), PPB |       |
|----------------------|------------------------------------|-------------------|--------|---------------------------------|-------|
|                      | Expected Concentration             | Analyzer Response | % Dif  | Analyzer Response               | Slope |
| Zero                 | 0                                  | 0.10              | -      | 0                               | -     |
| SO <sub>2</sub> Span | 400.0                              | 399.8             | -0.050 | 400.0                           | 1.007 |

### API Model 100E SO<sub>2</sub> Analyzer Check list

| Test Values               | Observed Value | Units  | Nominal Range                  |
|---------------------------|----------------|--------|--------------------------------|
| RANGE                     | 500            | PPB    | 0-500                          |
| SAMPLE PRESS              | 28.3           | in-Hg  | 25-35                          |
| SAMPLE FLOW               | 660            | cc/min | 650 ± 10%                      |
| PMT                       | 103.2          | mV     | -20-150 with Zero Air          |
| UV LAMP                   | 3038.6         | mV     | 1000-4900                      |
| STR. LGT                  | 61.5           | PPB    | <100                           |
| DRK PMT                   | 63.0           | mV     | -50 - 200                      |
| DRK LMP                   | 57.7           | mV     | -50 - 200                      |
| HVPS                      | 671            | V      | 550-900 constant               |
| DCPS                      | 2526           | mV     | 2500 ± 200                     |
| RCCELL TEMP               | 50.0           | °C     | 50 ± 1                         |
| BOX TEMP                  | 29.3           | °C     | 5-40                           |
| PMT TEMP                  | 7.1            | °C     | 7 ± 2.0                        |
| SO <sub>2</sub> Span Conc | 400            | PPB    | 20-20,000                      |
| SO <sub>2</sub> Slope     | 1.007          | -      | 1.0 ± 0.3                      |
| SO <sub>2</sub> Offset    | 21.6           | mV     | <250                           |
| Stability at Zero         | 0.1            | PPB    | <0.2                           |
| Stability at Span         | 0.2            | PPB    | 0.5% of reading (above 50 ppb) |

Calibrated by :

*Kaseam Simaphon*

(Mr.Kaseam Simaphon)

Approved by :

*Yuthana Thanataranit*

(Mr.Yuthana Thanataranit)



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# CALIBRATION REPORT

## SO<sub>2</sub> FLUORESCENT ANALYZER

DATE : 31 August 2025

BRAND : TELEDYNE

MODEL : TML-60

NO. : SO<sub>2</sub>-R08

SERIAL NO. : TRS1064

### Calibrator (Dilution System)

Brand : Teledyne Model : 700E  
Last Cal. Date : 28 October 2024 Serial No. : 201-S

### Reference Standard Gas

Standard Gas : Sulphur Dioxide (SO<sub>2</sub>) Cylinder No. : A00814SK  
Certified Date : 21 June 2021 Expired Date : 21 June 2029 Cylinder Conc. : 49.8 ppm

### CALIBRATING CONDITION

Pressure : 1011 mmbar Temp. : 24.6 °C % RH : 50

### CALIBRATION SETTING

| Span<br>Set Point    | Initial Reading (Before Adj.), PPB |                   |       | Final Reading (After Adj.), PPB |       |
|----------------------|------------------------------------|-------------------|-------|---------------------------------|-------|
|                      | Expected Concentration             | Analyzer Response | % Dif | Analyzer Response               | Slope |
| Zero                 | 0                                  | 0.11              | -     | 0                               | -     |
| SO <sub>2</sub> Span | 400.0                              | 400.1             | 0.025 | 400.0                           | 1.012 |

### API Model TML-60 SO<sub>2</sub> Analyzer Check list

| Test Values               | Observed Value | Units  | Nominal Range                  |
|---------------------------|----------------|--------|--------------------------------|
| RANGE                     | 500            | PPB    | 0-500                          |
| SAMPLE PRESS              | 28.7           | in-Hg  | 25-35                          |
| SAMPLE FLOW               | 653            | cc/min | 650 ± 10%                      |
| PMT                       | 103.0          | mV     | -20-150 with Zero Air          |
| UV LAMP                   | 3021.8         | mV     | 1000-4900                      |
| STR. LGT                  | 61.5           | PPB    | <100                           |
| DRK PMT                   | 62.9           | mV     | -50 - 200                      |
| DRK LMP                   | 57.6           | mV     | -50 - 200                      |
| HVPS                      | 669            | V      | 550-900 constant               |
| DCPS                      | 2520           | mV     | 2500 ± 200                     |
| RCELL TEMP                | 50.4           | °C     | 50 ± 1                         |
| BOX TEMP                  | 29.3           | °C     | 5-40                           |
| PMT TEMP                  | 7.2            | °C     | 7 ± 2.0                        |
| SO <sub>2</sub> Span Conc | 400            | PPB    | 20-20,000                      |
| SO <sub>2</sub> Slope     | 1.012          | -      | 1.0 ± 0.3                      |
| SO <sub>2</sub> Offset    | 21.8           | mV     | <250                           |
| Stability at Zero         | 0.1            | PPB    | <0.2                           |
| Stability at Span         | 0.2            | PPB    | 0.5% of reading (above 50 ppb) |

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

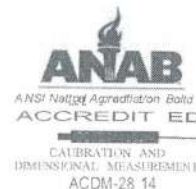
(Mr.Yuthana Thanataranit)

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศจากแหล่งกำเนิด



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## CERTIFICATE OF CALIBRATION FOR

|                 |                  |
|-----------------|------------------|
| NOMENCLATURE    | VACUUM GAUGE     |
| MANUFACTURER    | HI-LIGHT         |
| MODEL/TYPE      | N/A              |
| SERIAL NO.      | N/A[64-220088-1] |
| CLID.NO.        | 212301422        |
| JOB CONTROL NO. | 240720076546     |

CUSTOMER S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24 ROAD., JOMPOL,  
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 19 July 2025

DATE OF ISSUED: 24 July 2025

The report or calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sittipong Pimdee  
Calibration Engineer

Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
24 July 2025



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24076546

F3-011-05/12-23

page 1 of 3



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CALIBRATION AND  
DIMENSIONAL MEASUREMENT  
ACDM-2814

## REPORT OF CALIBRATION

### FOR

|                         |                   |
|-------------------------|-------------------|
| NOMENCLATURE            | VACUUM GAUGE      |
| MANUFACTURER            | HI-LIGHT          |
| MODEL/TYPE              | N/A               |
| SERIAL NO.              | N/A [64-220088-1] |
| DATE OF CALIBRATION     | 23 July 2025      |
| DUE DATE OF CALIBRATION | 23 July 2026      |

---

#### ENVIRONMENT CONDITIONS

Temperature :  $(23 \pm 2) ^\circ\text{C}$

Relative Humidity  $(55 \pm 10) \% \text{RH}$

#### PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPPP-05 according to DKD-R 6-1 as calibration guidelines.

The calibration was performed by direct measurement with Document Process Calibrator and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

Document Process Calibrator, Fluke Model 74 1B *S/N.* 8295020 with Pressure Module Model 700PD5 *S/N.* 89404505.

#### TRACEABILITY :

The measurement s are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).  
Certificate No. MP-0040-24.

#### UNCERTAINTY :

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of  $k = 2$ . It has been evaluated according to the "Calibration of Pressure Gauges (DKD-R 6-1)" which provides a level of confidence approximately 95%.

Certificate No. Q24076546

F3-011-05/12-23

page 2 of 3

## CONDITION OF CALIBRATION ITEM :RECEIVED IN GOOD OPERATIONAL CONDITION

### MEASUREMENT RESULTS: (X) without adjustment ( ) adjustment

The DUC was exercised by applying a known pressure from its zero to full scale 1 times. Then 2 series of known gauge pressure were applied. The STD reading were recorded and the means value were reported in the table below.

### CALIBRATION DATA

#### CORRECTION OF PRESSURE

| DUC Test point<br>( inHg ) | STD Reading ( kPa ) |         | Conversion to inHg |       | Correction ( inHg) |      |
|----------------------------|---------------------|---------|--------------------|-------|--------------------|------|
|                            | Up                  | Down    | Up                 | Down  | Up                 | Down |
| 0                          | 0.00                | 0.00    | 0.0                | 0.0   | 0.0                | 0.0  |
| -5                         | -15.07              | -15.10  | -4.5               | -4.5  | +0.5               | +0.5 |
| -10                        | -32.50              | -32.84  | -9.6               | -9.7  | +0.4               | +0.3 |
| -15                        | -49.44              | -49.77  | -14.6              | -14.7 | +0.4               | +0.3 |
| -20                        | -66.70              | -66.70  | -19.7              | -19.7 | +0.3               | +0.3 |
| -25                        | -83.63              | -83.97  | -24.7              | -24.8 | +0.3               | +0.2 |
| -30                        | -100.39             | -100.39 | -29.6              | -29.6 | +0.4               | +0.4 |

Uncertainty of measurement  $\pm 0.2$  inHg

Transmitting fluid : Air.

Technical Note. Conversion factor 1 kPa ; 0.2953003 inHg

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 43 of 67

**This report is valid for the above stated instrument/s only.**

**### End of Certificate ###**

Certificate No. Q24076546

F3-011-05/ 12-23

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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SITHIPORN  
associates



Cert. No. : SP25026

Pages : 1 of 4

## Calibration Certificate

**Equipment :** UV-VIS SPECTROPHOTOMETER  
**Manufacturer :** PERKINELMER  
**Model :** LAMBDA 25  
**Serial No.:** 501S14123010  
**ID No.:** SP03/58  
**Calibration Mode :** WAVELENGTH ACCURACY  
PHOTOMETRIC ACCURACY  
STRAY LIGHT  
  
**Condition As Found :** GOOD  
  
**Customer :** S.P.S CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD,  
CHOMPHON SUB-DISTRICT, CHATUCHAK DISTRICT,  
BANGKOK PROVINCE 10900 THAILAND.  
  
**Location :** ORGANIC LABORATORY IV  
  
**Ambient Temperature :** ( 22.9  $\pm$  5 ) °C  
**Relative Humidity :** ( 53.7  $\pm$  25 ) %  
  
**Received Date :** 22 AUGUST 2025  
**Calibration Date :** 22 AUGUST 2025  
**Date of Issue :** 25 AUGUST 2025

**Calibrated by :**

Nitinun Srihawan

**Approved by :**

*Wichok B.*  
( Wichok Ekpongpradit )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

**Cert. No. : SP25026**

**Job No. : VC68SP0019**

**Pages : 2 of 4**

**Calibration Method :**

This instrument was calibrated by using on-site calibration procedure In-house method : CP-SP-01

The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution, Photometric accuracy by using absorbance standard filter and absorbance standard solution

The calibration procedure used was based on ASTM E275-01, ASTM E925-02

**Condition of this result of calibration :**

1. Certified reference materials

| <u>Material</u>                | <u>Ref. type</u> | <u>Cell serial No.</u> | <u>Cert. No.</u> | <u>Due Date</u> |
|--------------------------------|------------------|------------------------|------------------|-----------------|
| Holmium liquid                 | RM-HL            | 29706                  | 126461           | 24/10/2026      |
| Didymium liquid                | RM-DL            | 28912                  | 126462           | 24/10/2026      |
| Neutral density filter         | RM-1N2N3N        | 13877                  | 126457           | 24/10/2026      |
| Potassium dichromate solutions | RM-0204060810    | 14204                  | 126497           | 25/10/2026      |
| Potassium Iodide solution      | -                | KI-0701-001            | CI-0185-24       | 14/05/2026      |

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

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

3.1 The UK National Physical Laboratory (NPL)

**Result of calibration : Wavelength Accuracy**

(Without adjustment)

| <b>Material</b> | <b>Certified Values of<br/>Reference Material (nm)</b> | <b>UUC* Reading<br/>(nm)</b> | <b>Error<br/>(nm)</b> | <b>Uncertainty<br/>± (nm)</b> | <b>k<br/>Factor</b> |
|-----------------|--------------------------------------------------------|------------------------------|-----------------------|-------------------------------|---------------------|
| <b>RM-HL</b>    | 278.13                                                 | 278.21                       | 0.08                  | 0.16                          | 2.00                |
|                 | 361.25                                                 | 361.39                       | 0.14                  | 0.16                          | 2.00                |
|                 | 467.82                                                 | 467.71                       | -0.11                 | 0.16                          | 2.00                |
|                 | 536.56                                                 | 536.50                       | -0.06                 | 0.16                          | 2.00                |
|                 | 640.50                                                 | 640.36                       | -0.14                 | 0.16                          | 2.00                |
| <b>RM-DL</b>    | 740.09                                                 | 739.85                       | -0.24                 | 0.16                          | 2.00                |
|                 | 864.94                                                 | 865.12                       | 0.18                  | 0.16                          | 2.00                |

UUC\* = Unit Under Calibration

Cert. No. : SP25026  
Job No. : VC68SP0019  
Pages : 3 of 4

**Result of calibration : Photometric Accuracy**

| Material                     | Wavelength<br>(nm) | Filter S/N | Nominal<br>Absorbance (A) | Certified<br>Absorbance (A) | UUC* Reading<br>Absorbance (A) | Error<br>(A) | Uncertainty<br>± (A) | k<br>Factor |
|------------------------------|--------------------|------------|---------------------------|-----------------------------|--------------------------------|--------------|----------------------|-------------|
| Neutral Density glass filter | 440.0              | 29381      | 0.5                       | 0.5443                      | 0.5413                         | -0.0030      | 0.0043               | 2.00        |
|                              |                    | 29914      | 0.7                       | 0.7484                      | 0.7455                         | -0.0029      | 0.0054               | 2.00        |
|                              |                    | 29360      | 1.0                       | 1.0527                      | 1.0535                         | 0.0008       | 0.0032               | 2.00        |
|                              | 465.0              | 29381      | 0.5                       | 0.4948                      | 0.4922                         | -0.0026      | 0.0041               | 2.00        |
|                              |                    | 29914      | 0.7                       | 0.6906                      | 0.6877                         | -0.0029      | 0.0050               | 2.00        |
|                              |                    | 29360      | 1.0                       | 0.9695                      | 0.9709                         | 0.0014       | 0.0031               | 2.00        |
|                              | 546.1              | 29381      | 0.5                       | 0.5090                      | 0.5068                         | -0.0022      | 0.0036               | 2.00        |
|                              |                    | 29914      | 0.7                       | 0.6985                      | 0.6960                         | -0.0025      | 0.0041               | 2.00        |
|                              |                    | 29360      | 1.0                       | 0.9814                      | 0.9825                         | 0.0011       | 0.0031               | 2.00        |
|                              | 590.0              | 29381      | 0.5                       | 0.5375                      | 0.5353                         | -0.0022      | 0.0034               | 2.00        |
|                              |                    | 29914      | 0.7                       | 0.7256                      | 0.7231                         | -0.0025      | 0.0037               | 2.00        |
|                              |                    | 29360      | 1.0                       | 1.0213                      | 1.0219                         | 0.0006       | 0.0032               | 2.00        |
|                              | 635.0              | 29381      | 0.5                       | 0.5223                      | 0.5202                         | -0.0021      | 0.0033               | 2.00        |
|                              |                    | 29914      | 0.7                       | 0.6927                      | 0.6901                         | -0.0026      | 0.0036               | 2.00        |
|                              |                    | 29360      | 1.0                       | 0.9744                      | 0.9750                         | 0.0006       | 0.0032               | 2.00        |

UUC\* = Unit Under Calibration

Cert. No. : SP25026  
Job No. : VC68SP0019  
Pages : 4 of 4

**Result of calibration : Photometric Accuracy**

(Without adjustment)

| Material                          | Wavelength<br>(nm) | Solution<br>(mg/l) | Certified<br>Absorbance (A) | UUC* Reading<br>Absorbance (A) | Error<br>(A) | Uncertainty<br>± (A) | k<br>Factor |
|-----------------------------------|--------------------|--------------------|-----------------------------|--------------------------------|--------------|----------------------|-------------|
| Potassium<br>dichromate solutions | 235.0              | 20                 | 0.2415                      | 0.2443                         | 0.0028       | 0.0101               | 2.00        |
|                                   |                    | 40                 | 0.4866                      | 0.4871                         | 0.0005       | 0.0115               | 2.00        |
|                                   |                    | 60                 | 0.7415                      | 0.7295                         | -0.0120      | 0.0067               | 2.00        |
|                                   |                    | 80                 | 0.9854                      | 0.9844                         | -0.0010      | 0.0071               | 2.00        |
|                                   |                    | 100                | 1.2444                      | 1.2425                         | -0.0019      | 0.0073               | 2.00        |

UUC\* = Unit Under Calibration

**Condition of this result of calibration : Spectrophotometer PERKINELMER Model LAMBDA 25 S/N 501S14123010**

Resolution of Wavelength Mode 0.1 nm

Resolution of Photometric Mode 0.001 A

Parameter Setting

Measurement Mode Wavelength, Absorbance

Wavelength Scan 190 nm - 1100 nm

Scanning Speed 7.5 nm/min

Band width(Wavelength) 1.0

Band width(Vis) 1.0

Band width(Uv) 1.0

| Stray Light** UUC* Reading at 220.0 nm |               |
|----------------------------------------|---------------|
| Transimission T(%)                     | Absorbance(A) |
| 0.020                                  | 3.7032        |

\*\*Specific Acceptance :

Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A

\*\*Stray light not TISI Accredited

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

**End of Calibration Certificate**



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chaluchak, Bangkok 10900  
Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com., www.spscon.com

|                                       |                                    |                   |                                 |                                 |             |
|---------------------------------------|------------------------------------|-------------------|---------------------------------|---------------------------------|-------------|
| Calibration Report                    |                                    |                   |                                 |                                 |             |
| Non-Dispersive Infrared CO Analyzer   |                                    |                   |                                 |                                 |             |
| Date :                                | 01 September 2025                  | Brand :           | API                             |                                 |             |
| No.                                   | CO-B05                             | Model :           | 300E                            |                                 |             |
|                                       |                                    | Serial No.        | 3116                            |                                 |             |
| Calibrator (Dilution System)          |                                    |                   |                                 |                                 |             |
| Brand                                 | : Teledyne                         |                   | Model                           | : 700E                          |             |
| Last Cal. Date                        | : 28 October 2024                  |                   | Serial No.                      | : 201-S                         |             |
| Reference Standard Gas                |                                    |                   |                                 |                                 |             |
| Standard Gas                          | : Carbon Monoxide (CO)             |                   | Cylinder No.                    | : D711839                       |             |
| Certified Date                        | : 14 March 2024                    | Expired Date      | : 14 March 2032                 | Cylinder Conc.                  | : 4,580 ppm |
| Calibrating Condition                 |                                    |                   |                                 |                                 |             |
| Pressure                              | 1011                               | mmbar             | Temp.                           | 24.6                            | °C          |
|                                       |                                    |                   | % RH                            | 50                              |             |
| Calibration Setting                   |                                    |                   |                                 |                                 |             |
| Span                                  | Initial Reading (Before Adj.), PPM |                   |                                 | Final Reading (After Adj.), PPM |             |
| Set Point                             | Expected Concentration             | Analyzer Response | %Dif                            | Analyzer Response               |             |
| Zero                                  | 0                                  | 0.11              | -                               | 0                               |             |
| CO Span                               | 40.00                              | 40.05             | 0.125                           | 40.00                           |             |
| API Model 300E CO Analyzer Check List |                                    |                   |                                 |                                 |             |
| Parameter                             | Observed Value                     | Units             | Nominal Range                   |                                 |             |
| Range                                 | 50                                 | PPM               | 0-1000 ppm                      |                                 |             |
| Stability                             | 0.10                               | PPM               | < 1 ppm With Zero Air           |                                 |             |
| CO Measure                            | 4015.5                             | mV                | 2500-4800 mV                    |                                 |             |
| CO Reference                          | 3949.1                             | mV                | 2500-4800 mV                    |                                 |             |
| Measure/Reference Ratio               | 1.180                              | -                 | 1.1-1.3 W/Zero Air              |                                 |             |
| Sample Pressure                       | 28.4                               | In-Hg-A           | ~2" < Ambient Absolute Pressure |                                 |             |
| Sample Flow                           | 811                                | CC/Min            | 800 ± 10%                       |                                 |             |
| Sample Temperature                    | 48.2                               | °C                | 48 ± 4                          |                                 |             |
| Bench Temperature                     | 48.0                               | °C                | 48 ± 2                          |                                 |             |
| Wheel Temperature                     | 68.3                               | °C                | 68 ± 2                          |                                 |             |
| Box Temperature                       | 30.6                               | °C                | Ambient Temp + 7 ± 10           |                                 |             |
| Photo-Drive                           | 3042.1                             | mV                | 250 mV to 4750 mV               |                                 |             |
| Slope                                 | 1.017                              | -                 | 1.0 ± 0.3                       |                                 |             |
| Offset                                | 0.2                                | -                 | 0 ± 0.3                         |                                 |             |

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

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### Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

#### Environmental Conditions

Temperature : 25 ± 3 °C  
Pressure : 1010 ± 15 mmbar

| Personal Pump Data |       |           |            | Calibration Data |                    |       |       |                 |       |       |                              |                |
|--------------------|-------|-----------|------------|------------------|--------------------|-------|-------|-----------------|-------|-------|------------------------------|----------------|
| No.                | Brand | Model     | Serial No. | Date             | Flow Rate (mL/min) |       |       |                 |       |       | Value From Calibration Curve |                |
|                    |       |           |            |                  | Setting            |       |       | Actual (Q std.) |       |       |                              |                |
|                    |       |           |            |                  | 1                  | 2     | 3     | 1               | 2     | 3     | y                            | R <sup>2</sup> |
| R01                | SKC   | 224-PCXR4 | 602467     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,510 | 2,008 | 1.008x - 10.783              | 1.000          |
| R02                | SKC   | 224-PCXR4 | 626450     | 03/07/2025       | 1,000              | 2,000 | 3,000 | 999             | 1,498 | 1,993 | 0.991x + 9.648               | 1.000          |
| R03                | SKC   | 224-PCXR4 | 691592     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,501 | 1,998 | 1.006x - 13.328              | 0.999          |
| R04                | SKC   | 224-PCXR4 | 691672     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,493 | 2,002 | 1.001x - 3.364               | 1.000          |
| R05                | SKC   | 224-PCXR4 | 798470     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,509 | 2,001 | 1.009x - 19.500              | 0.999          |
| R06                | SKC   | 224-PCXR4 | 798456     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,498 | 1,998 | 1.004x - 8.490               | 1.000          |
| R07                | SKC   | 224-PCXR4 | 798480     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,494 | 2,001 | 1.006x - 11.786              | 1.000          |
| R08                | SKC   | 224-PCXR4 | 883215     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,009           | 1,505 | 2,006 | 1.001x + 0.899               | 1.000          |
| R09                | SKC   | 224-PCXR4 | 034650     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,508 | 1,999 | 1.008x - 17.223              | 0.999          |
| R10                | SKC   | 224-PCXR4 | 091765     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,495 | 1,998 | 1.000x - 2.097               | 1.000          |
| R11                | SKC   | 224-PCXR4 | 091763     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,498 | 2,002 | 1.010x - 18.889              | 0.999          |
| R12                | SKC   | 224-PCXR4 | 091568     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,506 | 2,001 | 1.004x - 7.711               | 1.000          |
| R13                | SKC   | 224-PCXR4 | 091638     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,006           | 1,498 | 1,997 | 0.991x + 13.423              | 1.000          |
| R14                | SKC   | 224-PCXR4 | 091764     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 994             | 1,505 | 1,996 | 1.007x - 17.870              | 0.999          |
| R15                | SKC   | 224-PCXR8 | 529457     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,504 | 1,994 | 0.995x + 5.338               | 1.000          |
| R16                | SKC   | 224-PCXR8 | 529643     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,499 | 1,997 | 1.000x - 2.577               | 1.000          |
| R17                | SKC   | 224-PCXR8 | 529645     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,507 | 1,993 | 1.004x - 12.365              | 0.999          |
| R18                | SKC   | 224-PCXR8 | 566756     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,498 | 1,996 | 0.997x + 0.819               | 1.000          |
| R19                | SKC   | 224-PCXR8 | 566802     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,499 | 2,002 | 1.012x - 22.101              | 0.999          |
| R20                | SKC   | 224-PCXR8 | 529089     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 994             | 1,502 | 1,996 | 1.001x - 5.166               | 1.000          |
| R21                | SKC   | 224-PCXR8 | 665728     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,497 | 2,001 | 1.003x - 8.170               | 1.000          |
| R22                | SKC   | 224-PCXR8 | 707444     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,504 | 2,006 | 1.005x - 6.228               | 1.000          |
| R23                | SKC   | 224-PCXR8 | 761067     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,498 | 1,996 | 0.998x - 1.215               | 1.000          |
| R24                | SKC   | 224-PCXR8 | 707893     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,508 | 1,995 | 1.002x - 7.415               | 0.999          |
| R25                | SKC   | 224-PCXR8 | 761052     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,501 | 1,997 | 0.992x + 12.437              | 1.000          |
| R26                | SKC   | 224-PCXR8 | 707956     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,505 | 2,009 | 1.011x - 15.349              | 0.999          |
| R27                | SKC   | 224-PCXR8 | 707398     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,506 | 1,995 | 1.000x - 5.721               | 1.000          |
| R28                | SKC   | 224-PCXR8 | 707481     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,503 | 1,993 | 1.001x - 6.976               | 0.999          |
| R29                | SKC   | 224-PCXR8 | 707402     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,496 | 1,992 | 0.995x + 1.966               | 1.000          |
| R30                | SKC   | 224-PCXR8 | 093811     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,497 | 1,999 | 0.998x + 1.047               | 1.000          |
| R31                | SKC   | 224-PCXR8 | 093183     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,505 | 1,995 | 0.996x + 6.964               | 1.000          |
| R32                | SKC   | 224-PCXR8 | 671950     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,503 | 1,998 | 1.000x + 1.382               | 1.000          |
| R33                | SKC   | 224-PCXR4 | 626254     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,507 | 1,997 | 1.006x - 14.223              | 0.999          |
| R34                | SKC   | 224-PCXR4 | 626131     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,501 | 1,991 | 0.993x + 7.387               | 1.000          |
| R35                | SKC   | 224-PCXR8 | 707460     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,499 | 1,999 | 0.997x + 3.684               | 1.000          |
| R36                | SKC   | 224-PCXR8 | 707446     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,501 | 2,001 | 1.009x - 16.388              | 0.999          |
| R37                | SKC   | 224-PCXR8 | 707432     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,498 | 2,003 | 1.000x - 0.875               | 1.000          |
| R38                | SKC   | 224-PCXR8 | 707349     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,492 | 2,002 | 1.003x - 8.681               | 1.000          |
| R39                | SKC   | 224-PCXR8 | 761095     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,499 | 2,001 | 1.001x - 0.859               | 1.000          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
**S.P.S. CONSULTING SERVICE CO., LTD.**  
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Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

| Rotameter Data |       |        | Calibration Data |                     |       |       |                 |       |        |                              |                |
|----------------|-------|--------|------------------|---------------------|-------|-------|-----------------|-------|--------|------------------------------|----------------|
| No.            | Brand | Model  | Date             | Flow Rate (mL/min)  |       |       |                 |       |        | Value From Calibration Curve |                |
|                |       |        |                  | Flow Rate (Reading) |       |       | Actual (Q std.) |       |        |                              |                |
|                |       |        |                  | 1                   | 2     | 3     | 1               | 2     | 3      | y                            | R <sup>2</sup> |
| H-R01          | Dwyer | VFB-65 | 04/07/2025       | 500                 | 1,000 | 2,000 | 500.4           | 999.6 | 2002.7 | 0.999x + 1.975               | 1.000          |
| H-R02          | Dwyer | VFB-65 | 04/07/2025       | 500                 | 1,000 | 2,000 | 499.3           | 998.9 | 1998.1 | 1.000x - 0.723               | 1.000          |
| H-R03          | Dwyer | VFB-65 | 03/07/2025       | 500                 | 1,000 | 2,000 | 500.5           | 998.7 | 1996.7 | 0.998x + 2.184               | 0.999          |
| H-R04          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 501.7           | 998.1 | 1993.3 | 1.000x - 2.212               | 0.999          |
| H-R05          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 499.2           | 997.5 | 1997.1 | 1.002x - 3.115               | 1.000          |
| H-R06          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 499.8           | 997.4 | 1993.2 | 1.001x - 4.572               | 0.999          |

Calibrated by :

Adul Dangklom  
 (Mr. Adul Dangklom)

Approved by :

Peera Detudom  
 (Mr. Peera Detudom)



## Certificate of Calibration

### Aquion : Anion (ID#894)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co.,Ltd.

AQUION S/N : 190840059

AS-DV S/N : 190915235

for

**S.P.S. Consulting Service Co., Ltd.**



บริษัท อาร์เคมีกา แล็บ จำกัด  
ARCHEMICA LAB CO.,LTD.

Operator Signature : Teerapat B

Date : Jun 6, 2025

(Mr. Teerapat Boonla)

Application Chemist



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

| Calibration Report                  |                              |                         |                                      |
|-------------------------------------|------------------------------|-------------------------|--------------------------------------|
| Total Hydrocarbon Analyzer          |                              |                         |                                      |
| Date :                              | 01 September 2025            | Brand :                 | HORIBA                               |
|                                     |                              | Model :                 | APHA-370                             |
| No.                                 | R02                          | Serial No.              | 6F3AC3V4                             |
| Calibrator (Dilution System)        |                              |                         |                                      |
| Brand :                             | Teledyne                     | Model :                 | 700                                  |
| Last Cal. Date :                    | 29 October 2024              | Serial No.              | 421                                  |
| Reference Standard Gas              |                              |                         |                                      |
| Standard Gas :                      | Methane (CH <sub>4</sub> )   | Cylinder No.            | D612165                              |
| Certified Date :                    | 25 February 2023             | Expired Date :          | 25 February 2031                     |
|                                     |                              | Cylinder Conc.          | 453 ppm                              |
| Calibrating Condition               |                              |                         |                                      |
| Pressure                            | 1011 mmbar                   | Temp.                   | 24.6 °C                              |
|                                     |                              | % RH                    | 50                                   |
|                                     |                              | Start Time :            | 10:00 AM                             |
| Pre-Calibration Checks              |                              |                         |                                      |
| Change Particulate Filter           | Yes                          | Station Temp :          | 25.0 °C                              |
| Leak Test                           | Yes                          |                         |                                      |
| Calibration Setting                 |                              |                         |                                      |
| Span Set Point                      | Initial Reading (Before Adj) |                         | Final Reading (After Adj)            |
|                                     | Expected Concentration (PPM) | Analyzer Response (PPM) | Analyzer Response (PPM)              |
| Zero                                | 0                            | 0.10                    | 0                                    |
| Span                                | 10                           | 10.02                   | 10                                   |
| Calibration Setting (Final)         |                              |                         |                                      |
| Span Instrument Gain:               | 0.999                        | Finish Time:            | 11:00 AM                             |
| APHA-360 Total Hydrocarbon Analyzer |                              |                         |                                      |
| Test Values                         | Observed Value               | Units                   | Nominal Range                        |
| Signal (CH <sub>4</sub> )           | 912.2                        | mV                      | 800-1,350                            |
| Signal (THC)                        | 916.8                        | mV                      | 800-1,350                            |
| Detector                            | 78.2                         | kPa                     | ((Pressure Air/1013)x100)-20 ± 4 kPa |
| Purifier                            | 18.9                         | kPa                     | 8 - 25                               |
| NMC                                 | 259.2                        | °C                      | 260 ± 10                             |
| Bypass                              | 0.9                          | L / min                 | 0.9 ± 0.3                            |
| Over Flow                           | 0.8                          | L / Min                 | 0.8                                  |

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำ



# CALIBRATION LABORATORY Co., LTD.

2/10-11,14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : pH METER  
MANUFACTURER : HANNA  
MODEL / TYPE : HI3512/HI1332/HI7662-T  
SERIAL NO. : 08685754/11250B7M/092806BN[PH04/56]  
CLID. NO. : 272501562  
JOB CONTROL NO. : 250617070523  
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24 ROAD, JOMPOL,  
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 17 June 2025

DATE OF ISSUED : 20 June 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sukgasem Seehanart  
Wenick Inchaisri  
Calibration Engineer

Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
20 June 2025



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to  
the International System of Units ( SI )

Certificate No. Q25070523

F3-011-05/12-23

page 1 of 4



@clccalibration



**CLC**  
Accredited  
ISO/IEC 17025

# CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## REPORT OF CALIBRATION

### FOR

**NOMENCLATURE** : **pH METER**  
**MANUFACTURER** : **HANNA**  
**MODEL / TYPE** : **HI3512/HI1332/HI7662-T**  
**SERIAL NO.** : **08685754/11250B7M/092806BN[PH04/56]**  
**DATE OF CALIBRATION** : **18 June 2025**

---

#### ENVIRONMENT CONDITIONS :

**Temperature** :  **$(25 \pm 2.5) ^\circ\text{C}$**

**Relative Humidity** :  **$(50 \pm 15) \% \text{ RH}$**

#### PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPCH-01** [ pH Meter ]. The calibration was performed by direct measurement with Certified Reference Material (CRM).

This instrument was calibrated under procedure No. **CLC-CPTH-04** [ Temperature ] based on **ASTM E 644-04** as calibration guidelines. The calibration was performed by using Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

1. pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Control Company Catalog Number 06664260,11754256, Lot Number CC787362.
3. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F250 S/N. 1334023800.
5. IPRT, Wika Model CTP5000-250-D S/N. PO00043543-1-10-1.

Certificate No. **Q25070523**

**F3-011-05/12-23**

page 2 of 4



@clccalibration



# CALIBRATION LABORATORY CO., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).  
Lot Number. 080124 , 120124. Due Date 23 January 2026.
2. The measurements are traceable to International System of Units (SI) , through Control Company.  
Certificate No. 4281-14495731 , Due Date 27 September 2025.
3. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.  
Certificate No. Q24120999, Due Date 26 November 2025.
4. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 1042/67, Due Date 16 October 2025.
5. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).  
Certificate No. TT-0146-24, Due Date 28 October 2025.

## UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25070523

F3-011-05/12-23

page 3 of 4



@clccalibration



**CLC**  
Accredited  
ISO/IEC 17025

# CALIBRATION LABORATORY Co., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com



**CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

The table in the following gives the calibration results and associated measurement uncertainties of pH meter.

## CALIBRATION DATA

### 1. pH METER RESULT @ 25 °C

| Standard pH<br>Buffer Solution<br>(pH) | pH Meter<br>Reading<br>(pH) | pH Meter<br>Reading<br>(mV) | Correction<br>(pH) | Uncertainty of<br>pH Measurement<br>( $\pm$ pH) | k Factor |
|----------------------------------------|-----------------------------|-----------------------------|--------------------|-------------------------------------------------|----------|
| 4.003                                  | 4.005                       | 168.2                       | -0.002             | 0.010                                           | 2,00     |
| 7.005                                  | 7.010                       | -8.1                        | -0.005             | 0.013                                           | 2,00     |
| 10.015                                 | 10.010                      | -177.7                      | +0.005             | 0.014                                           | 2,00     |

Technical Note. Setting function CAL 3 point ( 4,7,10 ).

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 4 of 68

### 2. TEMPERATURE RESULT

| Immersion depth (mm) | Actual Temperature ( °C ) | DUC Reading ( °C ) | Correction ( °C ) | Uncertainty $\pm$ ( °C ) |
|----------------------|---------------------------|--------------------|-------------------|--------------------------|
| 100                  | 25.00                     | 25.0               | 0.00              | 0.07                     |

Technical Note. Type of sensor : Thermistor

Probe  $\varnothing$  3 mm

Materials : Metal Sheath.

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of  $k = 2,00$ .

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 56 of 68

**This report is valid for the above stated instrument/s only.**

**### End of Certificate ###**

Certificate No. Q25070523

F3-011-05/12-23

page 4 of 4



@clccalibration

## Certificate of Calibration

**Certificate No. :** 68-400046-2

**Page : 1 of 2**

**Submitted by :** S. P. S Consulting Service Co., Ltd.

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

**Equipment :** Liquid in Glass Thermometer

Manufacturer : SK

Model : N/A

Range : 0 °C to 100 °C

Resolution : 1 °C

Serial No. : N/A

Immersion : Total

ID No. : TM21/59

**Environment :** Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

**Date of Received :** 21 January 2025

**Date of Calibration :** 24 January 2025

**Date of Issue :** 24 January 2025

**Calibrated by :** Chortip Samchusri

**Calibration Method :** This instrument was calibrated by In-house method comparison technique CAL-M4001 based on ASTM E77-07 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    |
|--------|------------|-------------|
| 400001 | TT-0023-24 | 16 Feb 2026 |

Traceability

National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

| ID No. | Cert. No. | Due Date    |
|--------|-----------|-------------|
| 400003 | 23E1866   | 01 Jun 2025 |
| 400004 | 23E1866   | 01 Jun 2025 |

Traceability

National Institute of Metrology Thailand (NIMT)

National Institute of Metrology Thailand (NIMT)

Approved by :

( Permpoon Chanpu )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

**Certificate No. :** 68-400046-2

**Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement

Ice point check : UUC\* reading 0 °C Standard reading 0.4429 °C

| Standard Reading<br>( °C ) | UUC Reading<br>( °C ) | Correction<br>( °C ) | Uncertainty<br>( ± °C ) |
|----------------------------|-----------------------|----------------------|-------------------------|
| 20.4801                    | 20                    | 0.5                  | 0.31                    |

### 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%

- ๐0๐ -





CERTIFICATE No : 25M2254

REFERENCE No : 76365-1

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : METTLER TOLEDO

**MODEL** : XS105DU

**SERIAL No** : 1126422905

**ID No** : BA05/50

**CONDITION AS RECEIVED** : USED ITEM

**SUBMITTED BY** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,  
JOMPOL, CHATUCHAK, BANGKOK 10900

**CALIBRATED BY** : ATSAWIN Y.

**CALIBRATION DATE** : 07-Mar-25

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 13-Mar-25

**RECEIVED DATE** : 07-Mar-25

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.





CERTIFICATE No : 25M2254

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA05/50 RECEIVED DATE : 07-Mar-25  
AIR PRESSURE : 1009mbar  $\pm$  1mbar CALIBRATION DATE : 07-Mar-25  
AMBIENT TEMPERATURE : 24°C  $\pm$  1°C RELATIVE HUMIDITY : 54 %RH  $\pm$  10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

| INSTRUMENT             | MODEL | SERIAL No | CERTIFICATE No | DUE DATE  |
|------------------------|-------|-----------|----------------|-----------|
| 1) STANDARD WEIGHT SET | E2    | QK-I-151  | C02250116      | 28-Jan-27 |
| 2) STANDARD WEIGHT     | E2    | 15843     | C02250117      | 29-Jan-27 |

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

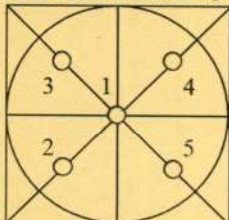
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

| NOMINAL VALUE (g) | BALANCE READING (g) | CORRECTION (g) | UNCERTAINTY ( $\pm$ g) |
|-------------------|---------------------|----------------|------------------------|
| 0.00              | 0.00000             | 0.00000        | 0.000065               |
| 0.02              | 0.01999             | 0.00001        | 0.000065               |
| 0.10              | 0.10001             | -0.00001       | 0.000066               |
| 0.20              | 0.20001             | -0.00001       | 0.000066               |
| 0.50              | 0.50002             | -0.00002       | 0.000065               |
| 1.00              | 1.00003             | -0.00003       | 0.000066               |
| 2.00              | 2.00001             | -0.00001       | 0.000067               |
| 5.00              | 5.00002             | -0.00002       | 0.000068               |
| 10.00             | 10.00000            | 0.00000        | 0.000070               |
| 20.00             | 20.00004            | -0.00004       | 0.000078               |
| 50.00             | 50.00000            | 0.00000        | 0.00013                |
| 100.00            | 100.0001            | -0.0001        | 0.00019                |
| 120.00            | 120.0002            | -0.0002        | 0.00022                |

5. OFF CENTER LOADING ERROR



| POINT              | READING (g) |
|--------------------|-------------|
| 1                  | 50.0000     |
| 2                  | 50.0000     |
| 3                  | 50.0000     |
| 4                  | 50.0000     |
| 5                  | 50.0000     |
| OFF-CENTER LOADING | 0.0000      |

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA  
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR  $k=2$ , PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



CERT.No.: HS-W015C

Calibration Date : 18 Mar 25  
 Submitted by : S.P.S CONSULTING SERVICE CO.,LTD  
 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,  
 Chatuchak, Bangkok, Thailand 10900

Avg Room Temp : 20 °C  
 Avg Water Temp : 20 °C  
 Air Pressure : 760.00 mmHg  
 Salinity : 0 ppt

Model : YSI 5000  
 S/N : 15B100751  
 Probe : YSI 5010  
 S/N : 22D100097  
 ID NO. : -  
 Air Temp ref : S/N. F8065C26  
 Barometric ref : S/N. F8065C26  
 Water Temp ref : -  
 ID NO. HS001  
 Technician : Kittipong M.

#### Calibration Details

| Calibration Point     | 100% air sat.<br>(@20 °C, DO = 9.09 mg/l) | (status) | (status) |
|-----------------------|-------------------------------------------|----------|----------|
| Measurement 1 (mg/l)  | 9.08                                      | (PASS)   | -        |
| Measurement 2 (mg/l)  | 9.08                                      | (PASS)   | -        |
| Measurement 3 (mg/l)  | 9.08                                      | (PASS)   | -        |
| Measurement 4 (mg/l)  | 9.07                                      | (PASS)   | -        |
| Measurement 5 (mg/l)  | 9.07                                      | (PASS)   | -        |
| Measurement 6 (mg/l)  | 9.07                                      | (PASS)   | -        |
| Measurement 7 (mg/l)  | 9.07                                      | (PASS)   | -        |
| Measurement 8 (mg/l)  | 9.07                                      | (PASS)   | -        |
| Measurement 9 (mg/l)  | 9.07                                      | (PASS)   | -        |
| Measurement 10 (mg/l) | 9.07                                      | (PASS)   | -        |

|                  |      |      |   |   |
|------------------|------|------|---|---|
| Mean Measurement | 9.07 | mg/l | - | - |
| Inaccuracy       | 0.02 | mg/l | - | - |

Overall Status (PASS)

#### Manufacturer Specification

Accuracy = +/- 0.02 mg/l

- 1) This certificate is issued based on the result that are found as shown on date and place of test only.
- 2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
- 3) This result shall not be used for advertising purpose.



Technician Signature  
 (Kittipong Maekwong)



Laboratory Manager  
 (Natenapha Pisatkunchon)



# QUALITY CALIBRATION CO., LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com

CERTIFICATE No : 25T0521

REFERENCE No : 75853-2

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : COD REACTOR

**MANUFACTURER** : HACH

**MODEL** : DRB 200

**SERIAL No** : 15110C0498

**ID No** : CRB 06/59

**CONDITION AS RECEIVED** : USED ITEM

**SUBMITTED BY** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,  
JOMPOL, CHATUCHAK, BANGKOK 10900

**CALIBRATED BY** : CHAICHARN CH.

**CALIBRATION DATE** : 03-Feb-25

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 03-Feb-25

**RECEIVED DATE** : 15-Jan-25





# QUALITY CALIBRATION CO., LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 25T0521

PAGE : 2 OF 2

## Calibration Report

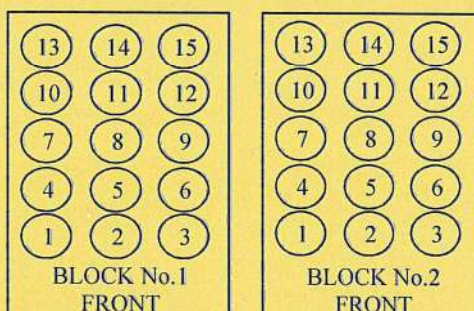
EQUIPMENT : COD REACTOR  
MANUFACTURER : HACH  
ID NUMBER : CRB 06/59  
RECEIVED DATE : 15-Jan-25  
AMBIENT TEMPERATURE : 23° C ± 1° C  
MODEL : DRB 200  
SERIAL NUMBER : 15110C0498  
CALIBRATION DATE : 03-Feb-25  
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON POINTS AND LOCATED AS THE PICTURE.
2. REFERENCE STANDARD INSTRUMENTS :-  

| INSTRUMENT                    | MODEL       | SERIAL No | CERTIFICATE No | DUE DATE  |
|-------------------------------|-------------|-----------|----------------|-----------|
| 1) DATA LOGGER WITH TC TYPE K | HYDRA 2635A | 7301307   | 24T6467        | 26-Jun-25 |
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



|                                                |    |        |        |
|------------------------------------------------|----|--------|--------|
| Block No.                                      |    | 1      | 2      |
| Calibration Point (°C)                         |    | 150    | 150    |
| Controller temperature (°C)                    |    | 145    | 145    |
| Indicating Temperature                         |    | 145    | 145    |
| Measured Temperature (° C) at Spread Locations | 1  | 150.23 | 150.64 |
|                                                | 2  | 149.73 | 149.78 |
|                                                | 3  | 150.29 | 150.29 |
|                                                | 4  | 150.04 | 150.49 |
|                                                | 5  | 150.09 | 150.51 |
|                                                | 6  | 150.74 | 150.67 |
|                                                | 7  | 149.97 | 150.66 |
|                                                | 8  | 150.76 | 150.57 |
|                                                | 9  | 150.54 | 150.51 |
|                                                | 10 | 149.44 | 149.94 |
|                                                | 11 | 150.12 | 150.64 |
|                                                | 12 | 149.93 | 150.33 |
|                                                | 13 | 149.19 | 149.82 |
|                                                | 14 | 148.96 | 149.70 |
|                                                | 15 | 149.09 | 149.79 |
| Uncertainty of Measurement(± °C)               |    | 0.88   | 0.88   |

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR  $k=2$ , PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำใต้ดิน



# CALIBRATION LABORATORY Co., LTD.

2/10-11,14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : pH METER  
MANUFACTURER : HANNA  
MODEL / TYPE : HI3512/HI1332/HI7662-T  
SERIAL NO. : 08685754/11250B7M/092806BN[PH04/56]  
CLID. NO. : 272501562  
JOB CONTROL NO. : 250617070523  
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24 ROAD, JOMPOL,  
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 17 June 2025

DATE OF ISSUED : 20 June 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sukgasem Seehanart  
Wenick Inchaisri  
Calibration Engineer

Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
20 June 2025



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to  
the International System of Units ( SI )

Certificate No. Q25070523

F3-011-05/12-23

page 1 of 4



@clccalibration



**CLC**  
Accredited  
ISO/IEC 17025

# CALIBRATION LABORATORY Co., LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## REPORT OF CALIBRATION

### FOR

**NOMENCLATURE** : **pH METER**  
**MANUFACTURER** : **HANNA**  
**MODEL / TYPE** : **HI3512/HI1332/HI7662-T**  
**SERIAL NO.** : **08685754/11250B7M/092806BN[PH04/56]**  
**DATE OF CALIBRATION** : **18 June 2025**

---

#### ENVIRONMENT CONDITIONS :

**Temperature :**  $(25 \pm 2.5) ^\circ\text{C}$

**Relative Humidity :**  $(50 \pm 15) \% \text{ RH}$

#### PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPCH-01** [ pH Meter ]. The calibration was performed by direct measurement with Certified Reference Material (CRM).

This instrument was calibrated under procedure No. **CLC-CPTH-04** [ Temperature ] based on **ASTM E 644-04** as calibration guidelines. The calibration was performed by using Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

1. pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Control Company Catalog Number 06664260,11754256, Lot Number CC787362.
3. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F250 S/N. 1334023800.
5. IPRT, Wika Model CTP5000-250-D S/N. PO00043543-1-10-1.

Certificate No. **Q25070523**

**F3-011-05/12-23**

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@clccalibration



# CALIBRATION LABORATORY CO., LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).  
Lot Number. 080124 , 120124. Due Date 23 January 2026.
2. The measurements are traceable to International System of Units (SI) , through Control Company.  
Certificate No. 4281-14495731 , Due Date 27 September 2025.
3. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.  
Certificate No. Q24120999, Due Date 26 November 2025.
4. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 1042/67, Due Date 16 October 2025.
5. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).  
Certificate No. TT-0146-24, Due Date 28 October 2025.

## UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25070523

F3-011-05/12-23

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# CALIBRATION LABORATORY Co., LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



**CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

The table in the following gives the calibration results and associated measurement uncertainties of pH meter.

## CALIBRATION DATA

### 1. pH METER RESULT @ 25 °C

| Standard pH<br>Buffer Solution<br>(pH) | pH Meter<br>Reading<br>(pH) | pH Meter<br>Reading<br>(mV) | Correction<br>(pH) | Uncertainty of<br>pH Measurement<br>( $\pm$ pH) | k Factor |
|----------------------------------------|-----------------------------|-----------------------------|--------------------|-------------------------------------------------|----------|
| 4.003                                  | 4.005                       | 168.2                       | -0.002             | 0.010                                           | 2,00     |
| 7.005                                  | 7.010                       | -8.1                        | -0.005             | 0.013                                           | 2,00     |
| 10.015                                 | 10.010                      | -177.7                      | +0.005             | 0.014                                           | 2,00     |

Technical Note. Setting function CAL 3 point ( 4,7,10 ).

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 4 of 68

### 2. TEMPERATURE RESULT

| Immersion depth (mm) | Actual Temperature ( °C ) | DUC Reading ( °C ) | Correction ( °C ) | Uncertainty $\pm$ ( °C ) |
|----------------------|---------------------------|--------------------|-------------------|--------------------------|
| 100                  | 25.00                     | 25.0               | 0.00              | 0.07                     |

Technical Note. Type of sensor : Thermistor

Probe  $\varnothing$  3 mm

Materials : Metal Sheath.

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of  $k = 2,00$ .

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 56 of 68

**This report is valid for the above stated instrument/s only.**

**### End of Certificate ###**

Certificate No. Q25070523

F3-011-05/12-23

page 4 of 4



@clccalibration

## ***GC Clarus 600/680 Preventive Maintenance (PM)***

|                                             |                                                                            |                                                |             |
|---------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------|-------------|
| <b>Company Name:</b>                        | <b>S.P.S. Consulting Service Co.,Ltd</b>                                   |                                                |             |
| <b>Address<br/>(Instrument Location):</b>   | 7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900. |                                                |             |
| <b>Serial Number:</b>                       | 680S14042502                                                               | <b>Service Tag:</b>                            | N68APSSFXMP |
| <b>Customer Name<br/>(if applicable):</b>   | Ms.Naruecha                                                                | <b>PM number:</b>                              | 2 of 2      |
| <b>Service Engineer<br/>Name:</b>           | Monchai Kitcharoenkeat                                                     | <b>Service Order<br/>Number:</b>               | WO-06815714 |
| <b>Date PM Performed:<br/>(DD-MMM-YYYY)</b> | 13-Aug-2025                                                                | <b>Next PM Due<br/>Date:<br/>(DD-MMM-YYYY)</b> | 13-Feb-2026 |

| <b>Part Number</b> | <b>Release</b> | <b>Publication Date</b> |  |
|--------------------|----------------|-------------------------|-------------------------------------------------------------------------------------|
| TH09370070         | C              | August 2016             |                                                                                     |

### **Scope**

The purpose of this PM is to ensure the continued functionality of the Clarus 600 and Clarus 680 GC by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

### **General Instructions:**

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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## Component List

| Component / Specific Model | Serial #     | Software Version | Configuration Notes |
|----------------------------|--------------|------------------|---------------------|
| Clarus680                  | 680S14042502 | Totalchrom6.3.2  | PSS, PSS, FID,      |
| Clarus SQ8T                | 648N4050804  | Turbomass 6.4    |                     |
| AtomX                      | US14113002   | Tekma AtomX      |                     |
|                            |              |                  |                     |

## Parts Lists

| Additional Tools Required for PM                  |             |          |             |                              |
|---------------------------------------------------|-------------|----------|-------------|------------------------------|
| Part Number (if applicable)                       | Description | Quantity | Serial #    | Calibration Due Date (MM/YY) |
| N/A                                               |             |          |             |                              |
|                                                   |             |          |             |                              |
| Additional Reagents and Standards Required for PM |             |          |             |                              |
| Part Number (if applicable)                       | Description | Quantity | Batch/Lot # | Expiration Date (MM/YY)      |
| N/A                                               |             |          |             |                              |
|                                                   |             |          |             |                              |

## Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

### 1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.

- ☒ Check incoming AC line voltage for proper levels and grounding.

L-N 220 Volt

L-G 220 Volt

N-G 0.32 Volt

*\*Neutral to ground not more than 0.5 volts peak to peak*

- ☒ Inspect all gas line filters and traps; Replace if necessary with customer supplied spares.

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other \_\_\_\_\_

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other \_\_\_\_\_

- ☒ Inspect the customer log book and make any appropriate PM entries.

- ☒ Leak check all fittings from the gas source to instrument.

Gas leakage ☒ Pass ☐ Fail Comment \_\_\_\_\_

- ☒ Perform general inspection of system for cleanliness.

- ☒ Inspect for functional and clean electronic cooling and oven vent fans

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

### 2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

- ☐ Check sub-ambient option. (If installed).

Oven temperature set point 5 °C ☐ Pass ☐ Fail

- ☒ Perform routine maintenance on detector/injector. Replace parts as necessary with customer supplied spares.

- ☒ Check flows, including split flows if applicable. Calibrate if necessary.
 

|              |      |
|--------------|------|
| Carrier flow | Pass |
| Split flow   | Pass |
- ☒ Check detector gas flows and adjust if necessary.
 

|               |      |
|---------------|------|
| Detector flow | Pass |
|---------------|------|
- ☒ Autosampler installed ☒ Yes ☐ No
 

|                                                             |      |
|-------------------------------------------------------------|------|
| Check autosampler sensor for wear and replace if necessary. |      |
| Vial sensor                                                 | Pass |
| Door sensor                                                 | Pass |
| Tower sensor                                                | Pass |
| Plunger sensor                                              | Pass |
| Elevator sensor                                             | Pass |
- ☒ Remove syringe, manually flush. Replace with customer supplied spare if necessary.
- ☒ Check firmware version. Upgrade to current levels if necessary.
 

|                  |            |
|------------------|------------|
| Firmware version | <u>6.5</u> |
|------------------|------------|
- ☒ Measure all accessible power supply voltages.
 

|          |      |
|----------|------|
| 5 Volt   | Pass |
| +15 Volt | Pass |
| -15 Volt | Pass |
| 24 Volt  | Pass |
- ☒ Record all detector voltage signal.
 

|                    |             |     |
|--------------------|-------------|-----|
| Detector Channel A | <u>0.98</u> | mV. |
| Detector Channel B | <u>NA</u>   | mV. |

### 3. Diagnostics Tests:

- ☒ Run instrument diagnostics.
 

|                                           |      |
|-------------------------------------------|------|
| <input checked="" type="checkbox"/> BRAM  | Pass |
| <input checked="" type="checkbox"/> EPROM | Pass |
- ☒ Run Autosampler diagnostics.
 

|                                           |      |
|-------------------------------------------|------|
| <input checked="" type="checkbox"/> BRAM  | Pass |
| <input checked="" type="checkbox"/> EPROM | Pass |

### 4. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer-supplied materials to have on hand
- ☒ Attach PM sticker.
- ☒ Update Logbook.

## Additional Comments

| Additional Comments Regarding the PM |
|--------------------------------------|
|                                      |
|                                      |
|                                      |

## Review

|                                                                                                                               |                                       |
|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| <p><i>The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.</i></p> |                                       |
| <p><i>This Clarus600/680 GC                      Pass                      the preventive maintenance.</i></p>                |                                       |
| <b>Review of Preventive Maintenance:</b>                                                                                      |                                       |
| Authorized PerkinElmer Representative:<br>Monchai Kitcharoenkeat <i>Monchai</i>                                               | Date:<br>13-Aug-2025<br>(DD-MMM-YYYY) |
| Authorized Customer Representative:<br>Ms.Naruecha <i>Naruecha</i>                                                            | Date:<br>13-Aug-2025<br>(DD-MMM-YYYY) |

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงทั่วไป



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

## CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co.,Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

### Ambient Environment

Temperature :  $(23 \pm 3) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \%$

Ambient Pressure :  $(101.325 \pm 1.500) \text{ kPa}$

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
  2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
  3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
  4. Digital Multimeter Agilent 34401A S/N MY44005560.
  5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
  6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
  7. Condenser Microphone B&K 4180 S/N 2889871.

**Calibration Procedure:** CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

1 / 2  
W

The results relate only to the items tested/calibrated or value assigned.

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FM.BL.MTC.002 Rev.5

#### Head Office

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Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

#### Office/Laboratory

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Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
(66) 08 3219 9440  
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

#### Office

196 Phahonyothin Road, Ladyao, Chatuchak,  
Bangkok 10900, Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
(66) 08 1889 6827

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

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

Nominal Output of Unit Under Test = 94 dB re 20 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

| Standard Microphone<br>Type | Measured Sound Pressure<br>Level (dB) | Deviated value<br>(dB) | Uncertainty<br>(dB) | Tolerance limit<br>IEC60942:2003 Class 1 |
|-----------------------------|---------------------------------------|------------------------|---------------------|------------------------------------------|
| 1/2 inch Bruel&Kjaer 4180   | 93.81                                 | -0.19                  | $\pm 0.10$          | $\pm 0.40$ dB                            |

2. Frequency

| Standard Microphone<br>Type | Measured Frequency<br>(Hz) | Deviated value<br>(Hz) | Uncertainty<br>(Hz) | Tolerance limit<br>IEC60942:2003 Class 1 |
|-----------------------------|----------------------------|------------------------|---------------------|------------------------------------------|
| 1/2 inch Bruel&Kjaer 4180   | 999.9                      | -0.1                   | $\pm 1.5$           | $\pm 1.0\%$                              |

3. Total Distortion

| Standard Microphone<br>Type | Measured Total Distortion<br>(%) | Uncertainty<br>(%) | Tolerance limit<br>IEC60942:2003 Class 1 |
|-----------------------------|----------------------------------|--------------------|------------------------------------------|
| 1/2 inch Bruel&Kjaer 4180   | 0.95                             | $\pm 0.50$         | $\pm 3.0\%$                              |

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

  
(Mr. Weerachai Deechaiyae)

Approved by :

  
(Mr. Prawate Khuaypa)  
Director

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Ref : 2011268021900739001

End of Certificate

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(66) 08 1889 6827



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S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Noise R\_529/25

## Sound Level Meter Calibration Report

### Acoustic Calibrator Data

|                   |                |                  |                  |
|-------------------|----------------|------------------|------------------|
| Brand             | ACO            | Number           | AC 03/56         |
| Model             | 2127           | Serial No.       | 130006           |
| Calibration Range | 94 dB, 1000 Hz | Last Calibration | 21 February 2025 |
|                   |                | Due Date         | 21 February 2026 |

### Calibration Data

| Sound Level Meter Data                                                                            |       |       |            | Calibration Data |                     |                  |
|---------------------------------------------------------------------------------------------------|-------|-------|------------|------------------|---------------------|------------------|
| SLM No.                                                                                           | Brand | Model | Serial No. | Date             | Actual Reading [dB] |                  |
|                                                                                                   |       |       |            |                  | Before Adjustment   | After Adjustment |
| ACO-R31                                                                                           | ACO   | 6236  | 00192043   | 31 August 2025   | 93.9                | 93.9             |
| ACO-R33                                                                                           | ACO   | 6236  | 00192045   | 31 August 2025   | 93.9                | 93.9             |
| ACO-R34                                                                                           | ACO   | 6236  | 00192046   | 31 August 2025   | 93.9                | 93.9             |
| ACO-R37                                                                                           | ACO   | 6236  | 00192049   | 31 August 2025   | 94.0                | 93.9             |
| Acoustic Certified Value : Thailand Institute of Scientific and Technological Research<br>(TISTR) |       |       |            |                  | 93.81 ± 0.10 dB     |                  |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพอากาศในสถานประกอบการ



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com., www.spscon.com

### Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

#### Environmental Conditions

Temperature : 25 ± 3 °C  
Pressure : 1010 ± 15 mmbar

| Personal Pump Data |       |           |            | Calibration Data |                    |       |       |                 |       |       |                              |                |
|--------------------|-------|-----------|------------|------------------|--------------------|-------|-------|-----------------|-------|-------|------------------------------|----------------|
| No.                | Brand | Model     | Serial No. | Date             | Flow Rate (mL/min) |       |       |                 |       |       | Value From Calibration Curve |                |
|                    |       |           |            |                  | Setting            |       |       | Actual (Q std.) |       |       |                              |                |
|                    |       |           |            |                  | 1                  | 2     | 3     | 1               | 2     | 3     | y                            | R <sup>2</sup> |
| R01                | SKC   | 224-PCXR4 | 602467     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,510 | 2,008 | 1.008x - 10.783              | 1.000          |
| R02                | SKC   | 224-PCXR4 | 626450     | 03/07/2025       | 1,000              | 2,000 | 3,000 | 999             | 1,498 | 1,993 | 0.991x + 9.648               | 1.000          |
| R03                | SKC   | 224-PCXR4 | 691592     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,501 | 1,998 | 1.006x - 13.328              | 0.999          |
| R04                | SKC   | 224-PCXR4 | 691672     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,493 | 2,002 | 1.001x - 3.364               | 1.000          |
| R05                | SKC   | 224-PCXR4 | 798470     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,509 | 2,001 | 1.009x - 19.500              | 0.999          |
| R06                | SKC   | 224-PCXR4 | 798456     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,498 | 1,998 | 1.004x - 8.490               | 1.000          |
| R07                | SKC   | 224-PCXR4 | 798480     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,494 | 2,001 | 1.006x - 11.786              | 1.000          |
| R08                | SKC   | 224-PCXR4 | 883215     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,009           | 1,505 | 2,006 | 1.001x + 0.899               | 1.000          |
| R09                | SKC   | 224-PCXR4 | 034650     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,508 | 1,999 | 1.008x - 17.223              | 0.999          |
| R10                | SKC   | 224-PCXR4 | 091765     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,495 | 1,998 | 1.000x - 2.097               | 1.000          |
| R11                | SKC   | 224-PCXR4 | 091763     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,498 | 2,002 | 1.010x - 18.889              | 0.999          |
| R12                | SKC   | 224-PCXR4 | 091568     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,506 | 2,001 | 1.004x - 7.711               | 1.000          |
| R13                | SKC   | 224-PCXR4 | 091638     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,006           | 1,498 | 1,997 | 0.991x + 13.423              | 1.000          |
| R14                | SKC   | 224-PCXR4 | 091764     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 994             | 1,505 | 1,996 | 1.007x - 17.870              | 0.999          |
| R15                | SKC   | 224-PCXR8 | 529457     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,504 | 1,994 | 0.995x + 5.338               | 1.000          |
| R16                | SKC   | 224-PCXR8 | 529643     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,499 | 1,997 | 1.000x - 2.577               | 1.000          |
| R17                | SKC   | 224-PCXR8 | 529645     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,507 | 1,993 | 1.004x - 12.365              | 0.999          |
| R18                | SKC   | 224-PCXR8 | 566756     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,498 | 1,996 | 0.997x + 0.819               | 1.000          |
| R19                | SKC   | 224-PCXR8 | 566802     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,499 | 2,002 | 1.012x - 22.101              | 0.999          |
| R20                | SKC   | 224-PCXR8 | 529089     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 994             | 1,502 | 1,996 | 1.001x - 5.166               | 1.000          |
| R21                | SKC   | 224-PCXR8 | 665728     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,497 | 2,001 | 1.003x - 8.170               | 1.000          |
| R22                | SKC   | 224-PCXR8 | 707444     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,504 | 2,006 | 1.005x - 6.228               | 1.000          |
| R23                | SKC   | 224-PCXR8 | 761067     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,498 | 1,996 | 0.998x - 1.215               | 1.000          |
| R24                | SKC   | 224-PCXR8 | 707893     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,508 | 1,995 | 1.002x - 7.415               | 0.999          |
| R25                | SKC   | 224-PCXR8 | 761052     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,501 | 1,997 | 0.992x + 12.437              | 1.000          |
| R26                | SKC   | 224-PCXR8 | 707956     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,505 | 2,009 | 1.011x - 15.349              | 0.999          |
| R27                | SKC   | 224-PCXR8 | 707398     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,506 | 1,995 | 1.000x - 5.721               | 1.000          |
| R28                | SKC   | 224-PCXR8 | 707481     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,503 | 1,993 | 1.001x - 6.976               | 0.999          |
| R29                | SKC   | 224-PCXR8 | 707402     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,496 | 1,992 | 0.995x + 1.966               | 1.000          |
| R30                | SKC   | 224-PCXR8 | 093811     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,497 | 1,999 | 0.998x + 1.047               | 1.000          |
| R31                | SKC   | 224-PCXR8 | 093183     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,505 | 1,995 | 0.996x + 6.964               | 1.000          |
| R32                | SKC   | 224-PCXR8 | 671950     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,503 | 1,998 | 1.000x + 1.382               | 1.000          |
| R33                | SKC   | 224-PCXR4 | 626254     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,507 | 1,997 | 1.006x - 14.223              | 0.999          |
| R34                | SKC   | 224-PCXR4 | 626131     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,501 | 1,991 | 0.993x + 7.387               | 1.000          |
| R35                | SKC   | 224-PCXR8 | 707460     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,499 | 1,999 | 0.997x + 3.684               | 1.000          |
| R36                | SKC   | 224-PCXR8 | 707446     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,501 | 2,001 | 1.009x - 16.388              | 0.999          |
| R37                | SKC   | 224-PCXR8 | 707432     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,498 | 2,003 | 1.000x - 0.875               | 1.000          |
| R38                | SKC   | 224-PCXR8 | 707349     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,492 | 2,002 | 1.003x - 8.681               | 1.000          |
| R39                | SKC   | 224-PCXR8 | 761095     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,499 | 2,001 | 1.001x - 0.859               | 1.000          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

Temperature : 25 ± 3 °C  
Pressure : 1010 ± 15 mmbar

| Personal Pump Data |       |           |            | Calibration Data |                    |       |       |                 |       |       |                              |                |
|--------------------|-------|-----------|------------|------------------|--------------------|-------|-------|-----------------|-------|-------|------------------------------|----------------|
| No.                | Brand | Model     | Serial No. | Date             | Flow Rate (ml/min) |       |       |                 |       |       | Value From Calibration Curve |                |
|                    |       |           |            |                  | Setting            |       |       | Actual (Q std.) |       |       | y                            | R <sup>2</sup> |
|                    |       |           |            |                  | 1                  | 2     | 3     | 1               | 2     | 3     |                              |                |
| R01                | SKC   | 224-PCXR4 | 602467     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,504 | 2,006 | 1.001x + 1.123               | 1.000          |
| R02                | SKC   | 224-PCXR4 | 626450     | 01/10/2025       | 1,000              | 2,000 | 3,000 | 997             | 1,511 | 1,997 | 1.000x - 2.215               | 1.000          |
| R03                | SKC   | 224-PCXR4 | 691592     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,504 | 2,008 | 1.005x - 5.705               | 1.000          |
| R04                | SKC   | 224-PCXR4 | 691672     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,013           | 1,505 | 2,007 | 0.996x + 7.748               | 0.999          |
| R05                | SKC   | 224-PCXR4 | 798470     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,506 | 2,010 | 1.007x - 4.757               | 1.000          |
| R06                | SKC   | 224-PCXR4 | 798456     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,503 | 1,999 | 1.003x - 5.913               | 1.000          |
| R07                | SKC   | 224-PCXR4 | 798480     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,502 | 1,996 | 1.000x - 8.975               | 0.999          |
| R08                | SKC   | 224-PCXR4 | 883215     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,504 | 1,995 | 0.999x - 0.068               | 1.000          |
| R09                | SKC   | 224-PCXR4 | 034650     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 994             | 1,505 | 1,998 | 1.005x - 11.989              | 1.000          |
| R10                | SKC   | 224-PCXR4 | 091765     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,508 | 2,006 | 1.008x - 11.738              | 0.999          |
| R11                | SKC   | 224-PCXR4 | 091763     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,006           | 1,493 | 2,003 | 0.996x + 5.589               | 1.000          |
| R12                | SKC   | 224-PCXR4 | 091568     | 02/10/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,496 | 1,999 | 1.002x - 5.717               | 1.000          |
| R13                | SKC   | 224-PCXR4 | 091638     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,012           | 1,505 | 2,008 | 1.004x - 2.938               | 0.999          |
| R14                | SKC   | 224-PCXR4 | 091764     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,494 | 2,004 | 1.008x - 18.690              | 1.000          |
| R15                | SKC   | 224-PCXR8 | 529457     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,507 | 2,007 | 1.007x - 12.957              | 0.999          |
| R16                | SKC   | 224-PCXR8 | 529643     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,496 | 1,994 | 0.999x - 1.395               | 1.000          |
| R17                | SKC   | 224-PCXR8 | 529645     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,503 | 1,995 | 1.005x - 10.886              | 0.999          |
| R18                | SKC   | 224-PCXR8 | 566756     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,505 | 1,993 | 1.000x - 4.450               | 1.000          |
| R19                | SKC   | 224-PCXR8 | 566802     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,504 | 2,007 | 1.006x - 6.752               | 1.000          |
| R20                | SKC   | 224-PCXR8 | 529089     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 1,008           | 1,497 | 2,001 | 1.002x - 6.225               | 0.999          |
| R21                | SKC   | 224-PCXR8 | 665728     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,505 | 2,003 | 1.006x - 16.975              | 0.999          |
| R22                | SKC   | 224-PCXR8 | 707444     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,494 | 2,001 | 0.995x + 6.369               | 1.000          |
| R23                | SKC   | 224-PCXR8 | 761067     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,008           | 1,495 | 2,000 | 0.992x + 13.025              | 1.000          |
| R24                | SKC   | 224-PCXR8 | 707893     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,504 | 1,997 | 1.004x - 8.140               | 0.999          |
| R25                | SKC   | 224-PCXR8 | 761052     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,006           | 1,510 | 2,006 | 1.001x - 0.152               | 0.999          |
| R26                | SKC   | 224-PCXR8 | 707956     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,513 | 2,008 | 1.008x - 10.714              | 1.000          |
| R27                | SKC   | 224-PCXR8 | 707398     | 02/10/2025       | 1,000              | 1,500 | 2,000 | 1,011           | 1,512 | 2,012 | 1.002x + 2.547               | 0.999          |
| R28                | SKC   | 224-PCXR8 | 707481     | 02/10/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,498 | 2,000 | 1.000x + 0.144               | 1.000          |
| R29                | SKC   | 224-PCXR8 | 707402     | 02/10/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,509 | 2,006 | 1.004x - 5.501               | 1.000          |
| R30                | SKC   | 224-PCXR8 | 093811     | 02/10/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,514 | 2,005 | 1.009x - 10.222              | 1.000          |
| R31                | SKC   | 224-PCXR8 | 093183     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,508 | 2,003 | 1.005x - 9.587               | 1.000          |
| R32                | SKC   | 224-PCXR8 | 671950     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,494 | 1,996 | 0.994x + 5.137               | 1.000          |
| R33                | SKC   | 224-PCXR4 | 626254     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,493 | 2,005 | 1.008x - 16.151              | 0.999          |
| R34                | SKC   | 224-PCXR4 | 626131     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,508 | 1,994 | 0.998x - 0.764               | 1.000          |
| R35                | SKC   | 224-PCXR8 | 707460     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,502 | 1,993 | 0.993x + 8.172               | 1.000          |
| R36                | SKC   | 224-PCXR8 | 707446     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,510 | 1,999 | 1.004x - 8.044               | 1.000          |
| R37                | SKC   | 224-PCXR8 | 707432     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,012           | 1,515 | 2,007 | 0.997x + 7.376               | 0.999          |
| R38                | SKC   | 224-PCXR8 | 707349     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,511 | 1,998 | 1.001x - 2.918               | 1.000          |
| R39                | SKC   | 224-PCXR8 | 761095     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 1,008           | 1,514 | 1,996 | 0.993x + 11.058              | 0.999          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

Temperature : 25  $\pm$  3  $^{\circ}$ C  
Pressure : 1010  $\pm$  15 mmbar

| Personal Pump Data |       |           |            | Calibration Data |                    |       |       |                 |       |       |                              |                |
|--------------------|-------|-----------|------------|------------------|--------------------|-------|-------|-----------------|-------|-------|------------------------------|----------------|
| No.                | Brand | Model     | Serial No. | Date             | Flow Rate (ml/min) |       |       |                 |       |       | Value From Calibration Curve |                |
|                    |       |           |            |                  | Setting            |       |       | Actual (Q std.) |       |       | y                            | R <sup>2</sup> |
|                    |       |           |            |                  | 1                  | 2     | 3     | 1               | 2     | 3     |                              |                |
| R40                | SKC   | 224-PCXR4 | 612753     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,504 | 2,007 | 1.003x - 2.699               | 1.000          |
| R41                | SKC   | 224-PCXR4 | 626140     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,498 | 2,000 | 1.001x - 1.631               | 1.000          |
| R42                | SKC   | 224-PCXR4 | 626463     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,496 | 1,999 | 0.993x + 9.615               | 1.000          |
| R43                | SKC   | 224-PCXR4 | 626129     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,505 | 2,003 | 1.008x - 13.761              | 0.999          |
| R44                | SKC   | 224-PCXR4 | 602753     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,503 | 1,999 | 1.006x - 9.411               | 0.999          |
| R45                | SKC   | 224-PCXR4 | 626137     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,504 | 1,998 | 1.002x - 3.862               | 1.000          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

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Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

| Rotameter Data |       |        | Calibration Data |                     |       |       |                 |       |        |                              |                |
|----------------|-------|--------|------------------|---------------------|-------|-------|-----------------|-------|--------|------------------------------|----------------|
| No.            | Brand | Model  | Date             | Flow Rate (mL/min)  |       |       |                 |       |        | Value From Calibration Curve |                |
|                |       |        |                  | Flow Rate (Reading) |       |       | Actual (Q std.) |       |        |                              |                |
|                |       |        |                  | 1                   | 2     | 3     | 1               | 2     | 3      | y                            | R <sup>2</sup> |
| H-R01          | Dwyer | VFB-65 | 04/07/2025       | 500                 | 1,000 | 2,000 | 500.4           | 999.6 | 2002.7 | 0.999x + 1.975               | 1.000          |
| H-R02          | Dwyer | VFB-65 | 04/07/2025       | 500                 | 1,000 | 2,000 | 499.3           | 998.9 | 1998.1 | 1.000x - 0.723               | 1.000          |
| H-R03          | Dwyer | VFB-65 | 03/07/2025       | 500                 | 1,000 | 2,000 | 500.5           | 998.7 | 1996.7 | 0.998x + 2.184               | 0.999          |
| H-R04          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 501.7           | 998.1 | 1993.3 | 1.000x - 2.212               | 0.999          |
| H-R05          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 499.2           | 997.5 | 1997.1 | 1.002x - 3.115               | 1.000          |
| H-R06          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 499.8           | 997.4 | 1993.2 | 1.001x - 4.572               | 0.999          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

| Rotameter Data |       |        | Calibration Data |                     |     |     |                 |       |       |                              |                |
|----------------|-------|--------|------------------|---------------------|-----|-----|-----------------|-------|-------|------------------------------|----------------|
| No.            | Brand | Model  | Date             | Flow Rate (mL/min)  |     |     |                 |       |       | Value From Calibration Curve |                |
|                |       |        |                  | Flow Rate (Reading) |     |     | Actual (Q std.) |       |       |                              |                |
|                |       |        |                  | 1                   | 2   | 3   | 1               | 2     | 3     | y                            | R <sup>2</sup> |
| L-R01          | Dwyer | VFA-21 | 04/07/2025       | 50                  | 100 | 200 | 50.9            | 100.4 | 201.3 | 1.001x + 0.676               | 1.000          |
| L-R02          | Dwyer | VFA-21 | 04/07/2025       | 50                  | 100 | 200 | 50.3            | 101.8 | 201.0 | 1.003x + 0.005               | 0.999          |
| L-R03          | Dwyer | VFA-21 | 03/07/2025       | 50                  | 100 | 200 | 50.6            | 100.9 | 201.1 | 0.999x + 0.565               | 1.000          |
| L-R04          | Dwyer | VFA-21 | 02/07/2025       | 50                  | 100 | 200 | 50.5            | 100.4 | 200.8 | 0.997x + 0.797               | 1.000          |
| L-R05          | Dwyer | VFA-21 | 02/07/2025       | 50                  | 100 | 200 | 50.1            | 101.7 | 200.9 | 1.002x - 0.024               | 0.999          |
| L-R06          | Dwyer | VFA-21 | 02/07/2025       | 50                  | 100 | 200 | 50.3            | 101.5 | 200.8 | 1.000x + 0.647               | 1.000          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

| Calibration Data |       |        |                  |                     |       |       |                 |        |        |                              |                |
|------------------|-------|--------|------------------|---------------------|-------|-------|-----------------|--------|--------|------------------------------|----------------|
| Rotameter Data   |       |        | Calibration Data |                     |       |       |                 |        |        |                              |                |
| No.              | Brand | Model  | Date             | Flow Rate (mL/min)  |       |       |                 |        |        | Value From Calibration Curve |                |
|                  |       |        |                  | Flow Rate (Reading) |       |       | Actual (Q std.) |        |        |                              |                |
|                  |       |        |                  | 1                   | 2     | 3     | 1               | 2      | 3      | y                            | R <sup>2</sup> |
| H-R01            | Dwyer | VFB-65 | 01/10/2025       | 500                 | 1,000 | 2,000 | 501.1           | 997.7  | 1996.7 | 1.000x - 2.348               | 0.999          |
| H-R02            | Dwyer | VFB-65 | 01/10/2025       | 500                 | 1,000 | 2,000 | 500.3           | 999.2  | 1997.5 | 1.001x - 2.181               | 1.000          |
| H-R03            | Dwyer | VFB-65 | 02/10/2025       | 500                 | 1,000 | 2,000 | 500.9           | 1001.1 | 1999.3 | 0.999x + 0.708               | 0.999          |
| H-R04            | Dwyer | VFB-65 | 02/10/2025       | 500                 | 1,000 | 2,000 | 501.4           | 999.4  | 1998.9 | 0.997x + 3.139               | 1.000          |
| H-R05            | Dwyer | VFB-65 | 01/10/2025       | 500                 | 1,000 | 2,000 | 500.5           | 1000.7 | 1998.2 | 0.998x + 2.480               | 1.000          |
| H-R06            | Dwyer | VFB-65 | 03/10/2025       | 500                 | 1,000 | 2,000 | 502.0           | 998.5  | 1994.8 | 1.000x - 1.968               | 0.999          |

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

| Rotameter Data |       |        | Calibration Data |                     |     |     |                 |       |       |                              |                |
|----------------|-------|--------|------------------|---------------------|-----|-----|-----------------|-------|-------|------------------------------|----------------|
| No.            | Brand | Model  | Date             | Flow Rate (mL/min)  |     |     |                 |       |       | Value From Calibration Curve |                |
|                |       |        |                  | Flow Rate (Reading) |     |     | Actual (Q std.) |       |       |                              |                |
|                |       |        |                  | 1                   | 2   | 3   | 1               | 2     | 3     | y                            | R <sup>2</sup> |
| L-R01          | Dwyer | VFA-21 | 01/10/2025       | 50                  | 100 | 200 | 50.3            | 101.0 | 200.7 | 0.997x + 0.613               | 1.000          |
| L-R02          | Dwyer | VFA-21 | 01/10/2025       | 50                  | 100 | 200 | 50.1            | 101.2 | 200.1 | 1.001x - 0.303               | 0.999          |
| L-R03          | Dwyer | VFA-21 | 02/10/2025       | 50                  | 100 | 200 | 49.7            | 99.8  | 199.9 | 1.002x - 0.371               | 1.000          |
| L-R04          | Dwyer | VFA-21 | 02/10/2025       | 50                  | 100 | 200 | 50.2            | 100.9 | 200.6 | 1.000x - 0.110               | 0.999          |
| L-R05          | Dwyer | VFA-21 | 01/10/2025       | 50                  | 100 | 200 | 50.7            | 100.8 | 200.3 | 0.999x + 0.555               | 1.000          |
| L-R06          | Dwyer | VFA-21 | 03/10/2025       | 50                  | 100 | 200 | 50.5            | 99.7  | 201.1 | 0.998x + 0.476               | 1.000          |

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงในสถานประกอบการ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

## CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co.,Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

### Ambient Environment

Temperature :  $(23 \pm 3) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \%$

Ambient Pressure :  $(101.325 \pm 1.500) \text{ kPa}$

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
  2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
  3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
  4. Digital Multimeter Agilent 34401A S/N MY44005560.
  5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
  6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
  7. Condenser Microphone B&K 4180 S/N 2889871.

**Calibration Procedure:** CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

1 / 2  
W

The results relate only to the items tested/calibrated or value assigned.

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FM.BL.MTC.002 Rev.5

#### Head Office

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

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

Nominal Output of Unit Under Test = 94 dB re 20 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

| Standard Microphone<br>Type | Measured Sound Pressure<br>Level (dB) | Deviated value<br>(dB) | Uncertainty<br>(dB) | Tolerance limit<br>IEC60942:2003 Class 1 |
|-----------------------------|---------------------------------------|------------------------|---------------------|------------------------------------------|
| 1/2 inch Bruel&Kjaer 4180   | 93.81                                 | -0.19                  | $\pm 0.10$          | $\pm 0.40$ dB                            |

2. Frequency

| Standard Microphone<br>Type | Measured Frequency<br>(Hz) | Deviated value<br>(Hz) | Uncertainty<br>(Hz) | Tolerance limit<br>IEC60942:2003 Class 1 |
|-----------------------------|----------------------------|------------------------|---------------------|------------------------------------------|
| 1/2 inch Bruel&Kjaer 4180   | 999.9                      | -0.1                   | $\pm 1.5$           | $\pm 1.0\%$                              |

3. Total Distortion

| Standard Microphone<br>Type | Measured Total Distortion<br>(%) | Uncertainty<br>(%) | Tolerance limit<br>IEC60942:2003 Class 1 |
|-----------------------------|----------------------------------|--------------------|------------------------------------------|
| 1/2 inch Bruel&Kjaer 4180   | 0.95                             | $\pm 0.50$         | $\pm 3.0\%$                              |

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

  
(Mr. Weerachai Deechaiyae)

Approved by :

  
(Mr. Prawate Khuaypa)  
Director

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Ref : 2011268021900739001

End of Certificate

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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
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Noise R\_518/25

## Sound Level Meter Calibration Report

### Acoustic Calibrator Data

|                   |                |                  |                  |
|-------------------|----------------|------------------|------------------|
| Brand             | ACO            | Number           | AC 03/56         |
| Model             | 2127           | Serial No.       | 130006           |
| Calibration Range | 94 dB, 1000 Hz | Last Calibration | 21 February 2025 |
|                   |                | Due Date         | 21 February 2026 |

### Calibration Data

| Sound Level Meter Data                                                                         |       |       |            | Calibration Data |                     |                  |
|------------------------------------------------------------------------------------------------|-------|-------|------------|------------------|---------------------|------------------|
| SLM No.                                                                                        | Brand | Model | Serial No. | Date             | Actual Reading [dB] |                  |
|                                                                                                |       |       |            |                  | Before Adjustment   | After Adjustment |
| ACO-R12                                                                                        | ACO   | 6236  | 00172040   | 17 August 2025   | 93.9                | 93.9             |
| ACO-R18                                                                                        | ACO   | 6236  | 00172065   | 17 August 2025   | 94.0                | 93.9             |
| ACO-R23                                                                                        | ACO   | 6236  | 00192035   | 17 August 2025   | 93.9                | 93.9             |
| ACO-R37                                                                                        | ACO   | 6236  | 00192049   | 17 August 2025   | 93.9                | 93.9             |
| ACO-R44                                                                                        | ACO   | 6236  | 00192056   | 17 August 2025   | 93.9                | 93.9             |
| Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR) |       |       |            |                  | 93.81 ± 0.10 dB     |                  |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงสะสมแบบติดตัวบุคคล



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0647

MTC No. EEL. BP. 40/0967

## CALIBRATION CERTIFICATE

Submitted by : S.P.S Consulting Service Co.,Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

### Instrument Calibrated :

### Ambient Environment

Description : Sound Calibrator

Temperature :  $(23 \pm 3) ^\circ\text{C}$

Manufacturer : SVANTEK

Relative Humidity :  $(50 \pm 15) \%$

Model : SV34

Ambient Pressure :  $(101.325 \pm 1.500) \text{ kPa}$

Serial No. : 33146

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
  2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
  3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
  4. Digital Multimeter Agilent 34401A S/N MY44005560.
  5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
  6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
  7. Condenser Microphone B&K 4180 S/N 2633526.

**Calibration Procedure:** CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 17 Sep. 2024

Date of Calibration : 25 Sep. 2024

1/2

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0647

MTC No. EEL. BP. 40/0967

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

Nominal Output of Unit Under Test = 114 dB re 20 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

| Standard Microphone<br>Type | Measured Sound Pressure<br>Level (dB) | Deviated value<br>(dB) | Uncertainty<br>(dB) | Tolerance limit<br>IEC60942:2003 Class 2 |
|-----------------------------|---------------------------------------|------------------------|---------------------|------------------------------------------|
| 1/2 inch Bruel&Kjaer 4180   | 113.60                                | -0.40                  | $\pm 0.10$          | $\pm 0.75$ dB                            |

2. Frequency

| Standard Microphone<br>Type | Measured Frequency<br>(Hz) | Deviated value<br>(Hz) | Uncertainty<br>(Hz) | Tolerance limit<br>IEC60942:2003 Class 2 |
|-----------------------------|----------------------------|------------------------|---------------------|------------------------------------------|
| 1/2 inch Bruel&Kjaer 4180   | 1000.0                     | 0.0                    | $\pm 1.5$           | $\pm 2.0\%$                              |

3. Total Distortion

| Standard Microphone<br>Type | Measured Total Distortion<br>(%) | Uncertainty<br>(%) | Tolerance limit<br>IEC60942:2003 Class 2 |
|-----------------------------|----------------------------------|--------------------|------------------------------------------|
| 1/2 inch Bruel&Kjaer 4180   | 0.49                             | $\pm 0.50$         | $\pm 4.0\%$                              |

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

  
(Mr. Weerachai Deechaiyae)

Approved by :

  
(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 25 Sep. 2024

Date of Issue : 26 Sep. 2024

Ref : 2011267091703412006

End of Certificate

2 / 2

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Noise Dose R\_520/25

## Noise Dose Meter Calibration Report

### Acoustic Calibrator Data

|                   |                 |                  |                   |
|-------------------|-----------------|------------------|-------------------|
| Brand             | SVANTEK         | Number           | SV 60/62          |
| Model             | SV34            | Serial No.       | 33146             |
| Calibration Range | 114 dB, 1000 Hz | Last Calibration | 25 September 2024 |
|                   |                 | Due Date         | 25 September 2025 |

### Calibration Data

| Sound Level Meter Data                                                                            |         |          |            | Calibration Data |                     |                  |
|---------------------------------------------------------------------------------------------------|---------|----------|------------|------------------|---------------------|------------------|
| SLM No.                                                                                           | Brand   | Model    | Serial No. | Date             | Actual Reading [dB] |                  |
|                                                                                                   |         |          |            |                  | Before Adjustment   | After Adjustment |
| NMD-B01                                                                                           | SVANTEK | SV-104IS | 80840      | 17 August 2025   | 113.6               | 113.6            |
| NMD-B02                                                                                           | SVANTEK | SV-104IS | 80842      | 17 August 2025   | 113.6               | 113.6            |
| NMD-B05                                                                                           | SVANTEK | SV-104IS | 80856      | 17 August 2025   | 113.6               | 113.6            |
| NMD-B10                                                                                           | SVANTEK | SV-104IS | 80830      | 17 August 2025   | 113.5               | 113.6            |
| NMD-R05                                                                                           | SVANTEK | SV-104IS | 60155      | 17 August 2025   | 113.6               | 113.6            |
| NMD-R10                                                                                           | SVANTEK | SV-104IS | 60150      | 17 August 2025   | 113.6               | 113.6            |
| NMD-R11                                                                                           | SVANTEK | SV-104IS | 63435      | 17 August 2025   | 113.6               | 113.6            |
| NMD-R15                                                                                           | SVANTEK | SV-104IS | 63440      | 17 August 2025   | 113.6               | 113.6            |
| NMD-R17                                                                                           | SVANTEK | SV-104IS | 63442      | 17 August 2025   | 113.6               | 113.6            |
| NMD-R18                                                                                           | SVANTEK | SV-104IS | 63444      | 17 August 2025   | 113.5               | 113.6            |
| NMD-R19                                                                                           | SVANTEK | SV-104IS | 70030      | 17 August 2025   | 113.6               | 113.6            |
| NMD-R20                                                                                           | SVANTEK | SV-104IS | 70035      | 17 August 2025   | 113.6               | 113.6            |
| NMD-R21                                                                                           | SVANTEK | SV-104IS | 80800      | 17 August 2025   | 113.6               | 113.6            |
| NMD-R25                                                                                           | SVANTEK | SV-104IS | 80835      | 17 August 2025   | 113.6               | 113.6            |
| NMD-R29                                                                                           | SVANTEK | SV-104IS | 80855      | 17 August 2025   | 113.6               | 113.6            |
| NMD-R32                                                                                           | SVANTEK | SV-104IS | 80862      | 17 August 2025   | 113.5               | 113.6            |
| NMD-R34                                                                                           | SVANTEK | SV-104IS | 80872      | 17 August 2025   | 113.6               | 113.6            |
| Acoustic Certified Value : Thailand Institute of Scientific and Technological Research<br>(TISTR) |         |          |            |                  | 113.60± 0.10 dB     |                  |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peer Detudom  
(Mr. Peera Detudom)



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0514

MTC No. EEL. BP. 34/0868

## CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co.,Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : SVANTEK

Model : SV34

Serial No. : 83820

### Ambient Environment

Temperature :  $(23 \pm 3) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \%$

Ambient Pressure :  $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.  
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.  
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.  
4. Digital Multimeter Agilent 34401A S/N MY44005560.  
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.  
6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.  
7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 14 Aug. 2025

Date of Calibration : 22 Aug. 2025

1 / 2

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

### Head Office

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

Nominal Output of Unit Under Test = 114 dB re 20 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

| Standard Microphone<br>Type | Measured Sound Pressure<br>Level (dB) | Deviated value<br>(dB) | Uncertainty<br>(dB) | Tolerance limit<br>IEC60942:2003 Class 2 |
|-----------------------------|---------------------------------------|------------------------|---------------------|------------------------------------------|
| 1/2 inch Bruel&Kjaer 4180   | 114.02                                | 0.02                   | $\pm 0.10$          | $\pm 0.75$ dB                            |

2. Frequency

| Standard Microphone<br>Type | Measured Frequency<br>(Hz) | Deviated value<br>(Hz) | Uncertainty<br>(Hz) | Tolerance limit<br>IEC60942:2003 Class 2 |
|-----------------------------|----------------------------|------------------------|---------------------|------------------------------------------|
| 1/2 inch Bruel&Kjaer 4180   | 1000.0                     | 0.0                    | $\pm 1.5$           | $\pm 2.0\%$                              |

3. Total Distortion

| Standard Microphone<br>Type | Measured Total Distortion<br>(%) | Uncertainty<br>(%) | Tolerance limit<br>IEC60942:2003 Class 2 |
|-----------------------------|----------------------------------|--------------------|------------------------------------------|
| 1/2 inch Bruel&Kjaer 4180   | 0.21                             | $\pm 0.50$         | $\pm 4.0\%$                              |

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

  
(Mr. Weerachai Deechaiyae)

Approved by :

  
(Mr. Prawate Kluaypa)



Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 22 Aug. 2025

Date of Issue : 25 Aug. 2025

Ref : 2011268081403169011

End of Certificate

2 / 2

The results relate only to the items tested/calibrated or value assigned.  
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Noise Dose R\_660/25

## Noise Dose Meter Calibration Report

### Acoustic Calibrator Data

|                   |                 |                  |                |
|-------------------|-----------------|------------------|----------------|
| Brand             | SVANTEK         | Number           | SV 03/60       |
| Model             | SV34            | Serial No.       | 83820          |
| Calibration Range | 114 dB, 1000 Hz | Last Calibration | 25 August 2025 |
|                   |                 | Due Date         | 25 August 2026 |

### Calibration Data

| Sound Level Meter Data                                                                         |         |          |            | Calibration Data |                     |                  |
|------------------------------------------------------------------------------------------------|---------|----------|------------|------------------|---------------------|------------------|
| SLM No.                                                                                        | Brand   | Model    | Serial No. | Date             | Actual Reading [dB] |                  |
|                                                                                                |         |          |            |                  | Before Adjustment   | After Adjustment |
| NMD-R03                                                                                        | SVANTEK | SV-104IS | 60153      | 16 November 2025 | 114.1               | 114.0            |
| NMD-R05                                                                                        | SVANTEK | SV-104IS | 60155      | 16 November 2025 | 114.0               | 114.0            |
| NMD-R07                                                                                        | SVANTEK | SV-104IS | 60147      | 16 November 2025 | 114.0               | 114.0            |
| NMD-R10                                                                                        | SVANTEK | SV-104IS | 60150      | 16 November 2025 | 114.0               | 114.0            |
| NMD-R13                                                                                        | SVANTEK | SV-104IS | 63438      | 16 November 2025 | 114.0               | 114.0            |
| NMD-R15                                                                                        | SVANTEK | SV-104IS | 63440      | 16 November 2025 | 114.1               | 114.0            |
| NMD-R17                                                                                        | SVANTEK | SV-104IS | 63442      | 16 November 2025 | 114.0               | 114.0            |
| NMD-R20                                                                                        | SVANTEK | SV-104IS | 70035      | 16 November 2025 | 114.0               | 114.0            |
| NMD-R21                                                                                        | SVANTEK | SV-104IS | 80800      | 16 November 2025 | 114.1               | 114.0            |
| NMD-R24                                                                                        | SVANTEK | SV-104IS | 80833      | 16 November 2025 | 114.0               | 114.0            |
| NMD-R25                                                                                        | SVANTEK | SV-104IS | 80835      | 16 November 2025 | 114.0               | 114.0            |
| NMD-R29                                                                                        | SVANTEK | SV-104IS | 80855      | 16 November 2025 | 114.0               | 114.0            |
| NMD-R31                                                                                        | SVANTEK | SV-104IS | 80861      | 16 November 2025 | 114.0               | 114.0            |
| NMD-R32                                                                                        | SVANTEK | SV-104IS | 80862      | 16 November 2025 | 114.1               | 114.0            |
| NMD-R34                                                                                        | SVANTEK | SV-104IS | 80872      | 16 November 2025 | 114.0               | 114.0            |
| Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR) |         |          |            |                  | 114.02± 0.10 dB     |                  |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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Noise Dose R\_729/25

## Noise Dose Meter Calibration Report

### Acoustic Calibrator Data

|                   |                 |                  |                |
|-------------------|-----------------|------------------|----------------|
| Brand             | SVANTEK         | Number           | SV 03/60       |
| Model             | SV34            | Serial No.       | 83820          |
| Calibration Range | 114 dB, 1000 Hz | Last Calibration | 25 August 2025 |
|                   |                 | Due Date         | 25 August 2026 |

### Calibration Data

| Sound Level Meter Data                                                                         |         |          |            | Calibration Data |                     |                  |
|------------------------------------------------------------------------------------------------|---------|----------|------------|------------------|---------------------|------------------|
| SLM No.                                                                                        | Brand   | Model    | Serial No. | Date             | Actual Reading [dB] |                  |
|                                                                                                |         |          |            |                  | Before Adjustment   | After Adjustment |
| NMD-R26                                                                                        | SVANTEK | SV-104IS | 80836      | 08 December 2025 | 114.0               | 114.0            |
| Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR) |         |          |            |                  | 114.02± 0.10 dB     |                  |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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Noise Dose R\_737/25

## Noise Dose Meter Calibration Report

### Acoustic Calibrator Data

|                   |                 |                  |                |
|-------------------|-----------------|------------------|----------------|
| Brand             | SVANTEK         | Number           | SV 03/60       |
| Model             | SV34            | Serial No.       | 83820          |
| Calibration Range | 114 dB, 1000 Hz | Last Calibration | 25 August 2025 |
|                   |                 | Due Date         | 25 August 2026 |

### Calibration Data

| Sound Level Meter Data                                                                         |         |          |            | Calibration Data |                     |                  |
|------------------------------------------------------------------------------------------------|---------|----------|------------|------------------|---------------------|------------------|
| SLM No.                                                                                        | Brand   | Model    | Serial No. | Date             | Actual Reading [dB] |                  |
|                                                                                                |         |          |            |                  | Before Adjustment   | After Adjustment |
| NMD-R15                                                                                        | SVANTEK | SV-104IS | 63440      | 17 December 2025 | 114.1               | 114.0            |
| NMD-R21                                                                                        | SVANTEK | SV-104IS | 80800      | 17 December 2025 | 114.0               | 114.0            |
| NMD-R26                                                                                        | SVANTEK | SV-104IS | 80836      | 17 December 2025 | 114.0               | 114.0            |
| NMD-R31                                                                                        | SVANTEK | SV-104IS | 80861      | 17 December 2025 | 114.0               | 114.0            |
| Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR) |         |          |            |                  | 114.02± 0.10 dB     |                  |

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)

เอกสารสอบเทียบเครื่องมือการตรวจการรับสัมผัสสารเคมี



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

Temperature : 25 ± 3 °C  
Pressure : 1010 ± 15 mmbar

| Personal Pump Data |       |           |            | Calibration Data |                    |       |       |                 |       |       |                              |                |
|--------------------|-------|-----------|------------|------------------|--------------------|-------|-------|-----------------|-------|-------|------------------------------|----------------|
| No.                | Brand | Model     | Serial No. | Date             | Flow Rate (ml/min) |       |       |                 |       |       | Value From Calibration Curve |                |
|                    |       |           |            |                  | Setting            |       |       | Actual (Q std.) |       |       | y                            | R <sup>2</sup> |
|                    |       |           |            |                  | 1                  | 2     | 3     | 1               | 2     | 3     |                              |                |
| R01                | SKC   | 224-PCXR4 | 602467     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,504 | 2,006 | 1.001x + 1.123               | 1.000          |
| R02                | SKC   | 224-PCXR4 | 626450     | 01/10/2025       | 1,000              | 2,000 | 3,000 | 997             | 1,511 | 1,997 | 1.000x - 2.215               | 1.000          |
| R03                | SKC   | 224-PCXR4 | 691592     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,504 | 2,008 | 1.005x - 5.705               | 1.000          |
| R04                | SKC   | 224-PCXR4 | 691672     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,013           | 1,505 | 2,007 | 0.996x + 7.748               | 0.999          |
| R05                | SKC   | 224-PCXR4 | 798470     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,506 | 2,010 | 1.007x - 4.757               | 1.000          |
| R06                | SKC   | 224-PCXR4 | 798456     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,503 | 1,999 | 1.003x - 5.913               | 1.000          |
| R07                | SKC   | 224-PCXR4 | 798480     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,502 | 1,996 | 1.000x - 8.975               | 0.999          |
| R08                | SKC   | 224-PCXR4 | 883215     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,504 | 1,995 | 0.999x - 0.068               | 1.000          |
| R09                | SKC   | 224-PCXR4 | 034650     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 994             | 1,505 | 1,998 | 1.005x - 11.989              | 1.000          |
| R10                | SKC   | 224-PCXR4 | 091765     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,508 | 2,006 | 1.008x - 11.738              | 0.999          |
| R11                | SKC   | 224-PCXR4 | 091763     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,006           | 1,493 | 2,003 | 0.996x + 5.589               | 1.000          |
| R12                | SKC   | 224-PCXR4 | 091568     | 02/10/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,496 | 1,999 | 1.002x - 5.717               | 1.000          |
| R13                | SKC   | 224-PCXR4 | 091638     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,012           | 1,505 | 2,008 | 1.004x - 2.938               | 0.999          |
| R14                | SKC   | 224-PCXR4 | 091764     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,494 | 2,004 | 1.008x - 18.690              | 1.000          |
| R15                | SKC   | 224-PCXR8 | 529457     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,507 | 2,007 | 1.007x - 12.957              | 0.999          |
| R16                | SKC   | 224-PCXR8 | 529643     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,496 | 1,994 | 0.999x - 1.395               | 1.000          |
| R17                | SKC   | 224-PCXR8 | 529645     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,503 | 1,995 | 1.005x - 10.886              | 0.999          |
| R18                | SKC   | 224-PCXR8 | 566756     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,505 | 1,993 | 1.000x - 4.450               | 1.000          |
| R19                | SKC   | 224-PCXR8 | 566802     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,504 | 2,007 | 1.006x - 6.752               | 1.000          |
| R20                | SKC   | 224-PCXR8 | 529089     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 1,008           | 1,497 | 2,001 | 1.002x - 6.225               | 0.999          |
| R21                | SKC   | 224-PCXR8 | 665728     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,505 | 2,003 | 1.006x - 16.975              | 0.999          |
| R22                | SKC   | 224-PCXR8 | 707444     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,494 | 2,001 | 0.995x + 6.369               | 1.000          |
| R23                | SKC   | 224-PCXR8 | 761067     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,008           | 1,495 | 2,000 | 0.992x + 13.025              | 1.000          |
| R24                | SKC   | 224-PCXR8 | 707893     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,504 | 1,997 | 1.004x - 8.140               | 0.999          |
| R25                | SKC   | 224-PCXR8 | 761052     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,006           | 1,510 | 2,006 | 1.001x - 0.152               | 0.999          |
| R26                | SKC   | 224-PCXR8 | 707956     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,513 | 2,008 | 1.008x - 10.714              | 1.000          |
| R27                | SKC   | 224-PCXR8 | 707398     | 02/10/2025       | 1,000              | 1,500 | 2,000 | 1,011           | 1,512 | 2,012 | 1.002x + 2.547               | 0.999          |
| R28                | SKC   | 224-PCXR8 | 707481     | 02/10/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,498 | 2,000 | 1.000x + 0.144               | 1.000          |
| R29                | SKC   | 224-PCXR8 | 707402     | 02/10/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,509 | 2,006 | 1.004x - 5.501               | 1.000          |
| R30                | SKC   | 224-PCXR8 | 093811     | 02/10/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,514 | 2,005 | 1.009x - 10.222              | 1.000          |
| R31                | SKC   | 224-PCXR8 | 093183     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,508 | 2,003 | 1.005x - 9.587               | 1.000          |
| R32                | SKC   | 224-PCXR8 | 671950     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,494 | 1,996 | 0.994x + 5.137               | 1.000          |
| R33                | SKC   | 224-PCXR4 | 626254     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,493 | 2,005 | 1.008x - 16.151              | 0.999          |
| R34                | SKC   | 224-PCXR4 | 626131     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,508 | 1,994 | 0.998x - 0.764               | 1.000          |
| R35                | SKC   | 224-PCXR8 | 707460     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,502 | 1,993 | 0.993x + 8.172               | 1.000          |
| R36                | SKC   | 224-PCXR8 | 707446     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,510 | 1,999 | 1.004x - 8.044               | 1.000          |
| R37                | SKC   | 224-PCXR8 | 707432     | 01/10/2025       | 1,000              | 1,500 | 2,000 | 1,012           | 1,515 | 2,007 | 0.997x + 7.376               | 0.999          |
| R38                | SKC   | 224-PCXR8 | 707349     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,511 | 1,998 | 1.001x - 2.918               | 1.000          |
| R39                | SKC   | 224-PCXR8 | 761095     | 03/10/2025       | 1,000              | 1,500 | 2,000 | 1,008           | 1,514 | 1,996 | 0.993x + 11.058              | 0.999          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

| Calibration Data |       |        |                  |                     |     |     |                 |       |       |                              |                |
|------------------|-------|--------|------------------|---------------------|-----|-----|-----------------|-------|-------|------------------------------|----------------|
| Rotameter Data   |       |        | Calibration Data |                     |     |     |                 |       |       |                              |                |
| No.              | Brand | Model  | Date             | Flow Rate (ml/min)  |     |     |                 |       |       | Value From Calibration Curve |                |
|                  |       |        |                  | Flow Rate (Reading) |     |     | Actual (Q std.) |       |       |                              |                |
|                  |       |        |                  | 1                   | 2   | 3   | 1               | 2     | 3     | y                            | R <sup>2</sup> |
| L-R01            | Dwyer | VFA-21 | 01/10/2025       | 50                  | 100 | 200 | 50.3            | 101.0 | 200.7 | 0.997x + 0.613               | 1.000          |
| L-R02            | Dwyer | VFA-21 | 01/10/2025       | 50                  | 100 | 200 | 50.1            | 101.2 | 200.1 | 1.001x - 0.303               | 0.999          |
| L-R03            | Dwyer | VFA-21 | 02/10/2025       | 50                  | 100 | 200 | 49.7            | 99.8  | 199.9 | 1.002x - 0.371               | 1.000          |
| L-R04            | Dwyer | VFA-21 | 02/10/2025       | 50                  | 100 | 200 | 50.2            | 100.9 | 200.6 | 1.000x - 0.110               | 0.999          |
| L-R05            | Dwyer | VFA-21 | 01/10/2025       | 50                  | 100 | 200 | 50.7            | 100.8 | 200.3 | 0.999x + 0.555               | 1.000          |
| L-R06            | Dwyer | VFA-21 | 03/10/2025       | 50                  | 100 | 200 | 50.5            | 99.7  | 201.1 | 0.998x + 0.476               | 1.000          |

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



## GAS CHROMATOGRAPH TEST CERTIFICATION

Certificate No. : SV0825/23032

Instrument Type : Gas Chromatography

Model : 3800

Serial Number : 00734

Organization : S.P.S. Consulting Service Co., Ltd.

Address : 7 Phahonyothin Soi 24 Phahonyothin Rd. Ladyao Chatuchak Bangkok 10900

Date : 02/08/2025

### ELECTRONIC TEST

|                      |                                          |                               |
|----------------------|------------------------------------------|-------------------------------|
| CPU                  | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL |
| DISPLAY & LED TEST   | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL |
| VENT TEST            | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL |
| KEY ECHO TEST        | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL |
| DESTRUCTION RAM TEST | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL |

### RUN CHROMATOGRAM TEST

DETECTOR : Flame Ionization Detectors ( FID Channel-Front)

INJECTOR : 1079 Injector

#### GC CONDITION:

|               |                                                         |
|---------------|---------------------------------------------------------|
| Column        | 80 °C hold 1 min., rate 20 °C/min. to 200 °C hold 1min. |
| Injector      | 220 °C                                                  |
| Detector      | 300 °C                                                  |
| Column flow   | 5 mL/min                                                |
| Makeup flow   | 25 mL/min                                               |
| Air flow      | 300 mL/min                                              |
| Hydrogen flow | 30 mL/min                                               |

Column: Capillary Column CP sil 5 CB 0.25 ID x 15 M

Sample: 1 µL Injection FID Test Sample 0.218g/L C14,C15,C16 in hexane (diluted to 30ppm)

SENSITIVITY TEST: C15. (Area count) = 515,940 Counts.





บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาทิพย์ไทย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thuwatt@thaiunique.com, Website : www.thaiunique.com

#### Detector Sensitivity (FID)

| Detector Response          | Result | Specification |
|----------------------------|--------|---------------|
| Baseline Noise ( $\mu V$ ) | 2.40   | $\leq 50$     |
| Baseline Drift (%)         | 0.18   | $\leq 1$      |
| Sensitivity (S/N for C15)  | 19,716 | $\geq 1,024$  |

#### Temperature Specification

| Temperature                 | Set | Result | Specification |
|-----------------------------|-----|--------|---------------|
| Column Oven ( $^{\circ}C$ ) | 80  | 79     | $\pm 5$       |
| Injector ( $^{\circ}C$ )    | 220 | 218    | $\pm 5$       |
| Detector ( $^{\circ}C$ )    | 300 | 298    | $\pm 5$       |
| Incubator ( $^{\circ}C$ )   | 60  | N/A    | $\pm 5$       |

#### Relative Standard Deviation % (%RSD)

| Checkout Procedure     | Result | Specification |
|------------------------|--------|---------------|
| Area C15 (%)           | 1.48   | $\leq 5$      |
| Retention Time C15 (%) | 0.08   | $\leq 0.5$    |

APPROVAL :

Signature:

Engineer : Somchai Pohtongkam

Date : 02/08/2025



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80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

### Results Integrated System Testing

| Checkout Procedure | FID           |
|--------------------|---------------|
| Detector Position  | Front         |
| Inlet Type         | 1079 Injector |
| C15 Area 1         | 506,043       |
| C15 Area 2         | 520,497       |
| C15 Area 3         | 522,154       |
| C15 Area 4         | 521,664       |
| C15 Area 5         | 509,340       |
| C15 Area Average   | 515,940       |
| * % RSD ( < 5 % )  | 1.48          |

\* The precision specification should be less than 2.0 % RSD \*\* ( Relative Standard Deviation ) for an Auto sampler injection and less than 5 % for Manual injections. To calculate the %RSD, select the C15 peak area for each of the five ( 5 ) samples.

\*\* (Relative Standard Deviation is determined by dividing the standard deviation by the average and multiplying by 100.)

$$\% \text{ RSD} = ( \text{std.dev} / \text{avg} ) * 100$$

|                |                                          |                               |
|----------------|------------------------------------------|-------------------------------|
| Compliance     | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| Performance by | <i>Sachin P.</i>                         |                               |
| Date           | 02/08/2025                               |                               |



|             |                |      |            |
|-------------|----------------|------|------------|
| Comments    |                |      |            |
| Reviewed by | <i>Wattana</i> | Date | 02/08/2025 |



VARIAN



บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

### Results Integrated System Testing

| Checkout Procedure  | FID           |
|---------------------|---------------|
| Detector Position   | Front         |
| Inlet Type          | 1079 Injector |
| C15 RT 1            | 3.874         |
| C15 RT 2            | 3.880         |
| C15 RT 3            | 3.875         |
| C15 RT 4            | 3.872         |
| C15 RT 5            | 3.878         |
| C15 RT Average      | 3.876         |
| * % RSD ( < 0.5 % ) | 0.08          |

\* The precision specification should be less than 0.5 % RSD \*\* ( Relative Standard Deviation ) for an Auto sampler injection and less than 0.5 % for Manual injections. To calculate the %RSD, select the RT C15 peak for each of the five ( 5 ) samples.

\*\* (Relative Standard Deviation is determined by dividing the standard deviation by the average and multiplying by 100.)

$$\% \text{ RSD} = ( \text{std.dev} / \text{avg} ) * 100$$

|                |                                          |                               |
|----------------|------------------------------------------|-------------------------------|
| Compliance     | <input checked="" type="checkbox"/> Pass | <input type="checkbox"/> Fail |
| Performance by | <i>Somchai P.</i>                        |                               |
| Date           | 02/08/2025                               |                               |



|             |                |      |            |
|-------------|----------------|------|------------|
| Comments    |                |      |            |
| Reviewed by | <i>Wattana</i> | Date | 02/08/2025 |



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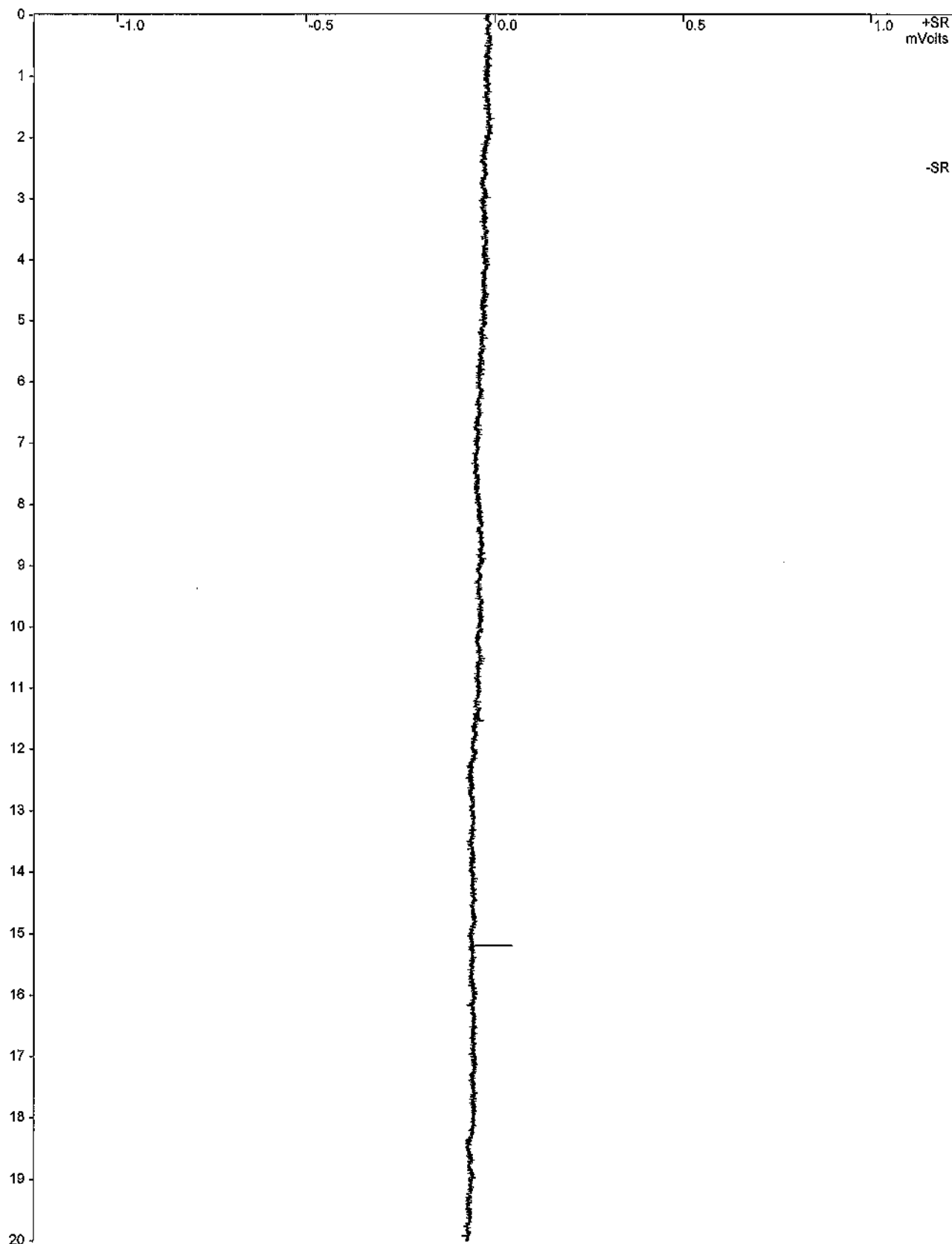
Title :  
Run File : e:\sps2025\blk001.run  
Method File : c:\star\data\tu\2025\cal fid.mth  
Sample ID : blk

Injection Date: 2/8/2568 12:01      Calculation Date: 2/8/2568 12:33

Operator : watsamon                      Detector Type: 3800 (10 Volts)  
Workstation: GC-LAB                      Bus Address : 44  
Instrument :                              Sample Rate : 10.00 Hz  
Channel : Front = FID                    Run Time : 20.005 min

\*\* LC Workstation Version 6.20 \*\* 02511-7390-ae7-0265 \*\*

Chart Speed = 1.13 cm/min      Attenuation = 1                      Zero Offset = 50%  
Start Time = 0.000 min      End Time = 20.005 min      Min / Tick = 1.00



Title :  
Run File : e:\sps2025\blk001.run  
Method File : c:\star\data\tu\2025\cal fid.mth  
Sample ID : blk

Injection Date: 2/8/2568 12:01      Calculation Date: 2/8/2568 12:33

Operator : watsamon      Detector Type: 3800 (10 Volts)  
Workstation: GC-LAB      Bus Address : 44  
Instrument :      Sample Rate : 10.00 Hz  
Channel : Front = FID      Run Time : 20.005 min

\*\* LC Workstation Version 6.20 \*\* 02511-7390-ae7-0265 \*\*

Run Mode : Analysis  
Peak Measurement: Peak Area  
Calculation Type: External Standard

| Peak<br>No. | Peak<br>Name | Result<br>( ) | Ret.<br>Time<br>(min) | Time<br>Offset<br>(min) | Area<br>(counts) | Sep.<br>Code | Width<br>1/2<br>(sec) | Status<br>Codes |
|-------------|--------------|---------------|-----------------------|-------------------------|------------------|--------------|-----------------------|-----------------|
| -----       | -----        | -----         | -----                 | -----                   | -----            | -----        | -----                 | -----           |
| -----       | -----        | =====         | -----                 | =====                   | =====            | -----        | -----                 | -----           |
| Totals:     |              | 0.0000        |                       | 0.000                   | 0                |              |                       |                 |

Total Unidentified Counts :              0 counts

Detected Peaks: 0              Rejected Peaks: 0              Identified Peaks: 0

Multiplier: 1              Divisor: 1              Unidentified Peak Factor: 0

Baseline Offset: -14 microVolts              LSB:      1 microVolts

Noise (used): 24 microVolts - monitored before this run

Manual injection

Data Handling: No peaks

\*\*\*\*\*

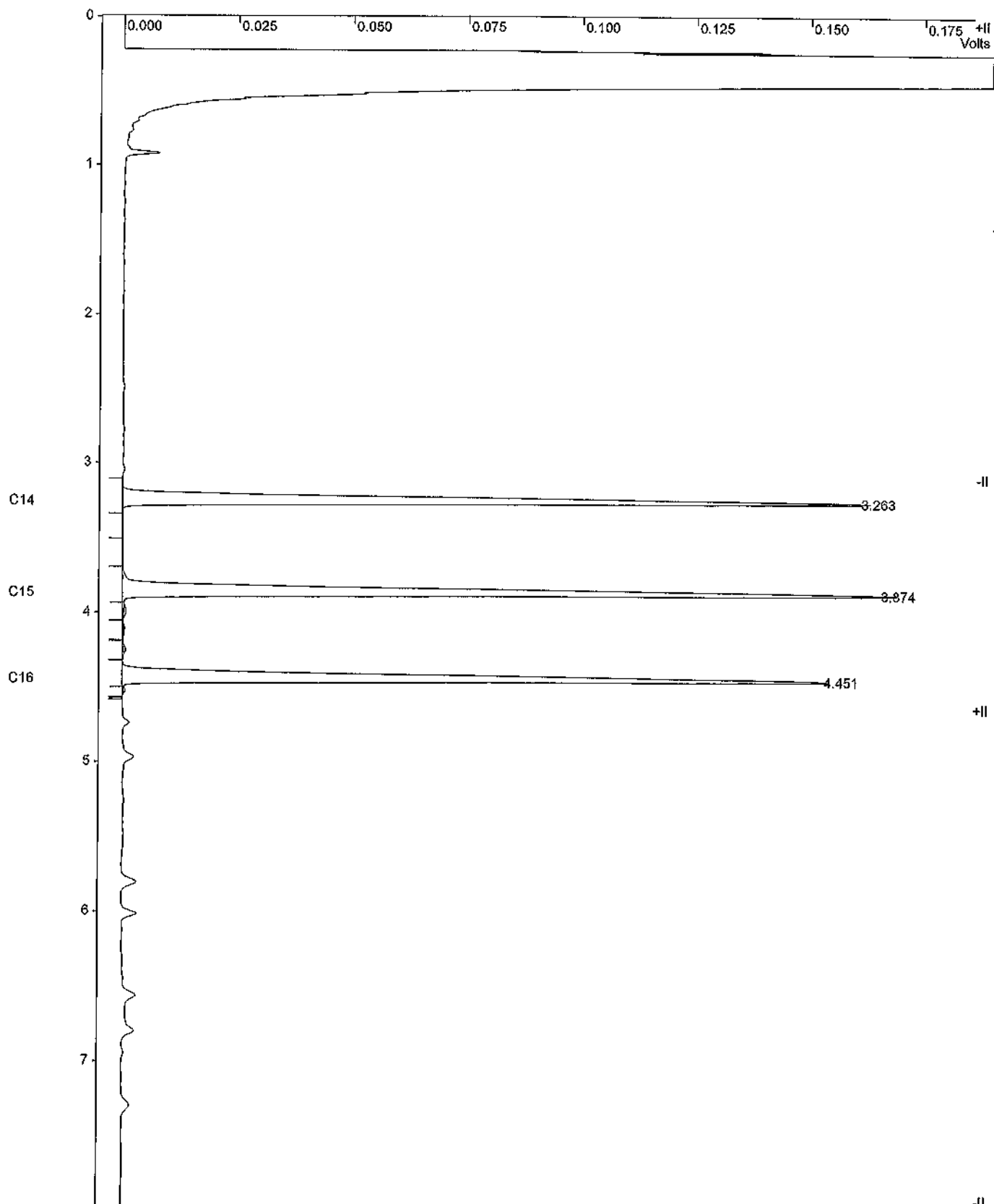
Title :  
Run File : e:\sps2025\fidstd001.run  
Method File : c:\star\data\tu\2025\cal fid.mth  
Sample ID : fidstd

Injection Date: 2/8/2568 12:34      Calculation Date: 2/8/2568 13:26

Operator : watsamon                      Detector Type: 3800 (10 Volts)  
Workstation: GC-LAB                      Bus Address : 44  
Instrument :                              Sample Rate : 10.00 Hz  
Channel : Front = FID                    Run Time : 7.993 min

\*\* LC Workstation Version 6.20 \*\* 02511-7390-ae7-0265 \*\*

Chart Speed = 2.83 cm/min      Attenuation = 79                      Zero Offset = 2%  
Start Time = 0.000 min      End Time = 7.993 min      Min / Tick = 1.00



Title :  
Run File : e:\sps2025\fidstd001.run  
Method File : c:\star\data\tu\2025\cal fid.mth  
Sample ID : fidstd

Injection Date: 2/8/2568 12:34      Calculation Date: 2/8/2568 13:26

Operator : watsamon      Detector Type: 3800 (10 Volts)  
Workstation: GC-LAB      Bus Address : 44  
Instrument :      Sample Rate : 10.00 Hz  
Channel : Front = FID      Run Time : 7.993 min

\*\* LC Workstation Version 6.20 \*\* 02511-7390-ae7-0265 \*\*

Run Mode : Calibration  
Peak Measurement: Peak Area  
Calculation Type: External Standard  
Level : 1

| Peak No. | Peak Name | Ret. Time (min) | Time Offset (min) | Area (counts) | Sep. Code | Width 1/2 (sec) | Status Codes |
|----------|-----------|-----------------|-------------------|---------------|-----------|-----------------|--------------|
| 1        | C14       | 3.263           | 0.002             | 458627        | BB        | 2.7             |              |
| 2        | C15       | 3.874           | 0.002             | 506043        | VV        | 2.8             |              |
| 3        | C16       | 4.451           | 0.001             | 460610        | VB        | 2.8             |              |
| Totals:  |           |                 | 0.005             | 1425280       |           |                 |              |

Total Unidentified Counts :      0 counts

Detected Peaks: 8      Rejected Peaks: 5      Identified Peaks: 3

Multiplier: N/A      Divisor: N/A      Unidentified Peak Factor: 0

Baseline Offset: 6 microVolts      LSB:      1 microVolts

Noise (used): 2 microVolts - monitored before this run

Manual injection

\*\*\*\*\*

Sample ID: fid std

Operator (Inj): watsamon

Injection Date: 02/08/2025

Calc Date: 02/08/2025

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):



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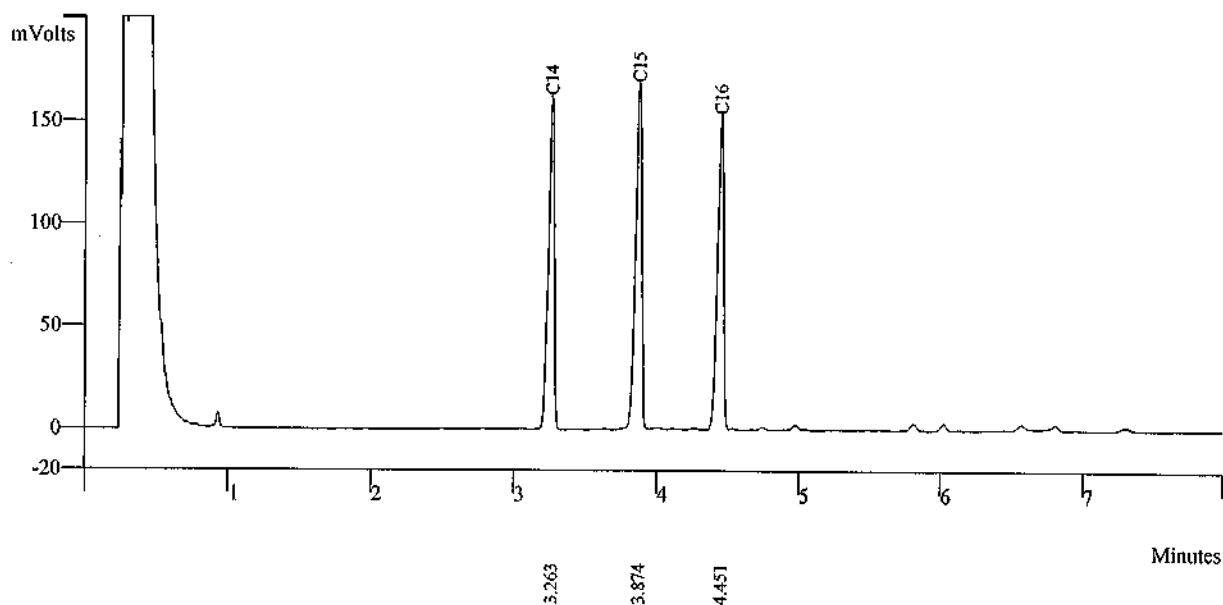
Run Mode: Calibration

Peak Measurement: Peak Area

Calculation Type: External Std.

e:\sps2025\fidstd001.run

A = FID 10 V RESULTS



| Peak No | Peak Name | Result () | Ret Time (min) | Peak Area (counts) | Sep. Code | Width 1/2 (sec) |
|---------|-----------|-----------|----------------|--------------------|-----------|-----------------|
| 1       | C14       | 0.0000    | 3.263          | 458627             | BB        | 2.7             |
| 2       | C15       | 0.0000    | 3.874          | 506043             | VV        | 2.8             |
| 3       | C16       | 0.0000    | 4.451          | 460610             | VB        | 2.8             |
|         | Totals    | 0.0000    |                | 1425280            |           |                 |

Sample ID: **fid std**



Operator (Inj): **watsamon**

Injection Date: **02/08/2025**

Calc Date: **02/08/2025**

Run Time (min): **7.993**

Workstation: **GC-LAB**

Instrument (Inj):

**VARIAN**

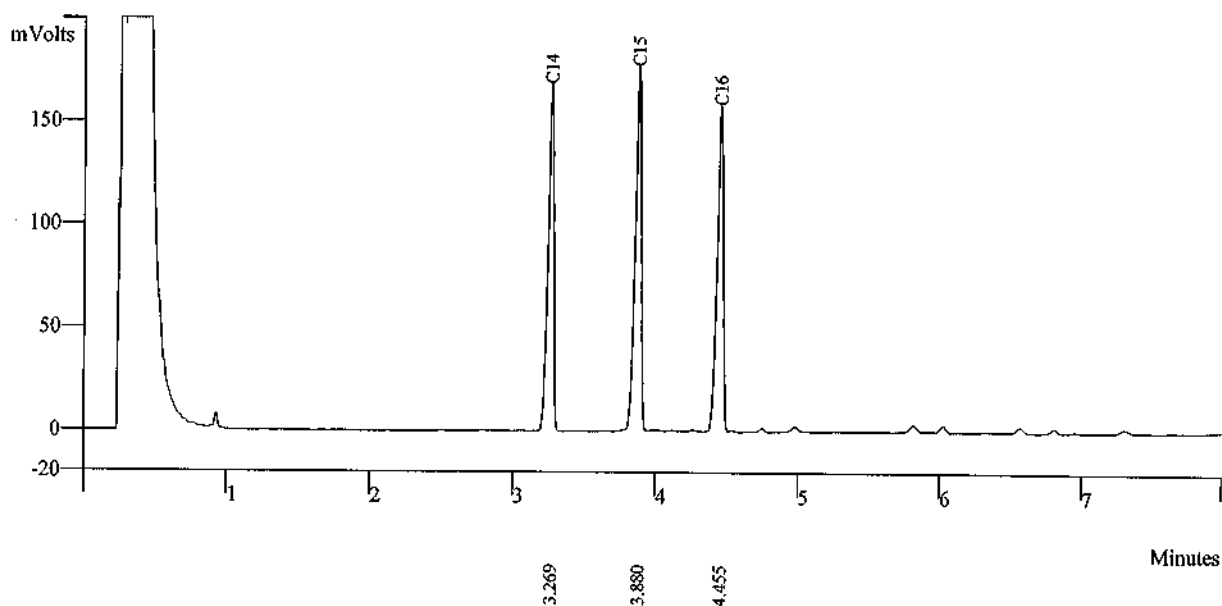
Run Mode: **Calibration**

Peak Measurement: **Peak Area**

Calculation Type: **External Std.**

e:\sps2025\fidstd002.run

A = FID 10 V RESULTS



| Peak No | Peak Name | Result () | Ret Time (min) | Peak Area (counts) | Sep. Code | Width 1/2 (sec) |
|---------|-----------|-----------|----------------|--------------------|-----------|-----------------|
| 1       | C14       | 0.0000    | 3.269          | 472338             | BB        | 2.6             |
| 2       | C15       | 0.0000    | 3.880          | 520497             | VV        | 2.7             |
| 3       | C16       | 0.0000    | 4.455          | 471916             | VB        | 2.8             |
|         | Totals    | 0.0000    |                | 1464751            |           |                 |

Sample ID: fid std

Operator (Inj): watsamon

Injection Date: 02/08/2025

Calc Date: 02/08/2025

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):



**VARIAN**

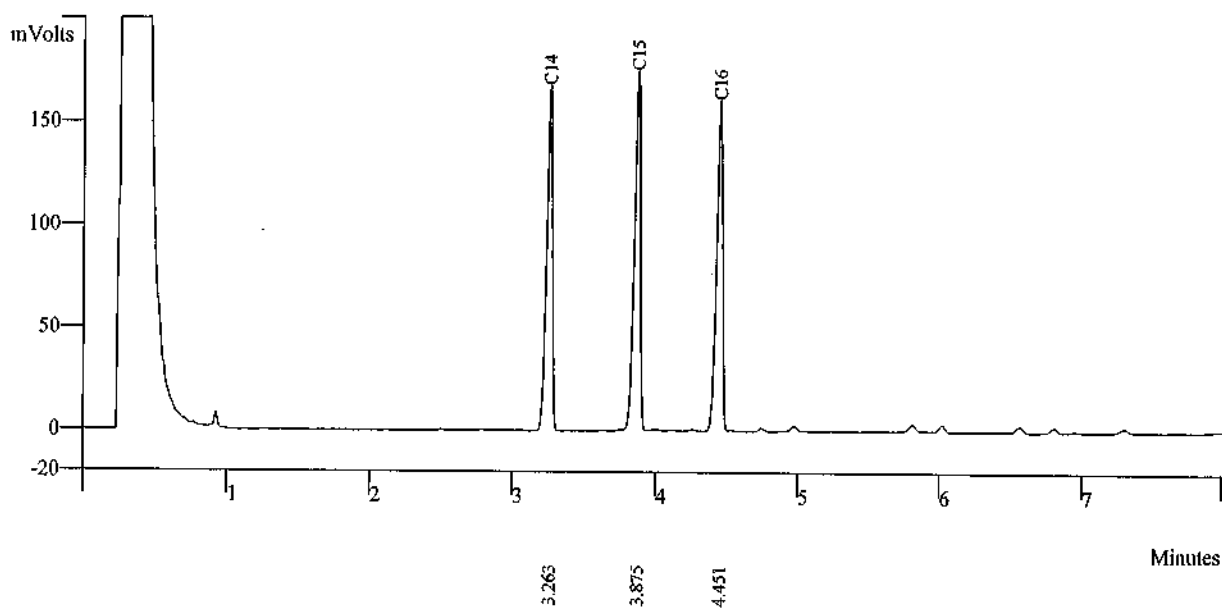
Run Mode: Calibration

Peak Measurement: Peak Area

Calculation Type: External Std.

e:\sps2025\fidstd003.run

A = FID 10 V RESULTS



| Peak No | Peak Name | Result () | Ret Time (min) | Peak Area (counts) | Sep. Code | Width 1/2 (sec) |
|---------|-----------|-----------|----------------|--------------------|-----------|-----------------|
| 1       | C14       | 0.0000    | 3.263          | 469265             | BB        | 2.6             |
| 2       | C15       | 0.0000    | 3.875          | 522154             | VV        | 2.8             |
| 3       | C16       | 0.0000    | 4.451          | 478526             | VB        | 2.8             |
|         | Totals    | 0.0000    |                | 1469945            |           |                 |

Sample ID: fid std



Operator (Inj): watsamon

Injection Date: 02/08/2025

Calc Date: 02/08/2025

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):

**VARIAN**

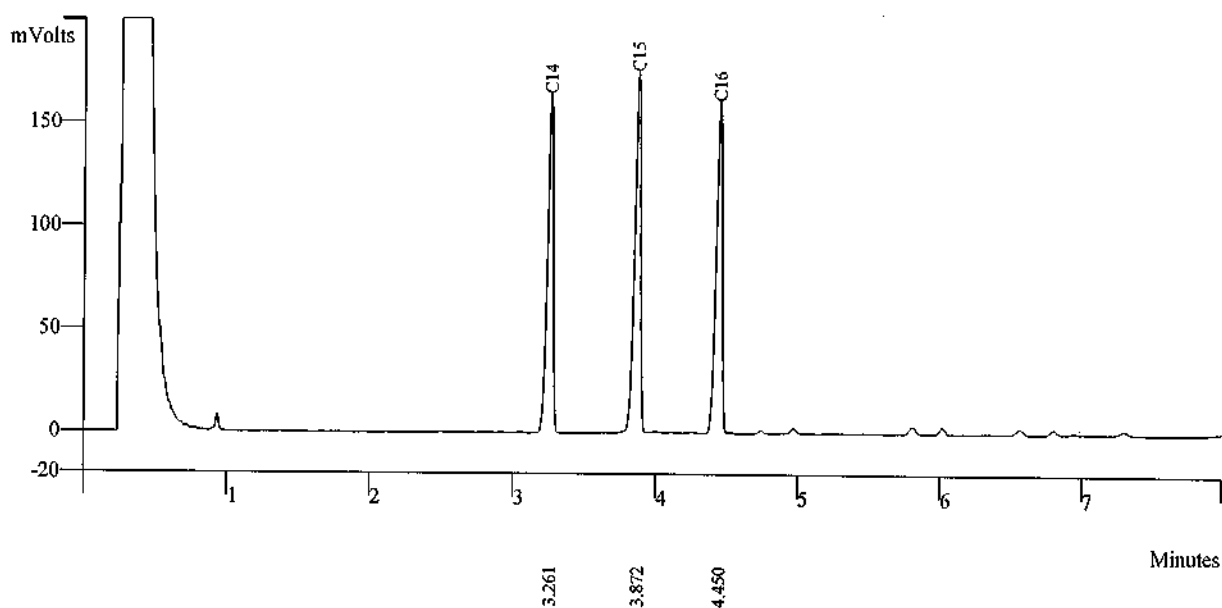
Run Mode: Calibration

Peak Measurement: Peak Area

Calculation Type: External Std.

e:\sps2025\fidstd004.run

A = FID 10 V RESULTS



| Peak No | Peak Name | Result () | Ret Time (min) | Peak Area (counts) | Sep. Code | Width 1/2 (sec) |
|---------|-----------|-----------|----------------|--------------------|-----------|-----------------|
| 1       | C14       | 0.0000    | 3.261          | 468907             | BB        | 2.7             |
| 2       | C15       | 0.0000    | 3.872          | 521664             | VV        | 2.8             |
| 3       | C16       | 0.0000    | 4.450          | 478772             | VB        | 2.8             |
|         | Totals    | 0.0000    |                | 1469343            |           |                 |

Sample ID: **fid std**



**VARIAN**

Operator (Inj): watsamon

Injection Date: 02/08/2025

Calc Date: 02/08/2025

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):

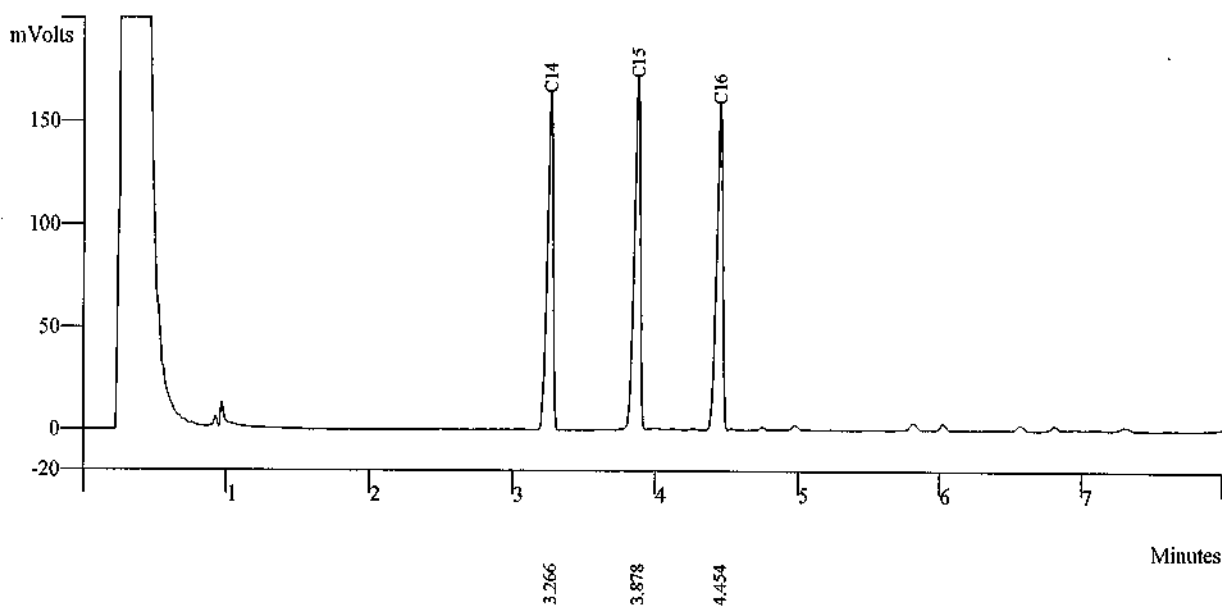
Run Mode: Calibration

Peak Measurement: Peak Area

Calculation Type: External Std.

e:\sps2025\fidstd005.run

A = FID 10 V RESULTS



| Peak No | Peak Name | Result () | Ret Time (min) | Peak Area (counts) | Sep. Code | Width 1/2 (sec) |
|---------|-----------|-----------|----------------|--------------------|-----------|-----------------|
| 1       | C14       | 0.0000    | 3.266          | 459351             | BB        | 2.6             |
| 2       | C15       | 0.0000    | 3.878          | 509340             | VV        | 2.8             |
| 3       | C16       | 0.0000    | 4.454          | 468353             | VB        | 2.8             |
|         | Totals    | 0.0000    |                | 1437044            |           |                 |



C14

External Standard Analysis

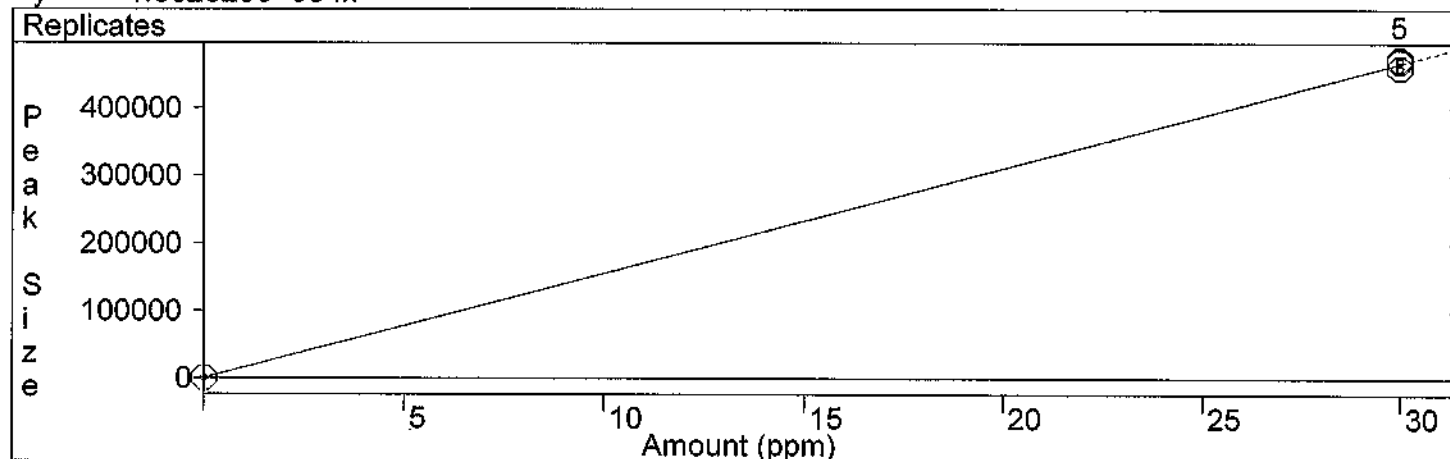
Curve Type: Linear

Origin: Force

$$y = +1.552325e+004x$$

Resp. Fact. RSD: 1.347%

Coeff. Det. ( $r^2$ ): 0.999130



C15

External Standard Analysis

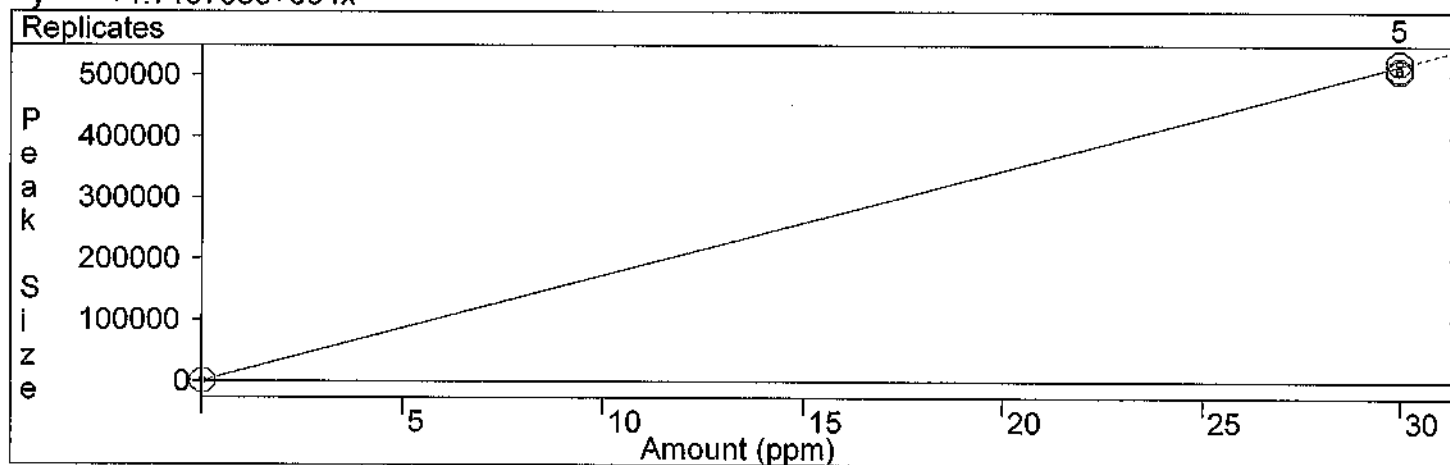
Curve Type: Linear

Origin: Force

$$y = +1.719798e+004x$$

Resp. Fact. RSD: 1.481%

Coeff. Det. ( $r^2$ ): 0.998948



C16

External Standard Analysis

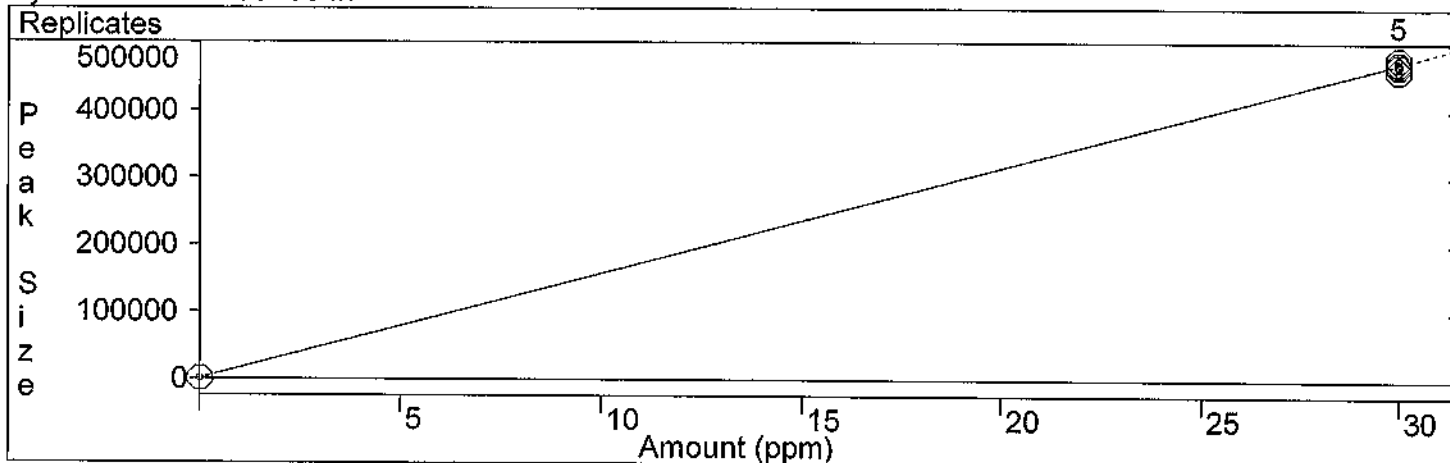
Curve Type: Linear

Origin: Force

$$y = +1.572118e+004x$$

Resp. Fact. RSD: 1.611%

Coeff. Det. ( $r^2$ ): 0.998756



# CERTIFICATE

This is to certify, that

***Somchai Pohthongkham***

has participated the course

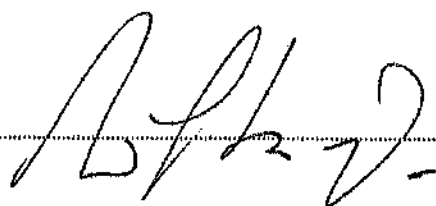
***Basic GC and Sampler training***

Date: ***24 – 27 May 2004***

Location: ***Middelburg***

Instructor: ***W.J. Buys***

Signature instructor:



**VARIAN**

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Varian Chrompack International BV  
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**WK Electric Co., Ltd.**



68/242 Moo 5, Sawaipracharaj Rd., Tumbol Ladsawai, Amphur Lamlukka, Pathumthani 12150

Tel. +66 2993 4773, +66 2153 7132-3 Fax. +66 2994 5509 E-mail : wk.calibrations@gmail.com www.wk-etc.com

## Certificate of Calibration

**Certificate No.:** WK2412-053-1

Page 1 of 2

**Customer** : THAI UNIQUE CO., LTD.  
80-82 Prachathipatai Rd., Bangkhunphrom,  
Pranakorn, Bangkok 10200

**Instrument** : AMD Flow Meter  
**Manufacturer** : Agilent Technologies  
**Model** : G6691A  
**Serial No.** : MY16470347  
**Identity No.** : SV-DF-001  
**Range** : 0 ml/min to 750 ml/min  
**Resolution** : See to Data  
**Calibration Method** : CP-WK-M10

**Ambient Temperature** : (23 ± 2) °C  
**Humidity** : (50 ± 15) %RH  
**Received Date** : 4-Dec-24  
**Calibrated Date** : 11-Dec-24  
**Issued Date** : 13-Dec-24  
**Calibrated Location** : In Lab

**Reference standard instruments :**

| <u>Instrument</u>       | <u>Serial No.</u> | <u>Certificate No.</u> | <u>Due Date</u> | <u>Traceability to</u> |
|-------------------------|-------------------|------------------------|-----------------|------------------------|
| Flow Calibrator         | 140215-134        | L202304114-001         | 18-Apr-25       | MIT                    |
| Primary Flow Calibrator | 1107-S            | WK2405-049-5           | 22-May-25       | WK Electric Co., Ltd.  |

MIT : Miracle International Technology Co., Ltd.

This result calibrate was found accurate as shown on date place of calibrate only

This certificate is traceability to the International System of Unit (SI)

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

**Calibrated by :** Mr.Thippatai Mungpungklang

**Approved by :**

Ms. Budsagorn Patcha

Authorized Signatory

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



**Measuretronix Limited**  
2425/2 Lat Phrao Road, Saphan Song  
Wangthonglang, Bangkok 10310, Thailand  
Phone : 0-2514-1000, 0-2514-1234  
Fax : 0-2514-0001, 0-2514-0003  
Website : www.measuretronix.com



## Certificate of Calibration

Certificate Number : LF25-0305  
Equipment : Thermometer  
Manufacturer : Fluke  
Model : 51  
Serial Number : 5910857  
Asset Number : 5910857  
Customer : Thal Unique Co., Ltd.  
80-82 Prachathipatal Road,  
Bangkhunphrom, Pranakorn,  
Bangkok 10200  
Date of Calibrate : 6-Jun-2025  
Date of Issue : 6-Jun-2025

*This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).*

*This calibration certificate applies only to the item identified and shall not be reproduced other than in full, without specific written approved by Measuretronix Cal-Lab. Calibration certificates without signature are not valid.*

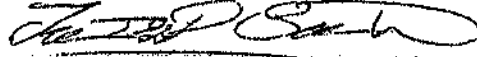
*The measurements marked with an asterisk (\*) in this certificate are outside our range of accreditation. They have been included for completeness.*

*The Calibration interval (Cal.Due) is the responsibility of the end user.*

Calibrated by

  
Mr. Samak Uaonkaonoi  
Metrology Technician

Approved by

  
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Cal-Lab Manager



Agilent Technologies

## Certificate of Analysis

### FID-TCD Performance Evaluation Sample Kit

Agilent Part  
Number: 5080-8842, 18710-60170

Sample Lot  
Number: 0006750304

This analytical reference material was manufactured and verified in accordance with an ISO 9001 registered quality system, and the analyte concentrations were verified by an ISO 17025 accredited laboratory. The certified value for each analyte was determined gravimetrically.

**Concentrations:**

|               |                           |             |
|---------------|---------------------------|-------------|
| n-tetradecane | 0.218 g/L ( $\pm 0.5\%$ ) | 0.033 w/w % |
| n-pentadecane | 0.218 g/L ( $\pm 0.5\%$ ) | 0.033 w/w % |
| n-hexadecane  | 0.218 g/L ( $\pm 0.5\%$ ) | 0.033 w/w % |

**Solvent:** hexane

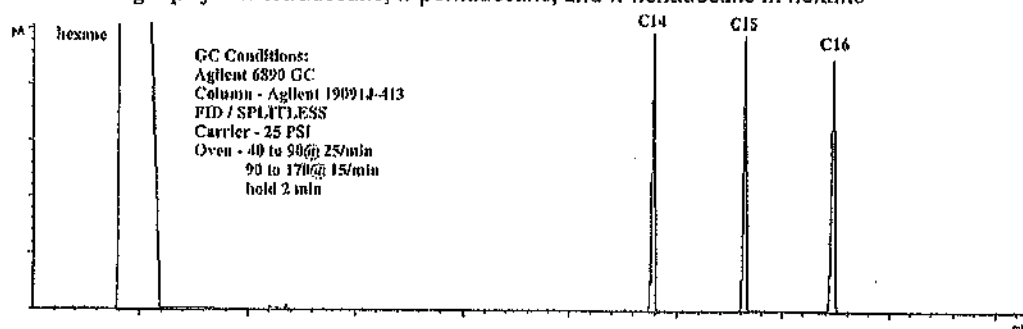
Calibrated Class A glassware and clean bottles were used in the manufacture of this standard. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

**Purities:**

|               |       |
|---------------|-------|
| n-tetradecane | 99.6% |
| n-pentadecane | 99%   |
| n-hexadecane  | 99.5% |
| hexane        | 99%   |

### Typical Analytical Spectrum or Chromatography

GC Chromatography – n-tetradecane, n-pentadecane, and n-hexadecane in hexane



Date of release: 30 June 2023

Date of expiration: 31 July 2025

*Monica Bourgeois*  
Monica Bourgeois  
QMS Representative