

## ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

| รายการตรวจวัด                              | เครื่องมือเก็บตัวอย่าง  | เครื่องมือตรวจวิเคราะห์                               |
|--|---|---|
| <b>1. คุณภาพอากาศในบรรยากาศ</b>            |   |   |
| Total Suspended Particulate                | High Volume Air Sampler No. B08, B12, B16, B18, B25                                     | Digital Balance                                       |
| PM <sub>10</sub>                           | High Volume PM <sub>10</sub> Air Sampler No. B03, B07, B10, B15, B17                    | Digital Balance                                       |
| PM <sub>2.5</sub>                          | High Volume PM <sub>2.5</sub> Air Sampler No. 06, 07, 09, 12, 13                        | Digital Balance                                       |
| Hydrogen Chloride                          | Gas Sampler Box No. B01, B03, B05, B07, B10   | -   |
| Sulfur Dioxide                             | SO <sub>2</sub> Analyzer No. B04, B05, B12, R07, R010                                   | SO <sub>2</sub> Analyzer No. B04, B05, B12, R07, R010 |
| Nitrogen Dioxide                           | NO <sub>x</sub> Analyzer No. B01, B07, B11, B21, R07                                    | NO <sub>x</sub> Analyzer No. B01, B07, B11, B21, R07  |
| <b>2. คุณภาพอากาศจากปล่อง</b>              |   |   |
| Total Suspended Particulate                | Console No. B01, R01<br>Pitot Tube No. B35, B58   | Digital Balance                                       |
| Oxides of Nitrogen                         | Vacuum Gauge  | Spectrophotometer                                     |
| Sulfur Dioxide                             | Personal Pump SKC No. B05, B90<br>Rotameter No. H-B08                                   | -   |
| Sodium Hydroxide as Sodium                 | Console No. R01<br>Pitot Tube No. B58   | Inductively Couple Plasma (ICP)                       |
| Hydrogen Chloride                          | Personal Pump SKC No. B74, B90<br>Rotameter No. H-B05, B08                              | Ion Chromatography (IC)                               |
| <b>3. ระดับเสียงในบรรยากาศ</b>             |   |   |
| <b>3.1 ระดับเสียงริมรั้วโรงงาน</b>         |   |   |
| L <sub>eq</sub> 24 hr และ L <sub>90</sub>  | Acoustic Calibrator<br>Sound Level Meter No. ACO-B04, B05, B09, B10, B27, B32, B43, R07 | -<br>-  |
| <b>3.2 ระดับเสียงในชุมชน</b>               |   |   |
| L <sub>eq</sub> 24 hr และ L <sub>max</sub> | Acoustic Calibrator<br>Sound Level Meter No. ACO-B15, B23, B26, B38, B42, R54           | -   |

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)**

| รายการตรวจวัด            | เครื่องมือเก็บตัวอย่าง | เครื่องมือตรวจวิเคราะห์                   |
|--------------------------|------------------------|---|
| <b>4. คุณภาพน้ำ</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                           |
| Manganese                | -                      | Inductively Couple Plasma (ICP)           |
| Lead                     | -                      | Inductively Couple Plasma (ICP)           |
|                          |                        | Atomic Absorption Spectrophotometer (AAS) |
| Zinc                     | -                      | Inductively Couple Plasma (ICP)           |
| Total Chromium           | -                      | Inductively Couple Plasma (ICP)           |
| Conductivity             | -                      | Conductivity Meter                        |
| Total Aluminum           | -                      | Inductively Couple Plasma (ICP)           |
| Total Iron               | -                      | Inductively Couple Plasma (ICP)           |
| Total Coliform Bacteria  | -                      | Incubator                                 |
|                          |                        | Water Bath                                |
| Sulfate                  |                        | Spectrophotometer                         |
| Mercury                  | -                      | Atomic Absorption Spectrophotometer (AAS) |
| Hexavalent Chromium      | -                      | Spectrophotometer                         |
| Cadmium                  | -                      | Atomic Absorption Spectrophotometer (AAS) |
| Arsenic                  | -                      | Atomic Absorption Spectrophotometer (AAS) |
| Nickel                   | -                      | Inductively Couple Plasma (ICP)           |
| Copper                   | -                      | Inductively Couple Plasma (ICP)           |
| <b>5. คุณภาพกากตะกอน</b> |                        |   |
| Arsenic                  | -                      | Atomic Absorption Spectrophotometer (AAS) |
| Cadmium                  | -                      | Inductively Couple Plasma (ICP)           |
| Chromium                 | -                      | Inductively Couple Plasma (ICP)           |
| Lead                     | -                      | Inductively Couple Plasma (ICP)           |
| Mercury                  | -                      | Atomic Absorption Spectrophotometer (AAS) |
| Selenium                 | -                      | Atomic Absorption Spectrophotometer (AAS) |
| Zinc                     | -                      | Inductively Couple Plasma (ICP)           |
| Iron                     | -                      | Inductively Couple Plasma (ICP)           |
| Manganese                | -                      | Inductively Couple Plasma (ICP)           |

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)**

| รายการตรวจวัด                            | เครื่องมือเก็บตัวอย่าง   | เครื่องมือตรวจวิเคราะห์         |
|--|--|---------------------------------|
| <b>6. คุณภาพดิน</b>                      |  |                                 |
| Total Iron                               | -  | Inductively Couple Plasma (ICP) |
| Total Manganese                          | -  | Inductively Couple Plasma (ICP) |
| Total Chromium                           | -  | Inductively Couple Plasma (ICP) |
| Total Lead                               | -  | Inductively Couple Plasma (ICP) |
| <b>7. ระดับความร้อนในสถานประกอบการ</b>   |  |                                 |
| WBGT                                     | Digital Thermometer<br>Heat Stress WBGT Meter No. B05, B07,<br>B11, R08              | -                               |
| <b>8. คุณภาพอากาศในสถานประกอบการ</b>     |  |                                 |
| Total Dust                               | Personal Pump No. B45, R38<br>Rotameter No. H-B01, B03                               | Digital Balance                 |
| Respirable Dust                          | Personal Pump No. B39, R40<br>Rotameter No. H-B01, B03                               | Digital Balance                 |
| Hydrogen Chloride                        | Personal Pump No. B40, R39<br>Rotameter No. H-B01, B03                               | Ion Chromatography (IC)         |
| <b>9. ระดับเสียงในสถานประกอบการ</b>      |  |                                 |
| $L_{eq}$ 8 hr                            | Acoustic Calibrator<br>Sound Level Meter No. ACO-B18, B29,<br>B33, B36, B41, R41     | -                               |
| <b>10. ปริมาณเสียงสะสมแบบติดตัวบุคคล</b> |  |                                 |
| Noise Dose (TWA)                         | Acoustic Calibrator<br>Sound Level Meter No.NMD-B04, B05,<br>B06, B08, B11, B16, B20 | -                               |



คุณภาพอากาศในบรรยากาศ



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, Chatchak, 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> |
| B01                          | B01        | 01/08/2025       | $y = 1.099x - 3.517$                   | 0.999          |
| B02                          | B02        | 01/08/2025       | $y = 1.142x - 3.995$                   | 0.999          |
| B03                          | B03        | 01/08/2025       | $y = 1.127x - 5.756$                   | 0.997          |
| B04                          | B04        | 01/08/2025       | $y = 1.137x - 4.695$                   | 0.999          |
| B05                          | B05        | 01/08/2025       | $y = 1.128x - 5.472$                   | 0.999          |
| B06                          | B06        | 01/08/2025       | $y = 1.177x - 5.925$                   | 0.996          |
| B07                          | B07        | 01/08/2025       | $y = 1.147x - 5.407$                   | 0.999          |
| B08                          | B08        | 01/08/2025       | $y = 1.152x - 6.011$                   | 0.997          |
| B09                          | B09        | 01/08/2025       | $y = 1.132x - 4.325$                   | 0.998          |
| B10                          | B10        | 07/08/2025       | $y = 1.123x - 5.255$                   | 0.998          |
| B11                          | B11        | 01/08/2025       | $y = 1.131x - 3.867$                   | 0.997          |
| B12                          | B12        | 01/08/2025       | $y = 1.128x - 2.501$                   | 0.997          |
| B13                          | B13        | 01/08/2025       | $y = 1.162x - 4.037$                   | 0.996          |
| B14                          | B14        | 01/08/2025       | $y = 1.144x - 4.295$                   | 0.997          |
| B15                          | B15        | 01/08/2025       | $y = 1.101x - 3.061$                   | 0.998          |
| B16                          | B16        | 07/08/2025       | $y = 1.039x - 1.195$                   | 0.999          |
| B17                          | B17        | 01/08/2025       | $y = 1.056x + 0.573$                   | 0.998          |
| B18                          | B18        | 01/08/2025       | $y = 1.176x - 6.349$                   | 0.998          |
| B19                          | B19        | 01/08/2025       | $y = 1.150x - 4.805$                   | 0.996          |
| B20                          | B20        | 04/08/2025       | $y = 1.043x + 2.427$                   | 0.999          |
| B21                          | B21        | 01/08/2025       | $y = 1.064x + 0.460$                   | 0.997          |
| B22                          | B22        | 01/08/2025       | $y = 1.146x - 4.084$                   | 0.998          |
| B23                          | B23        | 01/08/2025       | $y = 1.118x - 2.441$                   | 0.999          |
| B24                          | B24        | 01/08/2025       | $y = 1.085x - 1.292$                   | 0.999          |
| B25                          | B25        | 01/08/2025       | $y = 1.074x + 0.323$                   | 0.999          |
| B26                          | B26        | 04/08/2025       | $y = 1.098x - 3.782$                   | 0.997          |
| B27                          | B27        | 01/08/2025       | $y = 1.173x - 7.561$                   | 0.997          |
| B28                          | B28        | 01/08/2025       | $y = 1.128x - 5.410$                   | 0.998          |
| B29                          | B29        | 01/08/2025       | $y = 1.134x - 3.750$                   | 0.998          |
| B30                          | B30        | 01/08/2025       | $y = 1.050x + 1.266$                   | 0.999          |
| B31                          | B31        | 04/08/2025       | $y = 1.166x - 5.291$                   | 0.999          |
| B32                          | B32        | 01/08/2025       | $y = 1.159x - 4.739$                   | 0.996          |
| B33                          | B33        | 01/08/2025       | $y = 1.173x - 5.447$                   | 0.997          |
| B34                          | B34        | 01/08/2025       | $y = 1.148x - 4.099$                   | 0.999          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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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

## High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3440

### Calibration Data

| High Volume PM-10 Data |            | Calibration Data |  |                |
|------------------------|------------|------------------|--|----------------|
| Recorder No.           | Blower No. | Date             | Actual Flowrate (ft <sup>3</sup> /min) | R <sup>2</sup> |
| B01                    | B01        | 01/08/2025       | $y = 1.114x - 2.914$                   | 0.997          |
| B02                    | B02        | 07/08/2025       | $y = 1.013x + 1.223$                   | 0.998          |
| B03                    | B03        | 01/08/2025       | $y = 1.161x - 6.637$                   | 0.997          |
| B04                    | B04        | 01/08/2025       | $y = 1.104x - 4.741$                   | 0.999          |
| B05                    | B05        | 01/08/2025       | $y = 1.139x - 4.983$                   | 0.999          |
| B06                    | B06        | 07/08/2025       | $y = 1.115x - 4.334$                   | 0.997          |
| B07                    | B07        | 01/08/2025       | $y = 1.134x - 5.274$                   | 0.999          |
| B08                    | B08        | 07/08/2025       | $y = 1.118x - 2.369$                   | 0.999          |
| B09                    | B09        | 01/08/2025       | $y = 1.043x - 0.834$                   | 0.999          |
| B10                    | B10        | 01/08/2025       | $y = 1.096x - 2.892$                   | 0.998          |
| B11                    | B11        | 01/08/2025       | $y = 1.114x - 3.605$                   | 0.997          |
| B12                    | B12        | 06/08/2025       | $y = 1.096x - 2.892$                   | 0.998          |
| B13                    | B13        | 04/08/2025       | $y = 1.112x - 4.752$                   | 0.996          |
| B14                    | B14        | 01/08/2025       | $y = 1.104x - 3.418$                   | 0.997          |
| B15                    | B15        | 01/08/2025       | $y = 1.119x - 2.509$                   | 0.996          |
| B16                    | B16        | 01/08/2025       | $y = 1.012x + 1.776$                   | 0.996          |
| B17                    | B17        | 04/08/2025       | $y = 1.094x - 0.874$                   | 0.999          |
| B18                    | B18        | 07/08/2025       | $y = 1.140x - 5.779$                   | 0.997          |
| B19                    | B19        | 04/08/2025       | $y = 1.087x - 0.543$                   | 0.999          |
| B20                    | B20        | 01/08/2025       | $y = 1.108x - 3.582$                   | 0.997          |
| B21                    | B21        | 01/08/2025       | $y = 1.138x - 4.442$                   | 0.996          |
| B22                    | B22        | 01/08/2025       | $y = 1.097x - 3.833$                   | 0.999          |
| B23                    | B23        | 01/08/2025       | $y = 1.127x - 4.713$                   | 0.999          |
| B24                    | B24        | 01/08/2025       | $y = 1.117x - 4.019$                   | 0.999          |
| B25                    | B25        | 01/08/2025       | $y = 1.137x - 5.745$                   | 0.996          |
| B26                    | B26        | 01/08/2025       | $y = 1.029x - 0.023$                   | 0.998          |
| B27                    | B27        | 01/08/2025       | $y = 1.136x - 6.732$                   | 0.996          |
| B28                    | B28        | 01/08/2025       | $y = 1.114x - 4.531$                   | 0.999          |
| B29                    | B29        | 01/08/2025       | $y = 1.126x - 5.420$                   | 0.999          |
| B30                    | B30        | 01/08/2025       | $y = 1.119x - 4.736$                   | 0.998          |
| B31                    | B31        | 01/08/2025       | $y = 1.011x + 2.394$                   | 0.998          |
| B32                    | B32        | 01/08/2025       | $y = 1.047x - 0.534$                   | 0.999          |
| B33                    | B33        | 01/08/2025       | $y = 1.052x - 0.474$                   | 0.998          |
| B34                    | B34        | 07/08/2025       | $y = 1.028x + 2.008$                   | 0.997          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Mr. Peera Detudom  
(Mr. Peera Detudom)



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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel: (662) 939-4370 (Automatic 5 Lines) Fax: (662) 513-4221 E-mail: sale@spscon.com

| CALIBRATION REPORT                              |   |                        |  |
|---|---|------------------------|--|
| PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC) |   |                        |  |
| DATE :  | 10 September 2025                             | BRAND :                | BGI  |
| MODEL :   | PQ200   | SERIAL NO.             | 164589 (VSCC)                              |
| NO.   | PM2.5-06                                      |                        |  |
| CALIBRATING CONDITION                           |   |                        |  |
| Pressure  | 1011  | mmbar                  | Temp. 24.6 °C                              |
| % RH  |   | 50                     |  |
| Calibration Method : Dry Cal Primary            |   | Model : Defender 510 H | S/N : 136164                               |
| CALIBRATION SETTING                             |   |                        |  |
| detaCal   | PM2.5 AIR SAMPLER                             |                        |  |
| Flowrate Reading, L/min                         | Initial Flowrate Reading (Before Adj.), L/min | % Dif.                 | Final Flowrate Reading (After Adj.), L/min |
| 16.70   | 16.65   | 0.299                  | 16.70                                      |

Calibrated by : Adul Dangklom  
(Mr. Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)

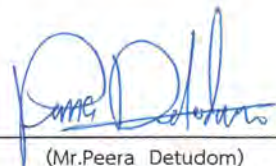




**บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด**  
**S.P.S. CONSULTING SERVICE CO., LTD.**  
 7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
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| CALIBRATION REPORT   |   |  |  |
|--|---|--|--|
| PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)                                      |   |  |  |
| DATE : <span style="border: 1px solid black; padding: 2px;">10 September 2025</span> | BRAND : <span style="border: 1px solid black; padding: 2px;">BGI</span>   | MODEL : <span style="border: 1px solid black; padding: 2px;">PQ200</span>            |  |
| NO. <span style="border: 1px solid black; padding: 2px;">PM2.5-07</span>             |   | SERIAL NO. <span style="border: 1px solid black; padding: 2px;">152099 (VSCC)</span> |  |
| CALIBRATING CONDITION  |   |  |  |
| Pressure <span style="border: 1px solid black; padding: 2px;">1011</span> mmbar      | Temp. <span style="border: 1px solid black; padding: 2px;">24.6</span> °C | % RH <span style="border: 1px solid black; padding: 2px;">50</span>                  |  |
| Calibration Method : Dry Cal Primary   | Model : Defender 510 H  | S/N : 136164   |  |
| CALIBRATION SETTING  |   |  |  |
| detaCal  | PM2.5 AIR SAMPLER   |  |  |
| Flowrate Reading, L/min  | Initial Flowrate Reading (Before Adj.), L/min                             | %Dif.  | Final Flowrate Reading (After Adj.), L/min |
| 16.70  | 16.66   | 0.240  | 16.70                                      |

Calibrated by : Adul Dangklom  
 (Mr.Adul Dangklom )

Approved by :   
 (Mr.Peera Detudom)



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  
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| CALIBRATION REPORT                              |  |                        |   |
|---|--|------------------------|---|
| PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC) |  |                        |   |
| DATE :  | 10 September 2025                            | BRAND :                | BGI                                       |
| MODEL :   | PQ200  | SERIAL NO.             | 152125 (VSCC)                             |
| NO.   | PM2.5-09                                     |                        |   |
| CALIBRATING CONDITION                           |  |                        |   |
| Pressure  | 1011   | mmbar                  | Temp. 24.6 °C                             |
|   |  |                        | % RH 50                                   |
| Calibration Method : Dry Cal Primary            |  | Model : Defender 510 H | S/N : 136164                              |
| CALIBRATION SETTING                             |  |                        |   |
| detaCal   | PM2.5 AIR SAMPLER                            |                        |   |
| Flowrate Reading,L/min                          | Initial Flowrate Reading (Before Adj.),L/min | %Dif.                  | Final Flowrate Reading (After Adj.),L/min |
| 16.70   | 16.64  | 0.359                  | 16.70                                     |

Calibrated by :

Adul Dangklom  
 (Mr.Adul Dangklom )

Approved by :

Peera Detudom  
 (Mr.Peera Detudom)



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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 (Automatic 5 Lines) Fax: (662) 513-4221 E-mail: sale@spscon.com

| CALIBRATION REPORT                              |   |                        |  |
|---|---|------------------------|--|
| PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC) |   |                        |  |
| DATE :  | 10 September 2025                             | MODEL :                | CCZ-30                                     |
| NO.   | PM2.5-12                                      | SERIAL NO.             | 2024EN0242003                              |
| CALIBRATING CONDITION                           |   |                        |  |
| Pressure  | 1011  | mmbar                  | Temp. 24.6 °C % RH 50                      |
| Calibration Method : Dry Cal Primary Flowmeter  |   | Model : Defender 510 H | S/N : 136164                               |
| CALIBRATION SETTING                             |   |                        |  |
| detaCal   | PM2.5 AIR SAMPLER                             |                        |  |
| Flowrate Reading, L/min                         | Initial Flowrate Reading (Before Adj.), L/min | % Dif.                 | Final Flowrate Reading (After Adj.), L/min |
| 16.70   | 16.65   | 0.299                  | 16.70                                      |

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 (Automatic 5 Lines) Fax: (662) 513-4221 E-mail: sale@spscon.com

| CALIBRATION REPORT                              |  |                        |   |
|---|--|------------------------|---|
| PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC) |  |                        |   |
| DATE :  | 10 September 2025                            | MODEL :                | CCZ--30                                   |
| NO.   | PM2.5-13                                     | SERIAL NO.             | 2024EN0242004                             |
| CALIBRATING CONDITION                           |  |                        |   |
| Pressure  | 1011   | mmbar                  | Temp. 24.6 °C % RH 50                     |
| Calibration Method : Dry Cal Primary Flowmeter  |  | Model : Defender 510 H | S/N : 136164                              |
| CALIBRATION SETTING                             |  |                        |   |
| detaCal   | PM2.5 AIR SAMPLER                            |                        |   |
| Flowrate Reading,L/min                          | Initial Flowrate Reading (Before Adj.),L/min | %Dif.                  | Final Flowrate Reading (After Adj.),L/min |
| 16.70   | 16.68  | 0.120                  | 16.70                                     |

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom )

Approved by : Peera Detudom  
(Mr.Peera Detudom)





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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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

## Gas Sampler Box Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Dry Cal DCL-ML

S/N : 136164

### Calibration Data

| Gas Sampler |           | Calibration Data |  |                           |                    |                  |                    |
|-------------|-----------|------------------|--|---------------------------|--------------------|------------------|--------------------|
| No.         | Rotameter | Date             | Setting<br>(Constant Flow)<br>(mL/min) | Actual Flow Rate (mL/min) |                    |                  |                    |
|             |           |                  |  | Sampling Line A           |                    | Sampling Line B  |                    |
|             |           |                  |  | Normal Condition          | Standard Condition | Normal Condition | Standard Condition |
| B01         | 2 (A&B)   | 01/09/2025       | 200                                    | 200.2                     | 199.6              | 200.4            | 199.8              |
| B02         | 2 (A&B)   | 02/09/2025       | 200                                    | 200.4                     | 199.8              | 200.5            | 199.9              |
| B03         | 2 (A&B)   | 02/09/2025       | 200                                    | 199.9                     | 199.3              | 199.7            | 199.1              |
| B04         | 2 (A&B)   | 03/09/2025       | 200                                    | 200.2                     | 199.6              | 199.8            | 199.2              |
| B05         | 2 (A&B)   | 02/09/2025       | 200                                    | 200.1                     | 199.5              | 200.4            | 199.8              |
| B06         | 2 (A&B)   | 01/09/2025       | 200                                    | 200.2                     | 199.6              | 199.8            | 199.2              |
| B07         | 2 (A&B)   | 03/09/2025       | 200                                    | 199.9                     | 199.3              | 200.3            | 199.8              |
| B08         | 2 (A&B)   | 01/09/2025       | 200                                    | 200.4                     | 199.8              | 199.9            | 199.4              |
| B09         | 2 (A&B)   | 01/09/2025       | 200                                    | 199.8                     | 199.3              | 200.2            | 199.6              |
| B10         | 2 (A&B)   | 01/09/2025       | 200                                    | 200.4                     | 199.8              | 200.5            | 199.9              |
| B11         | 2 (A&B)   | 02/09/2025       | 200                                    | 199.9                     | 199.4              | 200.2            | 199.6              |
| B12         | 2 (A&B)   | 02/09/2025       | 200                                    | 200.4                     | 199.8              | 200.1            | 199.5              |
| B13         | 2 (A&B)   | 01/09/2025       | 200                                    | 200.2                     | 199.7              | 199.8            | 199.2              |
| B14         | 2 (A&B)   | 01/09/2025       | 200                                    | 199.8                     | 199.2              | 199.9            | 199.3              |
| B15         | 2 (A&B)   | 03/09/2025       | 200                                    | 199.9                     | 199.3              | 199.6            | 199.0              |
| B16         | 2 (A&B)   | 03/09/2025       | 200                                    | 200.4                     | 199.8              | 200.2            | 199.6              |
| B17         | 2 (A&B)   | 01/09/2025       | 200                                    | 199.6                     | 199.1              | 199.9            | 199.3              |

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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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                                 |                                      |                   |                                |                                |            |
|--|--------------------------------------|-------------------|--------------------------------|--------------------------------|------------|
| SO <sub>2</sub> FLUORESCENT ANALYZER               |                                      |                   |                                |                                |            |
| DATE :   | 15 September 2025                    | BRAND :           | API                            | MODEL :                        | 100E       |
| NO.  | SO <sub>2</sub> -B04                 | SERIAL NO.        | 3159                           |                                |            |
| 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                                | 399.8             | -0.050                         | 400.0                          | 1.009      |
| 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  | 103.1                                | mV                | -20-150 with Zero Air          |                                |            |
| UV LAMP  | 3021.7                               | mV                | 1000-4900                      |                                |            |
| STR. LGT   | 61.5                                 | PPB               | <100                           |                                |            |
| DRK PMT  | 63.0                                 | mV                | -50 - 200                      |                                |            |
| DRK LMP  | 57.9                                 | mV                | -50 - 200                      |                                |            |
| HVPS   | 673                                  | V                 | 550-900 constant               |                                |            |
| DCPS   | 2516                                 | mV                | 2500 ± 200                     |                                |            |
| RCELL TEMP   | 50.2                                 | °C                | 50 ± 1                         |                                |            |
| BOX TEMP   | 29.1                                 | °C                | 5-40                           |                                |            |
| PMT TEMP   | 7.4                                  | °C                | 7 ± 2.0                        |                                |            |
| SO <sub>2</sub> Span Conc                          | 400                                  | PPB               | 20-20,000                      |                                |            |
| SO <sub>2</sub> Slope                              | 1.009                                | -                 | 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 :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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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

# CALIBRATION REPORT

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

DATE : 15 September 2025

BRAND : API

MODEL : 100E

NO. SO<sub>2</sub>-B05

SERIAL NO. 3270

### 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                             | 399.6             | -0.100 | 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              | 28.6           | in-Hg  | 25-35                          |
| SAMPLE FLOW               | 660            | cc/min | 650 ± 10%                      |
| PMT                       | 103.0          | mV     | -20-150 with Zero Air          |
| UV LAMP                   | 3017.9         | mV     | 1000-4900                      |
| STR. LGT                  | 61.9           | PPB    | <100                           |
| DRK PMT                   | 63.2           | mV     | -50 - 200                      |
| DRK LMP                   | 58.1           | mV     | -50 - 200                      |
| HVPS                      | 670            | V      | 550-900 constant               |
| DCPS                      | 2523           | mV     | 2500 ± 200                     |
| RCELL TEMP                | 50.0           | °C     | 50 ± 1                         |
| BOX TEMP                  | 28.9           | °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 : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

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# CALIBRATION REPORT

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

DATE : 15 September 2025

BRAND : TELEDYNE

MODEL : TML-50

NO. SO<sub>2</sub>-B12

SERIAL NO. 1886

### 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                             | 399.9             | -0.025 | 400.0                          | 1.010 |

### API Model TML-50 SO<sub>2</sub> Analyzer Check list

| Test Values               | Observed Value | Units  | Nominal Range                  |
|---------------------------|----------------|--------|--------------------------------|
| RANGE                     | 500            | PPB    | 0-500                          |
| SAMPLE PRESS              | 28.6           | in-Hg  | 25-35                          |
| SAMPLE FLOW               | 659            | cc/min | 650 ± 10%                      |
| PMT                       | 103.2          | mV     | -20-150 with Zero Air          |
| UV LAMP                   | 3027.8         | mV     | 1000-4900                      |
| STR. LGT                  | 61.4           | PPB    | <100                           |
| DRK PMT                   | 62.9           | mV     | -50 - 200                      |
| DRK LMP                   | 57.6           | mV     | -50 - 200                      |
| HVPS                      | 671            | V      | 550-900 constant               |
| DCPS                      | 2525           | mV     | 2500 ± 200                     |
| RCELL TEMP                | 50.3           | °C     | 50 ± 1                         |
| BOX TEMP                  | 29.2           | °C     | 5-40                           |
| PMT TEMP                  | 7.0            | °C     | 7 ± 2.0                        |
| SO <sub>2</sub> Span Conc | 400            | PPB    | 20-20,000                      |
| SO <sub>2</sub> Slope     | 1.010          | -      | 1.0 ± 0.3                      |
| SO <sub>2</sub> Offset    | 22.1           | 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 : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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| CALIBRATION REPORT                                   |                                   |                             |                                |                                |        |
|--|-----------------------------------|-----------------------------|--------------------------------|--------------------------------|--------|
| SO <sub>2</sub> FLUORESCENT ANALYZER                 |                                   |                             |                                |                                |        |
| DATE :   | 15 September 2025                 | BRAND :                     | TELEDYNE                       | MODEL :                        | TML-60 |
| NO.  | SO <sub>2</sub> -R07              | SERIAL NO.                  | TRS1068                        |                                |        |
| 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                             | 399.6                       | -0.100                         | 400.0                          | 1.005  |
| 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   | 28.4                              | in-Hg                       | 25-35                          |                                |        |
| SAMPLE FLOW  | 655                               | cc/min                      | 650 ± 10%                      |                                |        |
| PMT  | 103.4                             | mV                          | -20-150 with Zero Air          |                                |        |
| UV LAMP  | 3042.5                            | mV                          | 1000-4900                      |                                |        |
| STR. LGT   | 61.7                              | PPB                         | <100                           |                                |        |
| DRK PMT  | 63.2                              | mV                          | -50 - 200                      |                                |        |
| DRK LMP  | 58.0                              | mV                          | -50 - 200                      |                                |        |
| HVPS   | 669                               | V                           | 550-900 constant               |                                |        |
| DCPS   | 2519                              | mV                          | 2500 ± 200                     |                                |        |
| RCELL TEMP   | 50.4                              | °C                          | 50 ± 1                         |                                |        |
| BOX TEMP   | 29.2                              | °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                                | 1.005                             | -                           | 1.0 ± 0.3                      |                                |        |
| SO <sub>2</sub> Offset                               | 21.7                              | 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 :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Mr. Peera Detudom  
(Mr.Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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| CALIBRATION REPORT                                 |                                      |                   |                                |                                |            |    |
|--|--------------------------------------|-------------------|--------------------------------|--------------------------------|------------|----|
| SO <sub>2</sub> FLUORESCENT ANALYZER               |                                      |                   |                                |                                |            |    |
| DATE :   | 15 September 2025                    | BRAND :           | TELEDYNE                       | MODEL :                        | 100E       |    |
| NO.  | SO <sub>2</sub> -R10                 | SERIAL NO.        | TRS1065                        |                                |            |    |
| 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                                | 400.1             | 0.025                          | 400.0                          | 1.011      |    |
| API Model 100E SO <sub>2</sub> Analyzer Check list |                                      |                   |                                |                                |            |    |
| Test Values  | Observed Value                       | Units             | Nominal Range                  |                                |            |    |
| RANGE  | 500                                  | PPB               | 0-500                          |                                |            |    |
| SAMPLE PRESS                                       | 28.5                                 | in-Hg             | 25-35                          |                                |            |    |
| SAMPLE FLOW  | 658                                  | cc/min            | 650 ± 10%                      |                                |            |    |
| PMT  | 103.3                                | mV                | -20-150 with Zero Air          |                                |            |    |
| UV LAMP  | 3035.6                               | mV                | 1000-4900                      |                                |            |    |
| STR. LGT   | 61.9                                 | PPB               | <100                           |                                |            |    |
| DRK PMT  | 63.4                                 | mV                | -50 - 200                      |                                |            |    |
| DRK LMP  | 58.2                                 | mV                | -50 - 200                      |                                |            |    |
| HVPS   | 675                                  | V                 | 550-900 constant               |                                |            |    |
| DCPS   | 2528                                 | mV                | 2500 ± 200                     |                                |            |    |
| RCELL TEMP   | 50.2                                 | °C                | 50 ± 1                         |                                |            |    |
| BOX TEMP   | 29.3                                 | °C                | 5-40                           |                                |            |    |
| PMT TEMP   | 7.4                                  | °C                | 7 ± 2.0                        |                                |            |    |
| SO <sub>2</sub> Span Conc                          | 400                                  | PPB               | 20-20,000                      |                                |            |    |
| SO <sub>2</sub> Slope                              | 1.011                                | -                 | 1.0 ± 0.3                      |                                |            |    |
| SO <sub>2</sub> Offset                             | 22.2                                 | 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 :

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.  
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   |                                   |                   |                            |                                |            |    |
|--|-----------------------------------|-------------------|----------------------------|--------------------------------|------------|----|
| CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER |                                   |                   |                            |                                |            |    |
| DATE :   | 15 September 2025                 | BRAND :           | API                        | MODEL :                        | 200A       |    |
| NO.  | NOX-B01                           | SERIAL NO.        | 2368                       |                                |            |    |
| 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                               | 399.8             | -0.050                     | 400.0                          | 1.008      |    |
| NO <sub>x</sub> Span   | 400                               | 400.2             | 0.050                      | 400.0                          | 1.011      |    |
| API Model 200A 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  | 510                               | 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   | 7.0                               | °C                | 7 ± 2                      |                                |            |    |
| MOLY TEMP  | 315.2                             | °C                | 315 ± 5                    |                                |            |    |
| RCELL PRESS  | 8.2                               | IN-Hg-A           | 2 - 10 constant            |                                |            |    |
| SAMPLE PRESS   | 28.4                              | 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   | 1.008                             | -                 | 1.0 ± 0.3                  |                                |            |    |
| NO <sub>x</sub> Slope  | 1.011                             | -                 | 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 :

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.  
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   |                                   |                   |                            |                                |            |    |
|--|-----------------------------------|-------------------|----------------------------|--------------------------------|------------|----|
| CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER |                                   |                   |                            |                                |            |    |
| DATE :   | 15 September 2025                 | BRAND :           | API                        | MODEL :                        | 200E       |    |
| NO.  | NOX-B07                           | SERIAL NO.        | 4338                       |                                |            |    |
| 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                               | 399.6             | -0.100                     | 400.0                          | 1.004      |    |
| NO <sub>x</sub> Span   | 400                               | 399.8             | -0.050                     | 400.0                          | 1.008      |    |
| 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  | 509                               | cc/min            | 500 ± 50                   |                                |            |    |
| OZONE FLOW   | 79                                | cc/min            | 80 ± 15                    |                                |            |    |
| PMT  | 103.0                             | mV                | -20 - 150                  |                                |            |    |
| AZERO  | 93.7                              | mV                | -20 - 150                  |                                |            |    |
| HVPS   | 674                               | V                 | 420 - 900 constant         |                                |            |    |
| RCELL TEMP   | 50.1                              | °C                | 50 ± 1                     |                                |            |    |
| BOX TEMP   | 28.9                              | °C                | 8 - 48                     |                                |            |    |
| PMT TEMP   | 7.2                               | °C                | 7 ± 2                      |                                |            |    |
| MOLY TEMP  | 314.8                             | °C                | 315 ± 5                    |                                |            |    |
| RCELL PRESS  | 8.5                               | IN-Hg-A           | 2 - 10 constant            |                                |            |    |
| SAMPLE PRESS   | 28.7                              | 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   | 1.004                             | -                 | 1.0 ± 0.3                  |                                |            |    |
| NO <sub>x</sub> Slope  | 1.008                             | -                 | 1.0 ± 0.3                  |                                |            |    |
| NO Offset  | 1.0                               | 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 : 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.  
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   |                                   |                   |                            |                                |            |    |
|--|-----------------------------------|-------------------|----------------------------|--------------------------------|------------|----|
| CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER |                                   |                   |                            |                                |            |    |
| DATE :   | 15 September 2025                 | BRAND :           | API                        | MODEL :                        | 200E       |    |
| NO.  | NOX-B11                           | SERIAL NO.        | 4467                       |                                |            |    |
| 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                          | 1.010      |    |
| NO <sub>x</sub> Span   | 400                               | 400.3             | 0.075                      | 400.0                          | 1.014      |    |
| 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  | 508                               | cc/min            | 500 ± 50                   |                                |            |    |
| OZONE FLOW   | 78                                | cc/min            | 80 ± 15                    |                                |            |    |
| PMT  | 103.3                             | mV                | -20 - 150                  |                                |            |    |
| AZERO  | 94.1                              | mV                | -20 - 150                  |                                |            |    |
| HVPS   | 675                               | V                 | 420 - 900 constant         |                                |            |    |
| RCELL TEMP   | 50.0                              | °C                | 50 ± 1                     |                                |            |    |
| BOX TEMP   | 29.1                              | °C                | 8 - 48                     |                                |            |    |
| PMT TEMP   | 7.3                               | °C                | 7 ± 2                      |                                |            |    |
| MOLY TEMP  | 315.4                             | °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   | 1.010                             | -                 | 1.0 ± 0.3                  |                                |            |    |
| NO <sub>x</sub> Slope  | 1.014                             | -                 | 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 :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



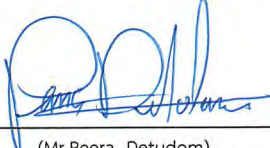
บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com.,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

| CALIBRATION REPORT   |                                   |                   |                            |                                |            |    |
|--|-----------------------------------|-------------------|----------------------------|--------------------------------|------------|----|
| CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER |                                   |                   |                            |                                |            |    |
| DATE :   | 15 September 2025                 | BRAND :           | API                        | MODEL :                        | TML-41M    |    |
| NO.  | NOX-B21                           | SERIAL NO.        | N02374                     |                                |            |    |
| 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                               | 399.9             | -0.025                     | 400.0                          | 1.009      |    |
| NO <sub>x</sub> Span   | 400                               | 400.2             | 0.050                      | 400.0                          | 1.012      |    |
| API Model TML-41M 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  | 103.1                             | mV                | -20 - 150                  |                                |            |    |
| AZERO  | 93.9                              | mV                | -20 - 150                  |                                |            |    |
| HVPS   | 670                               | V                 | 420 - 900 constant         |                                |            |    |
| RCELL TEMP   | 50.4                              | °C                | 50 ± 1                     |                                |            |    |
| BOX TEMP   | 29.3                              | °C                | 8 - 48                     |                                |            |    |
| PMT TEMP   | 7.2                               | °C                | 7 ± 2                      |                                |            |    |
| MOLY TEMP  | 314.9                             | °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   | 1.009                             | -                 | 1.0 ± 0.3                  |                                |            |    |
| NO <sub>x</sub> Slope  | 1.012                             | -                 | 1.0 ± 0.3                  |                                |            |    |
| NO Offset  | 1.4                               | 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 :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

  
(Mr.Peera Detudom)





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   |                                   |                   |                            |                                |            |    |
|--|-----------------------------------|-------------------|----------------------------|--------------------------------|------------|----|
| CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER |                                   |                   |                            |                                |            |    |
| DATE :   | 15 September 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.                     | : 201-5    |    |
| 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                          | 1.010      |    |
| NO <sub>x</sub> Span   | 400                               | 400.2             | 0.050                      | 400.0                          | 1.012      |    |
| 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  | 503                               | cc/min            | 500 ± 50                   |                                |            |    |
| OZONE FLOW   | 78                                | cc/min            | 80 ± 15                    |                                |            |    |
| PMT  | 102.9                             | mV                | -20 - 150                  |                                |            |    |
| AZERO  | 93.6                              | mV                | -20 - 150                  |                                |            |    |
| HVPS   | 673                               | V                 | 420 - 900 constant         |                                |            |    |
| RCELL TEMP   | 50.4                              | °C                | 50 ± 1                     |                                |            |    |
| BOX TEMP   | 29.0                              | °C                | 8 - 48                     |                                |            |    |
| PMT TEMP   | 7.3                               | °C                | 7 ± 2                      |                                |            |    |
| MOLY TEMP  | 315.3                             | °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   | 1.010                             | -                 | 1.0 ± 0.3                  |                                |            |    |
| NO <sub>x</sub> Slope  | 1.012                             | -                 | 1.0 ± 0.3                  |                                |            |    |
| NO Offset  | 1.6                               | mV                | -20 to +150                |                                |            |    |
| NO <sub>x</sub> Offset   | 1.0                               | 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 : Adul Dangklom  
(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

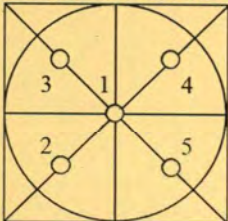
2. TARE FUNCTION : NORMAL

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



คุณภาพอากาศจากปล่อง





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

## Console Calibration Report

Calibration Method

Critical Orifices

### Calibration Data

| Console Data |            | Calibration Data |       |  |
|--------------|------------|------------------|-------|--|
| No.          | Serial No. | Date             | y     | $\Delta H_{\oplus}$ (mmH <sub>2</sub> O) |
| B01          | 1563       | 05/09/2025       | 1.004 | 49.67                                    |
| B02          | 8002514    | 01/09/2025       | 1.002 | 49.85                                    |
| B03          | 1503016    | 01/09/2025       | 1.005 | 49.77                                    |
| B04          | 00006659   | 04/09/2025       | 0.997 | 49.93                                    |
| B05          | 00007428   | 02/09/2025       | 1.003 | 49.51                                    |
| R01          | 1561       | 01/09/2025       | 0.999 | 49.82                                    |
| R02          | 8002513    | 01/09/2025       | 0.996 | 49.94                                    |
| R03          | 1570       | 04/09/2025       | 0.998 | 50.02                                    |
| R04          | 8002519    | 04/09/2025       | 1.002 | 49.89                                    |
| R05          | 1503015    | 02/09/2025       | 0.996 | 50.10                                    |

Remark : Accept Value of y (test) is  $0.97 < y < 1.03$

Accept Value of  $\Delta H_{\oplus}$  (test) is  $46.7 \pm 6.4$  (mmH<sub>2</sub>O)

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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## Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

### Calibration Data

| Pitot Tube Data |               |                               | Calibration Data |                   |        |
|-----------------|---------------|-------------------------------|------------------|-------------------|--------|
| No.             | Type of Pitot | Coefficient of Standard Pitot | Date             | Avg. of Cp (test) |        |
|                 |               |                               |                  | Side A            | Side B |
| B03             | S             | 0.99                          | 04/08/2025       | 0.84              | 0.84   |
| B04             | S             | 0.99                          | 01/08/2025       | 0.84              | 0.83   |
| B05             | S             | 0.99                          | 01/08/2025       | 0.84              | 0.84   |
| B07             | S             | 0.99                          | 04/08/2025       | 0.85              | 0.84   |
| B08             | S             | 0.99                          | 01/08/2025       | 0.84              | 0.84   |
| B09             | S             | 0.99                          | 04/08/2025       | 0.84              | 0.83   |
| B11             | S             | 0.99                          | 05/08/2025       | 0.84              | 0.84   |
| B16             | S             | 0.99                          | 04/08/2025       | 0.84              | 0.83   |
| B18             | S             | 0.99                          | 01/08/2025       | 0.84              | 0.84   |
| B19             | S             | 0.99                          | 01/08/2025       | 0.84              | 0.83   |
| B21             | S             | 0.99                          | 04/08/2025       | 0.84              | 0.83   |
| B24             | S             | 0.99                          | 01/08/2025       | 0.84              | 0.84   |
| B27             | S             | 0.99                          | 04/08/2025       | 0.84              | 0.83   |
| B30             | S             | 0.99                          | 01/08/2025       | 0.85              | 0.84   |
| B31             | S             | 0.99                          | 01/08/2025       | 0.84              | 0.85   |
| B33             | S             | 0.99                          | 01/08/2025       | 0.83              | 0.84   |
| B35             | S             | 0.99                          | 01/08/2025       | 0.84              | 0.85   |

Remark : Accept value of Cp (test) is  $0.84 \pm 0.01$

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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## Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

| Calibration Data |               |                               |                  |                   |        |
|------------------|---------------|-------------------------------|------------------|-------------------|--------|
| Pitot Tube Data  |               |                               | Calibration Data |                   |        |
| No.              | Type of Pitot | Coefficient of Standard Pitot | Date             | Avg. of Cp (test) |        |
|                  |               |                               |                  | Side A            | Side B |
| B36              | S             | 0.99                          | 01/08/2025       | 0.84              | 0.84   |
| B37              | S             | 0.99                          | 01/08/2025       | 0.84              | 0.85   |
| B38              | S             | 0.99                          | 01/08/2025       | 0.84              | 0.83   |
| B39              | S             | 0.99                          | 01/08/2025       | 0.84              | 0.84   |
| B40              | S             | 0.99                          | 04/08/2025       | 0.85              | 0.84   |
| B41              | S             | 0.99                          | 01/08/2025       | 0.84              | 0.84   |
| B44              | S             | 0.99                          | 05/08/2025       | 0.83              | 0.84   |
| B45              | S             | 0.99                          | 01/08/2025       | 0.84              | 0.85   |
| B46              | S             | 0.99                          | 01/08/2025       | 0.85              | 0.84   |
| B47              | S             | 0.99                          | 01/08/2025       | 0.85              | 0.84   |
| B48              | S             | 0.99                          | 01/08/2025       | 0.84              | 0.84   |
| B49              | S             | 0.99                          | 04/08/2025       | 0.85              | 0.84   |
| B54              | S             | 0.99                          | 01/08/2025       | 0.84              | 0.84   |
| B56              | S             | 0.99                          | 04/08/2025       | 0.84              | 0.84   |
| B57              | S             | 0.99                          | 04/08/2025       | 0.85              | 0.84   |
| B58              | S             | 0.99                          | 04/08/2025       | 0.84              | 0.84   |

Remark : Accept value of Cp (test) is  $0.84 \pm 0.01$

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

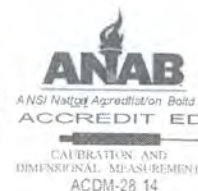
Approved by :

Peera Detudom  
(Mr. Peera Detudom)



# CALIBRATION LABORATORY Co.,LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-G353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## 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



# CALIBRATION LABORATORY Co., LTD.

211Q-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-Q353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



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





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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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 : 136164

#### Environmental Conditions

Temperature  
Pressure

25

± 3

°C

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> |
| B01                | SKC   | 224-PCXR4 | 262101     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,501 | 2,003 | 1.003x - 4.236               | 1.000          |
| B02                | SKC   | 224-PCXR4 | 626166     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,506 | 2,007 | 1.001x + 1.555               | 1.000          |
| B03                | SKC   | 224-PCXR4 | 612968     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,499 | 2,002 | 1.004x - 11.638              | 0.999          |
| B04                | SKC   | 224-PCXR4 | 602804     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,502 | 1,998 | 1.002x - 3.373               | 1.000          |
| B05                | SKC   | 224-PCXR4 | 612693     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,504 | 2,008 | 1.008x - 9.160               | 1.000          |
| B06                | SKC   | 224-PCXR4 | 262188     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,505 | 2,003 | 1.001x - 3.965               | 1.000          |
| B07                | SKC   | 224-PCXR4 | 626262     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,494 | 2,000 | 0.997x + 3.261               | 1.000          |
| B08                | SKC   | 224-PCXR4 | 626100     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,502 | 2,004 | 1.009x - 15.922              | 0.999          |
| B09                | SKC   | 224-PCXR4 | 626479     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,499 | 2,005 | 1.005x - 9.935               | 1.000          |
| B10                | SKC   | 224-PCXR4 | 091950     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,507 | 2,001 | 1.008x - 15.634              | 1.000          |
| B11                | SKC   | 224-PCXR8 | 564315     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,495 | 2,002 | 1.004x - 7.274               | 1.000          |
| B12                | SKC   | 224-PCXR4 | 034656     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,507 | 2,005 | 1.007x - 13.608              | 0.999          |
| B13                | SKC   | 224-PCXR4 | 602073     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,504 | 2,007 | 1.006x - 6.161               | 1.000          |
| B14                | SKC   | 224-PCXR4 | 626313     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,503 | 2,004 | 1.001x - 3.361               | 1.000          |
| B15                | SKC   | 224-PCXR4 | 626474     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,506 | 2,005 | 1.008x - 12.821              | 0.999          |
| B16                | SKC   | 224-PCXR4 | 626477     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,509 | 1,995 | 0.999x - 0.595               | 1.000          |
| B17                | SKC   | 224-PCXR4 | 626860     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,497 | 1,996 | 1.000x - 1.613               | 1.000          |
| B18                | SKC   | 224-PCXR4 | 691484     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,499 | 1,995 | 1.003x - 9.955               | 0.999          |
| B19                | SKC   | 224-PCXR4 | 691599     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,508 | 1,994 | 1.001x - 1.127               | 1.000          |
| B20                | SKC   | 224-PCXR4 | 691587     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,505 | 1,997 | 1.004x - 9.596               | 1.000          |
| B21                | SKC   | 224-PCXR4 | 691531     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,504 | 1,999 | 1.002x - 3.125               | 1.000          |
| B22                | SKC   | 224-PCXR4 | 691654     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,505 | 1,992 | 1.003x - 9.240               | 0.999          |
| B23                | SKC   | 224-PCXR4 | 798393     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 992             | 1,498 | 1,993 | 0.999x - 3.941               | 1.000          |
| B24                | SKC   | 224-PCXR4 | 626363     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,506 | 1,994 | 1.003x - 9.084               | 0.999          |
| B25                | SKC   | 224-PCXR4 | 798489     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,497 | 2,004 | 0.998x + 5.100               | 1.000          |
| B26                | SKC   | 224-PCXR4 | 798479     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,504 | 1,998 | 0.997x + 5.575               | 1.000          |
| B27                | SKC   | 224-PCXR4 | 691673     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,508 | 1,991 | 1.002x - 8.556               | 0.999          |
| B28                | SKC   | 224-PCXR4 | 691570     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,504 | 2,001 | 1.000x + 2.897               | 1.000          |
| B29                | SKC   | 224-PCXR4 | 626472     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,502 | 2,004 | 1.001x - 1.675               | 1.000          |
| B30                | SKC   | 224-PCXR4 | 691489     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,510 | 2,007 | 1.010x - 13.764              | 0.999          |
| B31                | SKC   | 224-PCXR4 | 691509     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,499 | 1,991 | 0.997x + 0.891               | 1.000          |
| B32                | SKC   | 224-PCXR4 | 091567     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,497 | 1,996 | 0.996x + 3.273               | 1.000          |
| B33                | SKC   | 224-PCXR4 | 091756     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,505 | 1,992 | 1.000x - 4.228               | 0.999          |
| B34                | SKC   | 224-PCXR4 | 612962     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,508 | 2,011 | 1.007x - 5.447               | 1.000          |
| B35                | SKC   | 224-PCXR4 | 602682     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,506 | 1,991 | 0.997x + 1.603               | 0.999          |
| B36                | SKC   | 224-PCXR4 | 626164     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,498 | 2,002 | 1.004x - 8.113               | 1.000          |
| B37                | SKC   | 224-PCXR4 | 626256     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,508 | 2,001 | 1.005x - 10.431              | 1.000          |
| B38                | SKC   | 224-PCXR4 | 626167     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,497 | 1,993 | 0.999x - 0.639               | 1.000          |
| B39                | SKC   | 224-PCXR4 | 034637     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,503 | 1,991 | 1.002x - 7.186               | 0.999          |
| B40                | SKC   | 224-PCXR4 | 798349     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,494 | 1,990 | 1.000x - 7.405               | 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.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร 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 : 136164

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> |
| B41                | SKC   | 224-PCXR4 | 612669     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,498 | 2,001 | 1.001x - 3.597               | 1.000          |
| B42                | SKC   | 224-PCXR4 | 626041     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,499 | 2,007 | 1.005x - 8.012               | 1.000          |
| B43                | SKC   | 224-PCXR4 | 034636     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,506 | 1,997 | 0.993x + 10.787              | 1.000          |
| B44                | SKC   | 224-PCXR8 | 529341     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,502 | 2,009 | 1.010x - 14.387              | 1.000          |
| B45                | SKC   | 224-PCXR8 | 529594     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,509 | 1,991 | 0.992x + 12.045              | 1.000          |
| B46                | SKC   | 224-PCXR8 | 566743     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,505 | 2,000 | 1.006x - 13.608              | 0.999          |
| B47                | SKC   | 224-PCXR8 | 566747     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,504 | 1,998 | 1.004x - 7.545               | 1.000          |
| B48                | SKC   | 224-PCXR8 | 566753     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,494 | 1,996 | 0.998x - 0.387               | 1.000          |
| B49                | SKC   | 224-PCXR8 | 566780     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,499 | 1,995 | 1.005x - 13.932              | 0.999          |
| B50                | SKC   | 224-PCXR8 | 500400     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,006           | 1,498 | 2,008 | 1.002x - 1.667               | 1.000          |
| B51                | SKC   | 224-PCXR8 | 500363     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,505 | 2,002 | 1.008x - 17.209              | 0.999          |
| B52                | SKC   | 224-PCXR8 | 093186     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 994             | 1,496 | 1,998 | 1.003x - 7.976               | 1.000          |
| B53                | SKC   | 224-PCXR8 | 707670     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,512 | 2,002 | 1.004x - 6.981               | 1.000          |
| B54                | SKC   | 224-PCXR3 | 509821     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,503 | 2,006 | 1.009x - 17.041              | 0.999          |
| B55                | SKC   | 224-PCXR3 | 510710     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,501 | 1,993 | 0.996x + 2.606               | 1.000          |
| B56                | SKC   | 224-PCXR3 | 511450     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,012           | 1,502 | 2,008 | 0.997x + 9.801               | 1.000          |
| B57                | SKC   | 224-PCXR3 | 510798     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,493 | 2,004 | 1.003x - 2.925               | 1.000          |
| B58                | SKC   | 224-PCXR3 | 509852     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,499 | 1,997 | 1.001x - 8.640               | 0.999          |
| B59                | SKC   | 224-PCXR3 | 509862     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,504 | 2,001 | 0.999x + 4.160               | 1.000          |
| B60                | SKC   | 224-PCXR3 | 512655     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,502 | 2,008 | 1.007x - 9.991               | 1.000          |
| B61                | SKC   | 224-PCXR3 | 503915     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,491 | 1,995 | 1.003x - 8.373               | 1.000          |
| B62                | SKC   | 224-PCXR3 | 505975     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,498 | 2,001 | 1.002x - 4.813               | 1.000          |
| B63                | SKC   | 224-PCXR3 | 511432     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,503 | 1,996 | 1.008x - 19.707              | 0.999          |
| B64                | SKC   | 224-PCXR3 | 508302     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,494 | 1,992 | 0.993x + 6.854               | 1.000          |
| B65                | SKC   | 224-PCXR3 | 508310     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,505 | 2,001 | 1.003x - 8.089               | 0.999          |
| B66                | SKC   | 224-PCXR3 | 509861     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,495 | 1,996 | 0.992x + 10.934              | 1.000          |
| B67                | SKC   | 224-PCXR3 | 506295     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,509 | 1,997 | 1.001x - 4.236               | 1.000          |
| B68                | SKC   | 224-PCXR3 | 505872     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,491 | 2,001 | 1.000x - 1.187               | 1.000          |
| B69                | SKC   | 224-PCXR3 | 508375     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,006           | 1,505 | 1,998 | 1.005x - 11.342              | 0.999          |
| B70                | SKC   | 224-PCXR3 | 510623     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,508 | 1,997 | 1.001x - 1.890               | 1.000          |
| B71                | SKC   | 224-PCXR3 | 508367     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,506 | 2,004 | 1.006x - 12.521              | 0.999          |
| B72                | SKC   | 224-PCXR3 | 505977     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,007           | 1,496 | 1,998 | 0.991x + 11.538              | 1.000          |
| B73                | SKC   | 224-PCXR3 | 512606     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,498 | 1,995 | 0.996x + 0.711               | 1.000          |
| B74                | SKC   | 224-PCXR3 | 505993     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,497 | 1,998 | 1.002x - 6.570               | 1.000          |
| B75                | SKC   | 224-PCXR3 | 509820     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,499 | 1,996 | 0.999x - 0.923               | 1.000          |
| B76                | SKC   | 224-PCXR3 | 509811     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,502 | 2,003 | 1.007x - 11.834              | 1.000          |
| B77                | SKC   | 224-PCXR3 | 508301     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,505 | 1,993 | 1.000x - 3.349               | 0.999          |
| B78                | SKC   | 224-PCXR3 | 510677     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,509 | 1,998 | 1.004x - 9.791               | 0.999          |
| B79                | SKC   | 224-PCXR3 | 510920     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,498 | 1,994 | 0.997x + 2.162               | 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.

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 : 136164

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.) |       |       |                              |                |
|                    |       |           |            |                  | 1                  | 2     | 3     | 1               | 2     | 3     | y                            | R <sup>2</sup> |
| B80                | SKC   | 224-PCXR3 | 504569     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,501 | 2,007 | 1.014x - 22.484              | 0.999          |
| B81                | SKC   | 224-PCXR3 | 503480     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,494 | 1,995 | 1.005x - 14.583              | 1.000          |
| B82                | SKC   | 224-PCXR3 | 505673     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,497 | 2,001 | 1.004 - 6.075                | 1.000          |
| B83                | SKC   | 224-PCXR3 | 510785     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,009           | 1,501 | 1,998 | 1.003x - 7.370               | 0.999          |
| B84                | SKC   | 224-PCXR3 | 508333     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,502 | 1,997 | 1.000x - 1.894               | 1.000          |
| B85                | SKC   | 224-PCXR3 | 505757     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,503 | 2,004 | 1.004x - 7.222               | 1.000          |
| B86                | SKC   | 224-PCXR3 | 512625     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,493 | 1,997 | 0.996x + 1.139               | 1.000          |
| B87                | SKC   | 224-PCXR3 | 504324     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,498 | 2,002 | 1.001x + 0.607               | 1.000          |
| B88                | SKC   | 224-PCXR3 | 508307     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,497 | 1,995 | 0.995x + 5.331               | 1.000          |
| B89                | SKC   | 224-PCXR3 | 509860     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,494 | 1,998 | 1.007x - 15.027              | 0.999          |
| B90                | SKC   | 224-PCXR3 | 508366     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,510 | 1,992 | 0.998x + 0.332               | 1.000          |
| B91                | SKC   | 224-PCXR3 | 510919     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,503 | 1,999 | 0.990x + 13.532              | 1.000          |
| B92                | SKC   | 224-PCXR3 | 510987     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,506 | 2,002 | 0.999x + 3.737               | 1.000          |
| B93                | SKC   | 224-PCXR3 | 509845     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,501 | 2,004 | 1.008x - 12.857              | 1.000          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Mr. Peera Detudom



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

### 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-B01          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 498.8           | 1001.4 | 2005.7 | 0.996x + 4.876               | 1.000          |
| H-B02          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 501.6           | 1001.3 | 1997.6 | 0.997x + 5.643               | 1.000          |
| H-B03          | Dwyer | VFB-65 | 03/07/2025       | 500                 | 1,000 | 2,000 | 499.3           | 1001.9 | 1990.3 | 0.998x + 3.307               | 0.999          |
| H-B04          | Dwyer | VFB-65 | 04/07/2025       | 500                 | 1,000 | 2,000 | 501.3           | 997.3  | 2005.9 | 1.000x + 1.052               | 1.000          |
| H-B05          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 501.6           | 998.8  | 2005.5 | 1.003x - 1.210               | 1.000          |
| H-B06          | Dwyer | VFB-65 | 03/07/2025       | 500                 | 1,000 | 2,000 | 500.9           | 1001.3 | 1990.6 | 0.997x + 5.814               | 0.999          |
| H-B07          | Dwyer | VFB-65 | 04/07/2025       | 500                 | 1,000 | 2,000 | 501.9           | 1001.7 | 2009.2 | 0.999x - 1.217               | 1.000          |
| H-B08          | Dwyer | VFB-65 | 04/07/2025       | 500                 | 1,000 | 2,000 | 499.0           | 998.4  | 2006.7 | 1.002x - 9.084               | 0.999          |
| H-B09          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 498.8           | 1000.5 | 1998.8 | 1.001x - 1.402               | 1.000          |
| H-B10          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 500.2           | 1000.6 | 2001.7 | 0.999x + 3.178               | 1.000          |

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Mr. 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

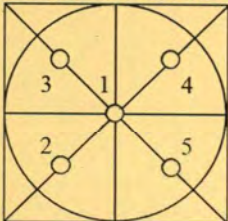
2. TARE FUNCTION : NORMAL

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





Cert. No. : SP25026

Pages : 1 of 4

## Calibration Certificate

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

| <u>Material</u> | <u>Certified Values of<br/>Reference Material (nm)</u> | <u>UUC* Reading<br/>(nm)</u> | <u>Error<br/>(nm)</u> | <u>Uncertainty<br/>± (nm)</u> | <u>k<br/>Factor</u> |
|-----------------|--|------------------------------|-----------------------|-------------------------------|---------------------|
| <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**



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

|   |   |  |
|---|---|--|
| <b>Customer :</b> <u>S.P.S.Consulting Service Co.,Ltd</u> | Date Tested: <u>July 1, 2025</u>              |  |
|   | Recommendation Recertification                |  |
| <b>Address :</b> <u>7 Soi Phaholyothin 24</u>             | Period <u>6</u> Months                        |  |
| <u>Paholyothin Road</u>                                   | Recertification Due: <u>January 1, 2026</u>   |  |
| <u>Jompol Chatuchak, Bangkok 1090</u>                     | Date Last Certified: <u>January 6, 2025</u>   |  |
| <b>User Name:</b> <u>K.Phenpha Vipasthawatt</u>           | Visit Number: <u>1 of 2</u>                   |  |
| <b>Phone:</b> <u>083-9269252</u>                          | PerkinElmer Phone: <u>02-719-6420 ext 206</u> |  |
| <b>Fax:</b> <u>02-513-4221</u>                            | PerkinElmer Fax: <u>02-318-5597</u>           |  |

| CONFIGURATION TESTED         |                           | ACCESSORIES/COMPONENT NOT INCLUDED |
|------------------------------|---------------------------|------------------------------------|
| <b>MODEL</b>                 | <b>SERIAL NUMBER</b>      |                                    |
| <u>OPTIMA 5300DV</u>         | <u>077C7042401</u>        |                                    |
| <b>TESTED EQUIPMENT</b>      | <b>CALIBRATION NUMBER</b> | <b>EXPIRATION</b>                  |
| <u>IPV Methods</u>           |                           |                                    |
| <b>TEST STANDARD USED</b>    | <b>PART NUMBER</b>        | <b>EXPIRATION DATE</b>             |
| <u>Multielement Standard</u> | <u>N069-1579</u>          | <u>December 30, 2024</u>           |
| <u>Wavecal Solution</u>      | <u>N058-2152</u>          | <u>March 30, 2024</u>              |
| <u>VIS Wavecal solution</u>  | <u>N930-2946</u>          | <u>February 28, 2024</u>           |
| <u>Instrument Cal. STD4</u>  | <u>N930-0221</u>          | <u>November 30, 2024</u>           |
| <b>CUSTOMER SUPPLIED</b>     | <b>COMMENTS</b>           | <b>CUSTOMER INITIALS</b>           |
| <u>2 % HNO3</u>              |                           |                                    |
| <u>10 % HNO3</u>             |                           |                                    |



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER** 077C7042401**DATE TESTED** July 1, 2025**1. MECHANICAL CHECKS**

A. Inspect and clean all fans and filters.

☐ OK

B. Inspect and replace as necessary, all torch components including the RF coil.

☐ OK

C. Inspect all tubing for sign of clacking or leaking.

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK**2. OPTICAL CHECKS**

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK**3. COOLING SYSTEM CHECKS**

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A**4. PERFORMANCE CHECKS**

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

SERIAL NUMBER : 077C7042401DATE TESTED : July 1, 2025

| PARAMETER                        |               | SPECIFICATION |       | FINAL VALUE |     |
|----------------------------------|---------------|---------------|-------|-------------|-----|
| Spectral Resolution : UV         | As 193.696 nm | ≤ 0.007       |       | 0.00570     |     |
|                                  | Ni 231.604 nm | ≤ 0.008       |       | 0.00734     |     |
|                                  | Ni 341.476 nm | ≤ 0.012       |       | 0.00763     |     |
| Spectral Resolution : VIS        | La 408.672 nm | ≤ 0.020       |       | 0.01627     |     |
|                                  | Ba 455.403 nm | ≤ 0.025       |       | 0.02428     |     |
| Precision                        |               |               |       |             |     |
|                                  | As 193.656 nm | % RSD         | < 1.0 | 0.82        | %   |
|                                  | Zn 213.856 nm | % RSD         | < 1.0 | 0.83        | %   |
|                                  | Mn 257.610 nm | % RSD         | < 1.0 | 0.20        | %   |
|                                  | La 379.478 nm | % RSD         | < 1.0 | 0.89        | %   |
|                                  | Ba 455.403 nm | % RSD         | < 1.0 | 0.92        | %   |
|                                  | Ba 493.408 nm | % RSD         | < 1.0 | 0.75        | %   |
| Detection Limits : Axial         | Tl 190.080 nm | 3(sd)         |       | 10.65       | ppb |
|                                  | As 193.696 nm | 3(sd)         |       | 2.48        | ppb |
|                                  | Pb 220.353 nm | 3(sd)         |       | 3.09        | ppb |
| Detection Limits : Radial        | As 193.696 nm | 3(sd)         |       | 331.50      | ppb |
|                                  | Zn 213.856 nm | 3(sd)         |       | 0.98        | ppb |
|                                  | Mn 257.610 nm | 3(sd)         |       | 0.34        | ppb |
|                                  | La 379.478 nm | 3(sd)         |       | 2.54        | ppb |
|                                  | Ba 455.403 nm | 3(sd)         |       | 2.19        | ppb |
|                                  | Ba 493.408 nm | 3(sd)         |       | 4.32        | ppb |
| BEC : Axial (IB X 500)/(IS-IB)   | Cd 226.502 nm | ≤ 150 ppb     |       | 140.03      |     |
| BEC : Radial (IB X 1000)/(IS-IB) | Mn 257.610 nm | ≤ 45 ppb      |       | 24.17       |     |



**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

**SERIAL NUMBER** 077C7042401

**DATE TESTED** July 1, 2025

**Remarks :**

Commissioning follow as commissioning performance sheets.

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This is to certify that the above tests have been performed and the configuration tested



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,  
including warranty terms.

**Service Department PerkinElmer Ltd.**

**Authorized Representative:**



( Wiphan Promlumda )

Service Engineer



## 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

ระดับเสียงในบรรยากาศ





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.

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

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

#### Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,  
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 Kluaypa)  
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

2 / 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

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

Office/Laboratory

668 Mu 2 Tambon Bangpoornai, Amphoe Muang Samutprakan,  
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



## 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-B10  | ACO   | 6236  | 00222299   | 12 July 2025     | 93.8                | 93.9             |
| ACO-B27  | ACO   | 6236  | 00182008   | 12 July 2025     | 93.9                | 93.9             |
| ACO-B32  | ACO   | 6236  | 00182014   | 12 July 2025     | 93.9                | 93.9             |
| ACO-B43  | ACO   | 6236  | 00192034   | 12 July 2025     | 93.7                | 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 :

(Signature)  
(Mr. Peera Detudom)



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

Noise B\_453/25

## 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-B04  | ACO   | 6236  | 00222298   | 10 September 2025 | 93.9                | 93.9             |
| ACO-B05  | ACO   | 6236  | 00222311   | 10 September 2025 | 93.9                | 93.9             |
| ACO-B09  | ACO   | 6236  | 00152004   | 10 September 2025 | 93.8                | 93.9             |
| ACO-R07  | ACO   | 6236  | 00172033   | 10 September 2025 | 93.8                | 93.9             |
| Acoustic Certified-Value : Thailand Institute of Scientific and Technological Research (TISTR) |       |       |            |                   | 93.81 ± 0.10 dB     |                  |

Calibrated by :

(Mr. Adul Dangklom )

Approved by :

(Mr. Peera Detudom)





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
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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

Noise B\_452/25

## 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-B15  | ACO   | 6236  | 00222300   | 10 September 2025 | 93.7                | 93.9             |
| ACO-B23  | ACO   | 6236  | 00182002   | 10 September 2025 | 93.7                | 93.9             |
| ACO-B26  | ACO   | 6236  | 00182007   | 10 September 2025 | 93.8                | 93.9             |
| ACO-B38  | ACO   | 6236  | 00192029   | 10 September 2025 | 93.9                | 93.9             |
| ACO-B42  | ACO   | 6236  | 00192033   | 10 September 2025 | 93.9                | 93.9             |
| ACO-R54  | ACO   | 6236  | 00222307   | 10 September 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)

คุณภาพน้ำ



# 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



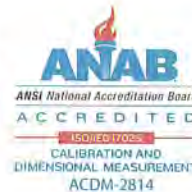
@clccalibration





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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    | Traceability                                    |
|--------|------------|-------------|---|
| 400001 | TT-0023-24 | 16 Feb 2026 | National Institute of Metrology-Thailand (NIMT) |

2. Standard Digital Thermometer

| ID No. | Cert. No. | Due Date    | Traceability                                    |
|--------|-----------|-------------|---|
| 400003 | 23E1866   | 01 Jun 2025 | National Institute of Metrology Thailand (NIMT) |
| 400004 | 23E1866   | 01 Jun 2025 | 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 : 25M2256  
REFERENCE No : 76365-3

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : SARTORIUS

**MODEL** : BSA224S-CW

**SERIAL No** : 36591843

**ID No** : BA09/61

**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 : 25M2256

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : BSA224S-CW  
MANUFACTURER : SARTORIUS S/N : 36591843  
ID No : BA09/61 RECEIVED DATE : 07-Mar-25  
AIR PRESSURE : 1009mbar  $\pm$  1mbar CALIBRATION DATE : 07-Mar-25  
AMBIENT TEMPERATURE : 24° C  $\pm$  1° C RELATIVE HUMIDITY : 52 %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

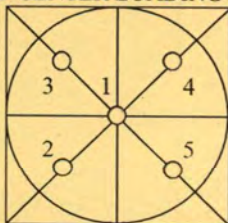
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000071 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

| NOMINAL VALUE (g) | BALANCE READING (g) | CORRECTION (g) | UNCERTAINTY ( $\pm$ g) |
|-------------------|---------------------|----------------|------------------------|
| 0.00              | 0.0000              | 0.0000         | 0.00012                |
| 0.10              | 0.1000              | 0.0000         | 0.00012                |
| 0.20              | 0.2000              | 0.0000         | 0.00012                |
| 0.50              | 0.5000              | 0.0000         | 0.00012                |
| 1.00              | 1.0000              | 0.0000         | 0.00012                |
| 2.00              | 2.0000              | 0.0000         | 0.00012                |
| 5.00              | 5.0000              | 0.0000         | 0.00012                |
| 10.00             | 10.0000             | 0.0000         | 0.00012                |
| 20.00             | 20.0001             | -0.0001        | 0.00012                |
| 50.00             | 50.0000             | 0.0000         | 0.00014                |
| 100.00            | 100.0001            | -0.0001        | 0.00019                |
| 200.00            | 200.0001            | -0.0001        | 0.00032                |

### 5. OFF CENTER LOADING ERROR



| POINT              | READING (g) |
|--------------------|-------------|
| 1                  | 100.0000    |
| 2                  | 100.0000    |
| 3                  | 100.0000    |
| 4                  | 100.0000    |
| 5                  | 100.0000    |
| 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

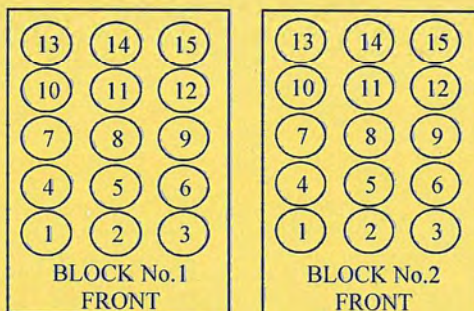
EQUIPMENT : COD REACTOR  
MANUFACTURER : HACH  
ID NUMBER : CRB 06/59  
RECEIVED DATE : 15-Jan-25  
AMBIENT TEMPERATURE : 23° C ± 1° C  
MODEL : DRB 200  
SERIAL NUMBER : 15110C0498  
CALIBRATION DATE : 03-Feb-25  
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

### 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 |
|   | 2    | 149.73 |
|   | 3    | 150.29 |
|   | 4    | 150.04 |
|   | 5    | 150.09 |
|   | 6    | 150.74 |
|   | 7    | 149.97 |
|   | 8    | 150.76 |
|   | 9    | 150.54 |
|   | 10   | 149.44 |
|   | 11   | 150.12 |
|   | 12   | 149.93 |
|   | 13   | 149.19 |
|   | 14   | 148.96 |
|   | 15   | 149.09 |
| 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





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

|   |   |                      |
|---|---|----------------------|
| <b>Customer :</b> <u>S.P.S.Consulting Service Co.,Ltd</u> | Date Tested: <u>July 1, 2025</u>              |                      |
|   | Recommendation Recertification                |                      |
| <b>Address :</b> <u>7 Soi Phaholyothin 24</u>             | Period <u>6</u>                               | Months <u>Months</u> |
| <u>Paholyothin Road</u>                                   | Recertification Due: <u>January 1, 2026</u>   |                      |
| <u>Jompol Chatuchak, Bangkok 1090</u>                     | Date Last Certified: <u>January 6, 2025</u>   |                      |
| <b>User Name:</b> <u>K.Phenpha Vipasthawatt</u>           | Visit Number: <u>1 of 2</u>                   |                      |
| <b>Phone:</b> <u>083-9269252</u>                          | PerkinElmer Phone: <u>02-719-6420 ext 206</u> |                      |
| <b>Fax:</b> <u>02-513-4221</u>                            | PerkinElmer Fax: <u>02-318-5597</u>           |                      |

| CONFIGURATION TESTED         |                           | ACCESSORIES/COMPONENT NOT INCLUDED |
|------------------------------|---------------------------|------------------------------------|
| <b>MODEL</b>                 | <b>SERIAL NUMBER</b>      |                                    |
| <u>OPTIMA 5300DV</u>         | <u>077C7042401</u>        |                                    |
| <b>TESTED EQUIPMENT</b>      | <b>CALIBRATION NUMBER</b> | <b>EXPIRATION</b>                  |
| <u>IPV Methods</u>           |                           |                                    |
| <b>TEST STANDARD USED</b>    | <b>PART NUMBER</b>        | <b>EXPIRATION DATE</b>             |
| <u>Multielement Standard</u> | <u>N069-1579</u>          | <u>December 30, 2024</u>           |
| <u>Wavecal Solution</u>      | <u>N058-2152</u>          | <u>March 30, 2024</u>              |
| <u>VIS Wavecal solution</u>  | <u>N930-2946</u>          | <u>February 28, 2024</u>           |
| <u>Instrument Cal. STD4</u>  | <u>N930-0221</u>          | <u>November 30, 2024</u>           |
| <b>CUSTOMER SUPPLIED</b>     | <b>COMMENTS</b>           | <b>CUSTOMER INITIALS</b>           |
| <u>2 % HNO3</u>              |                           |                                    |
| <u>10 % HNO3</u>             |                           |                                    |





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER**    077C7042401
**DATE TESTED**    July 1, 2025
**1. MECHANICAL CHECKS**

A. Inspect and clean all fans and filters.

☐ OK

B. Inspect and replace as necessary, all torch components including the RF coil.

☐ OK

C. Inspect all tubing for sign of clacking or leaking.

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK

**2. OPTICAL CHECKS**

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK

**3. COOLING SYSTEM CHECKS**

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A

**4. PERFORMANCE CHECKS**

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER :** 077C7042401
**DATE TESTED :** July 1, 2025

| PARAMETER                               |               | SPECIFICATION |       | FINAL VALUE |     |
|---|---------------|---------------|-------|-------------|-----|
| <b>Spectral Resolution : UV</b>         | As 193.696 nm | ≤ 0.007       |       | 0.00570     |     |
|   | Ni 231.604 nm | ≤ 0.008       |       | 0.00734     |     |
|   | Ni 341.476 nm | ≤ 0.012       |       | 0.00763     |     |
| <b>Spectral Resolution : VIS</b>        | La 408.672 nm | ≤ 0.020       |       | 0.01627     |     |
|   | Ba 455.403 nm | ≤ 0.025       |       | 0.02428     |     |
| <b>Precision</b>                        |               |               |       |             |     |
|   | As 193.656 nm | % RSD         | < 1.0 | 0.82        | %   |
|   | Zn 213.856 nm | % RSD         | < 1.0 | 0.83        | %   |
|   | Mn 257.610 nm | % RSD         | < 1.0 | 0.20        | %   |
|   | La 379.478 nm | % RSD         | < 1.0 | 0.89        | %   |
|   | Ba 455.403 nm | % RSD         | < 1.0 | 0.92        | %   |
|   | Ba 493.408 nm | % RSD         | < 1.0 | 0.75        | %   |
| <b>Detection Limits : Axial</b>         | Tl 190.080 nm | 3(sd)         |       | 10.65       | ppb |
|   | As 193.696 nm | 3(sd)         |       | 2.48        | ppb |
|   | Pb 220.353 nm | 3(sd)         |       | 3.09        | ppb |
| <b>Detection Limits : Radial</b>        | As 193.696 nm | 3(sd)         |       | 331.50      | ppb |
|   | Zn 213.856 nm | 3(sd)         |       | 0.98        | ppb |
|   | Mn 257.610 nm | 3(sd)         |       | 0.34        | ppb |
|   | La 379.478 nm | 3(sd)         |       | 2.54        | ppb |
|   | Ba 455.403 nm | 3(sd)         |       | 2.19        | ppb |
|   | Ba 493.408 nm | 3(sd)         |       | 4.32        | ppb |
| <b>BEC : Axial (IB X 500)/(IS-IB)</b>   | Cd 226.502 nm | ≤ 150 ppb     |       | 140.03      |     |
| <b>BEC : Radial (IB X 1000)/(IS-IB)</b> | Mn 257.610 nm | ≤ 45 ppb      |       | 24.17       |     |



**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

**SERIAL NUMBER** 077C7042401

**DATE TESTED** July 1, 2025

**Remarks :**

Commissioning follow as commissioning performance sheets.

This is to certify that the above tests have been performed and the configuration tested



meets



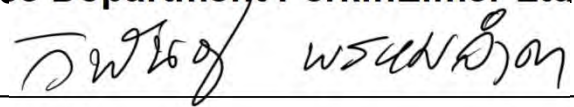
does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,  
including warranty terms.

**Service Department PerkinElmer Ltd.**

**Authorized Representative:**



( Wiphan Promlumda )

Service Engineer



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

|   |   |  |
|---|---|--|
| <b>Customer :</b> <u>S.P.S.Consulting Service Co.,Ltd</u> | Date Tested: <u>December 18, 2025</u>         |  |
|   | Recommendation Recertification                |  |
| <b>Address :</b> <u>7 Soi Phaholyothin 24</u>             | Period <u>6</u> Months                        |  |
| <u>Paholyothin Road</u>                                   | Recertification Due: <u>June 28, 2026</u>     |  |
| <u>Jompol Chatuchak, Bangkok 10900</u>                    | Date Last Certified: <u>July 1, 2025</u>      |  |
| <b>User Name:</b> <u>K.Phenpha Vipasthawatt</u>           | Visit Number: <u>2 of 2</u>                   |  |
| <b>Phone:</b> <u>083-9269252</u>                          | PerkinElmer Phone: <u>02-719-6420 ext 206</u> |  |
| <b>Fax:</b> <u>02-513-4221</u>                            | PerkinElmer Fax: <u>02-318-5597</u>           |  |

| CONFIGURATION TESTED         |                           | ACCESSORIES/COMPONENT<br>NOT INCLUDED |
|------------------------------|---------------------------|---------------------------------------|
| <b>MODEL</b>                 | <b>SERIAL NUMBER</b>      |                                       |
| <u>OPTIMA 5300DV</u>         | <u>077C7042401</u>        |                                       |
| <b>TESTED EQUIPMENT</b>      | <b>CALIBRATION NUMBER</b> | <b>EXPIRATION</b>                     |
| <u>IPV Methods</u>           |                           |                                       |
| <b>TEST STANDARD USED</b>    | <b>PART NUMBER</b>        | <b>EXPIRATION DATE</b>                |
| <u>Multielement Standard</u> | <u>N069-1579</u>          | <u>November 30, 2026</u>              |
| <u>Wavecal Solution</u>      | <u>N058-2152</u>          | <u>July 30, 2026</u>                  |
| <u>VIS Wavecal solution</u>  | <u>N930-2946</u>          | <u>August 30, 2026</u>                |
| <u>Instrument Cal. STD4</u>  | <u>N930-0221</u>          | <u>November 30, 2026</u>              |
| <b>CUSTOMER SUPPLIED</b>     | <b>COMMENTS</b>           | <b>CUSTOMER INITIALS</b>              |
| <u>2 % HNO3</u>              |                           |                                       |
| <u>10 % HNO3</u>             |                           |                                       |





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER** 077C7042401**DATE TESTED** December 18, 2025**1. MECHANICAL CHECKS**

- A. Inspect and clean all fans and filters.
- B. Inspect and replace as necessary, all torch components including the RF coil.
- C. Inspect all tubing for sign of clacking or leaking.
- D. Adjust water and gas pressure regulator settings.
- E. Inspect and leak check pneumatics drawers.
- F. Clean the exterior of the instrument.

☐ OK☐ OK☐ OK☐ OK☐ OK☐ OK**2. OPTICAL CHECKS**

- A. Inspect and clean all optical components.
- B. As required, check and replace all purgefilters.
- C. Recheck optical alignment.

☐ OK☐ OK☐ OK**3. COOLING SYSTEM CHECKS**

- A. Perform preventive maintenance on chiller.
- B. Flush out the chiller every year.

☐ OK☐ N/A**4. PERFORMANCE CHECKS**

- A. Torch View Alignment.
- B. Wavelength Calibration.

☐ OK☐ OK



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

| SERIAL NUMBER : 077C7042401      |               |            | DATE TESTED : December 18, 2025 |             |     |
|----------------------------------|---------------|------------|---------------------------------|-------------|-----|
| PARAMETER                        | SPECIFICATION |            |                                 | FINAL VALUE |     |
| Spectral Resolution : UV         | As            | 193.696 nm | ≤ 0.007                         | 0.00530     |     |
|                                  | Ni            | 231.604 nm | ≤ 0.008                         | 0.00708     |     |
|                                  | Ni            | 341.476 nm | ≤ 0.012                         | 0.00776     |     |
| Spectral Resolution : VIS        | La            | 408.672 nm | ≤ 0.020                         | 0.01614     |     |
|                                  | Ba            | 455.403 nm | ≤ 0.025                         | 0.02377     |     |
| Precision                        |               |            |                                 |             |     |
|                                  | As            | 193.656 nm | % RSD < 1.0                     | 0.67        | %   |
|                                  | Zn            | 213.856 nm | % RSD < 1.0                     | 0.62        | %   |
|                                  | Mn            | 257.610 nm | % RSD < 1.0                     | 0.88        | %   |
|                                  | La            | 379.478 nm | % RSD < 1.0                     | 0.63        | %   |
|                                  | Ba            | 455.403 nm | % RSD < 1.0                     | 0.65        | %   |
|                                  | Ba            | 493.408 nm | % RSD < 1.0                     | 0.45        | %   |
| Detection Limits : Axial         | Tl            | 190.080 nm | 3(sd)                           | 3.21        | ppb |
|                                  | As            | 193.696 nm | 3(sd)                           | 6.06        | ppb |
|                                  | Pb            | 220.353 nm | 3(sd)                           | 0.92        | ppb |
| Detection Limits : Radial        | As            | 193.696 nm | 3(sd)                           | 17.35       | ppb |
|                                  | Zn            | 213.856 nm | 3(sd)                           | 1.79        | ppb |
|                                  | Mn            | 257.610 nm | 3(sd)                           | 0.18        | ppb |
|                                  | La            | 379.478 nm | 3(sd)                           | 0.76        | ppb |
|                                  | Ba            | 455.403 nm | 3(sd)                           | 0.11        | ppb |
|                                  | Ba            | 493.408 nm | 3(sd)                           | 0.56        | ppb |
| BEC : Axial (IB X 500)/(IS-IB)   | Cd            | 226.502 nm | ≤ 150 ppb                       | 40.52       |     |
| BEC : Radial (IB X 1000)/(IS-IB) | Mn            | 257.610 nm | ≤ 45 ppb                        | 42.33       |     |



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER** 077C7042401**DATE TESTED** December 18, 2025**Remarks :**

Commissioning follow as commissioning performance sheets.

This is to certify that the above tests have been performed and the configuration tested



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,  
including warranty terms.

**Service Department PerkinElmer Ltd.**

**Authorized Representative:**

( Wiphan Promlumda )

Service Engineer



## MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

### FLOW INJECTION MERCURY SYSTEMS MODEL

#### FIAS 100

|                   |   |                                       |                          |
|-------------------|---|---------------------------------------|--------------------------|
| <b>Customer :</b> | <u>S.P.S.Consulting Service Co.,Ltd</u> | <b>Date Tested:</b>                   | <u>July 1, 2025</u>      |
|                   |   | <b>Recommendation Recertification</b> |                          |
| <b>Address :</b>  | <u>7 Soi Phaholyothin 24</u>            | <b>Period</b>                         | <u>6</u> Months          |
|                   | <u>Paholyothin Road</u>                 | <b>Recertification Due:</b>           | <u>January 1, 2026</u>   |
|                   | <u>Jompol Chatuchak, Bangkok 10900</u>  | <b>Date Last Certified:</b>           | <u>January 6, 2025</u>   |
| <b>User Name:</b> | <u>K.Phenpha Viphashtawat</u>           | <b>Visit Number:</b>                  | <u>1 of 2</u>            |
| <b>Phone:</b>     | <u>083-9269252</u>                      | <b>PerkinElmer Phone:</b>             | <u>02-719-6420 ext 8</u> |
| <b>Fax:</b>       | <u>02-513-4221</u>                      | <b>PerkinElmer Fax:</b>               | <u>02-318-5597</u>       |

#### CONFIGURATION TESTED

| MODEL           | SERIAL NUMBER       | SOFTWARE                     |
|-----------------|---------------------|------------------------------|
| <u>FIAS 100</u> | <u>100S14090404</u> | <u>Syngistix version 7.3</u> |
| <u> </u>        | <u> </u>            | <u> </u>                     |
| <u> </u>        | <u> </u>            | <u> </u>                     |
| <u> </u>        | <u> </u>            | <u> </u>                     |
| <u> </u>        | <u> </u>            | <u> </u>                     |

| TEST STANDARD USED      | PART NUMBER     | EXPIRATION DATE     |
|-------------------------|-----------------|---------------------|
| <u>Mercury (Hg) Std</u> | <u>N9300174</u> | <u>JUN 30, 2026</u> |
| <u> </u>                | <u> </u>        | <u> </u>            |
| <u> </u>                | <u> </u>        | <u> </u>            |

# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

## FLOW INJECTION MERCURY SYSTEMS MODEL

### FIAS 100

**SERIAL NUMBER** 100S14090404

**DATE TESTED** July 1, 2025

#### 1. INSTRUMENT CHECKS

A. The light part, quartz windows and detector. Clean if necessary.

☐ OK

B. Inspect the mercury lamp. Alignment if necessary.

☐ OK

C. Inspect the mercury filter. Replace if necessary.

☐ OK

D. Inspect and clean or replace the dust filter.

☐ OK

E. Inspect peristaltic pump tubes. Replace if necessary.

☐ OK

#### 2. ELECTRONICS CHECKS

A. Electronic power supplies

+ 5 Volts ( $\pm 0.3$ )

+ 4.98 Volts

+ 15 Volts ( $\pm 1.0$ )

+ 15.03 Volts

- 15 Volts ( $\pm 1.0$ )

- 15.07 Volts

+ 40 Volts ( $\pm 1.0$ )

+ 40.02 Volts

#### 3. GAS SYSTEM CHECK

A. Leak test all internal and external gas box joints.

☐ OK

B. Inspect solenoid valve and pressure switch.

☐ OK

C. Inspect non return valve. Replace sleeve if necessary.

☐ OK

D. Inspect flow meter and needle valve. Clean if necessary.

☐ OK

#### 4. MECHANICAL CHECKS

A. Inspect pump motor and pump roller.

☐ OK

B. Inspect and clean switching valve.

☐ OK

C. Inspect, clean and lubricant autosample.

☐ OK

# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

## FLOW INJECTION MERCURY SYSTEMS MODEL

### FIAS 100

|   |                     |                            |                         |
|---|---------------------|----------------------------|-------------------------|
| <b>SERIAL NUMBER</b>                                    | <u>100S14090404</u> | <b>DATE TESTED</b>         | <u>July 1, 2025</u>     |
| <b>PARAMETER</b>  |                     | <b>SPECIFICATION</b>       | <b>ACTUAL VALUE</b>     |
| <b>5. PERFORMANCE TEST</b>                              |                     |                            |                         |
| A. Baseline Noise Test                                  |                     |                            |                         |
| (measure peak area at 10 replicates without any sample) |                     |                            |                         |
|   | SD                  | $\leq 0.0015 \text{ A*s}$  | <u>0.0025</u> A*s       |
| B. Sensitivity Check                                    |                     |                            |                         |
| (10 ppb Hg Standard at 11 replicates)                   |                     |                            |                         |
|   | Mean Absorbance     | $\geq 0.0800 \text{ Abs.}$ | <u>0.1201</u> Abs.      |
| C. Characteristic mass( $m_0$ )                         |                     |                            |                         |
| (10 ppb Hg Standard at 11 replicates)                   |                     |                            |                         |
|   | $m_0$               | $\leq 314 \text{ pg}$      | <u>183.2</u> pg/0.0044A |
| D. Precision Check (%RSD)                               |                     |                            |                         |
| (10 ppb Hg Standard at 11 replicates)                   |                     |                            |                         |
|   | %RSD                | $\leq 2.5 \%$              | <u>1.65</u> %           |



# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

## FLOW INJECTION MERCURY SYSTEMS MODEL

FIAS 100

SERIAL NUMBER 100S14090404

DATE TESTED July 1, 2025

Remarks :

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This is to certify that the above tests have been performed and the configuration tested



meets



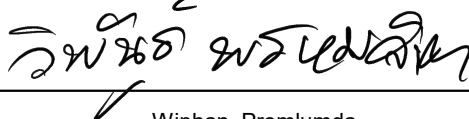
does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,  
including warranty terms.

**Service Department PerkinElmer Ltd.**

Customer Service Engineer:



(

Wiphan Promlumda

)

Service Engineer



# PinAAcle 900T Preventive Maintenance Report

Company Name: S.P.S Consulting Service Co.,Ltd

Instrument Location: AAS Room


Phaholyothin Rd, Ladyao, Jatujak, Bangkok 10900

Instrument Serial No.: PTCS1411103

Date: 18 DEC 2025

## ***PinAAcle 900T Preventive Maintenance (PM)***

|  |  |  |             |
|--|--|--|-------------|
| <b>Company Name:</b>                         | S.P.S Consulting Service Co.,Ltd                                 |  |             |
| <b>Address<br/>(Instrument Location):</b>    | Phaholyothin 24, Phaholyothin Rd, Ladyao, Jatujak, Bangkok 10900 |  |             |
| <b>Serial Number:</b>                        | PTCS1411103  | <b>PM Number:</b>                          | 2/2         |
| <b>Customer Name<br/>(if applicable):</b>    | K.Phenpha  | <b>Telephone Number:</b>                   | WO-11540402 |
| <b>Customer Support<br/>Engineer Name:</b>   | Prasit   | <b>Service Order<br/>Number:</b>           | 083-9269252 |
| <b>Date PM Performed:<br/>(DD-MMM-YYYY)</b>  | 18 DEC 2025  | <b>Next PM Due Date:<br/>(DD-MMM-YYYY)</b> | 18 JUN 2026 |
| <b>Standard Labor Hours to Complete PM :</b> |  | <b>5 hours</b>                             |             |

| Part Number    | Release | Publication Date |  |
|----------------|---------|------------------|---|
| 09370143 Rev.9 | A       | January 2018     |   |

### **Scope**

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900T 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 #    | Configuration Notes     |
|----------------------------|-------------|-------------------------|
| PinAAcle900T               | PTCS1411103 | WinLab32 Ver 7.4.1.0730 |
|                            |             |                         |
|                            |             |                         |
|                            |             |                         |

## Parts Lists

| Parts Included with the PM     |   |                          |
|--------------------------------|---|--------------------------|
| Part Number<br>(if applicable) | Description   | Quantity                 |
| B0501696                       | Fan Filters   | N/A <input type="text"/> |
| B3002013                       | THGA Contact Cylinders  | N/A <input type="text"/> |
| B3141064                       | Glycerol for THGA Cooling   | N/A                      |
| N3160156                       | O-Ring Kits for Sampling Introduction ( Stainless Steels Nebulizer) | N/A                      |
| N3160157                       | O-Ring Kits for Sampling Introduction ( Plastic Nebulizer)          | N/A <input type="text"/> |
| N9301714                       | Replacement Acetylene Filter Cartridge                              | N/A <input type="text"/> |
| TH001022                       | Replacement Air Filter Cartridge                                    | N/A <input type="text"/> |

| Additional Reagents and Standards Required for PM |                           |         |             |                         |
|---|---------------------------|---------|-------------|-------------------------|
| Part Number<br>(if applicable)                    | Description               | Quality | Batch/Lot # | Expired<br>Date (MM/YY) |
| N9300183  | 1000 mg/L Copper Standard | AR      | 27-156CUY1  | SEP-2026                |
| N9300244  | GFAAS Mixed Standard      | AR      |             |                         |

| Additional Reagents and Standards Required for PM (Customer Support Solution) |                       |          |             |                            |
|---|-----------------------|----------|-------------|----------------------------|
| Part Number<br>(if applicable)  | Description           | Quantity | Batch/Lot # | Expiration<br>Date (MM/YY) |
| N/A   | DI Water              | 250 ml.  | AR          | AR                         |
| N/A   | 0.5% HNO <sub>3</sub> | 250 ml.  | AR          | AR                         |

| Additional Tools Required for PM |                             |          |                |
|----------------------------------|-----------------------------|----------|----------------|
| Part Number<br>(if applicable)   | Description                 | Quantity | Serial #       |
| N1013000                         | 0.2A Neutral density filter | 1        | MG0-704        |
| N1013002                         | 1.0A Neutral density filter | 1        | MG2-891        |
| B3100652<br>Or N9307029          | Electronic Flow Meter       | 1        |                |
| B0505495                         | Test Jig                    | 1        |                |
| 03030997                         | System 2 EDL Driver         | 1        | 030309-97E     |
| N3050605                         | As System 2 EDL             | 1        | 17986          |
| N3050121                         | Cu Lumina HCL               | 1        | 000003793D12   |
| N3050109                         | Ba Lumina HCL               | 1        | 041123-010120  |
| N3050139                         | K Lumina HCL                | 1        | 0000037B8E1D   |
| N3050152                         | Ni Lumina HCL               | 1        |                |
| N3050119                         | Cr Lumina HCL               | 1        | 010324-0300050 |

# 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.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

## 2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

## 3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas and water lines for leaks and/or wear. Replace if needed. Thoroughly inspect all quick connects. Replace the Y connector, P/N 09921079, if needed.
- ☒ Clean exterior of the instrument.

### 3.1 Flame Technique

- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C<sub>2</sub>H<sub>2</sub> and N<sub>2</sub>O-C<sub>2</sub>H<sub>2</sub> flames (if applicable).

### 3.2 THGA Technique

- ☒ Inspect the pole pieces and clean where the pole pieces contact the furnace. Replace the pole piece p-rings as needed, P/N's B0501018 & B0501250. Grease the O-rings as needed with Apiezon L grease, P/N 09905148
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function.
- ☒ Verify the operation of the GFTV Camera for proper operation and viewing alignment in the furnace camera Tube View window. Align if needed.
- ☒ Check the operation of the Halogen Light ASSY for the GFTV Camera. Replace if needed.
- ☒ Check the water level/quality in the recirculation (if applicable). Add distilled water if necessary.
- ☒ Check the cooling system fluid flow rate with the FCS In-Line Flow Meter for proper levels if needed. Refer to SDB# COSY008.STN



- ☒ Perform Cooling System maintenance if needed per SDB# COSY005.STN.
- ☒ Check auto sampler operation.
- ☒ Perform an auto sampler check valve test as described in the Service Manual.
- ☒ Lubricate the spindles of the auto sampler pumps and all moving parts of the tray mechanics as described in the Service Manual.
- ☒ Inspect the auto sampler sampling capillary as described in the Service Manual. Replace if necessary.

#### 4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

#### 5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect and clean the furnace windows, if needed.
- ☒ Inspect and clean the GFTV camera lens, if needed.
- ☒ Inspect optics. Clean or replace if necessary,

#### 6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the air filter element is dry. Replace if necessary.

#### 7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

| Parameter                                     | Specification  | Test Results                    | Pass/Fail |
|---|--|---------------------------------|-----------|
| Flame Sensor                                  | Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down                 | Active <input type="checkbox"/> | Passed    |
| Drain Sensor                                  | Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down                 | Active <input type="checkbox"/> | Passed    |
| Nebulizer Sensor                              | Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down                 | Active <input type="checkbox"/> | Passed    |
| C <sub>2</sub> H <sub>2</sub> Pressure Sensor | Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down                 | Active <input type="checkbox"/> | Passed    |
| Air Pressure Sensor                           | Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down                 | Active <input type="checkbox"/> | Passed    |
| Burner Head Sensor                            | Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down | Active <input type="checkbox"/> | Passed    |

## 8. After PM Performance tests [Flame]:

### 8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

| Parameter       | Specification   | Certificate Value<br>at 553.6 nm (Abs.) | Test Results | Pass/Fail                               |
|-----------------|-----------------|---|--------------|---|
| 1.0 A ND Filter | ± 5% from Cert. | 0.9874                                  | 0.9644       | Passed <input type="button" value="v"/> |
| 0.2 A ND Filter | ± 5% from Cert. | 0.1886                                  | 0.1727       | Passed <input type="button" value="v"/> |

### 8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

| Parameter          | Specification | Results | Pass/Fail                               |
|--------------------|---------------|---------|---|
| Standard Deviation | ≤ 0.010       | 0.0016  | Passed <input type="button" value="v"/> |

### 8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

| Parameter          | Specification | Results | Pass/Fail                               |
|--------------------|---------------|---------|---|
| Standard Deviation | ≤ 0.001       | 0.0001  | Passed <input type="button" value="v"/> |

### 8.4 D<sub>2</sub> Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

| Parameter          | Specification | Results | Pass/Fail                                       |
|--------------------|---------------|---------|---|
| Standard Deviation | ≤ 0.010       | 0.0069  | Not Applicable <input type="button" value="v"/> |

### 8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

| Parameter          | Specification | Results | Pass/Fail                                       |
|--------------------|---------------|---------|---|
| Standard Deviation | ≤ 0.005       | 0.0005  | Not Applicable <input type="button" value="v"/> |

### 8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

| Parameter          | Specification | Results | Pass/Fail                                       |
|--------------------|---------------|---------|---|
| Standard Deviation | $\leq 0.005$  | 0.0013  | Not Applicable <input type="button" value="v"/> |

### 8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

| Standard Copper Sensitivity               | Specification | Results (Abs.) | Pass/Fail                               |
|---|---------------|----------------|---|
| 5 mg/L Sensitivity SS Neb (if applicable) | > 0.250 Abs.  | N/A            | Not Applicable                          |
| 2 mg/L Sensitivity HS Neb (if applicable) | > 0.250 Abs.  | 0.3544         | Passed <input type="button" value="v"/> |

## 9. After PM Performance tests [THGA]:

### 9.1 Furnace Gas Flows

Description: Ensures the flow rates are within specification.

| Parameter          | Specification              | Test Results | Pass/Fail                               |
|--------------------|----------------------------|--------------|---|
| Internal Flow Rate | 250 mL/min $\pm$ 25 mL/min | 252          | Passed <input type="button" value="v"/> |
| External Flow Rate | 100 mL/min $\pm$ 10 mL/min | 97           | Passed <input type="button" value="v"/> |

### 9.2 Chromium Baseline Noise

Description: Signal to noise check.

| Parameter          | Specification     | Results | Pass/Fail                               |
|--------------------|-------------------|---------|---|
| Baseline Noise     | $\leq 0.005$ Abs. | -0.0010 | Passed <input type="button" value="v"/> |
| Standard Deviation | $\leq 0.005$      | 0.0009  | Passed <input type="button" value="v"/> |

### 9.3 Chromium Characteristic Mass and Precision

Description: Calculate the characteristic mass using the characteristic mass tool and precision from the integrated absorbance values.

| Parameter        | Specification            | Results | Pass/Fail                               |
|------------------|--------------------------|---------|---|
| Cr $m_0$ Results | $\leq 7.0$ pg/0.0044 A-s | 6.8     | Passed <input type="button" value="v"/> |
| Precision        | $\leq 2.0$ %             | 0.38    | Passed <input type="button" value="v"/> |



#### 9.4 Copper Characteristic Mass and Zeeman Ratio

Description: Calculate the characteristic mass using the characteristic mass tool and check the Zeeman Ratio.

| Parameter                | Specification        | Results | Pass/Fail      |
|--------------------------|----------------------|---------|----------------|
| Cu m <sub>0</sub> Result | ≤ 16.5 pg/0.0044 A-s | 15.4    | Not Applicable |
| Zeeman Ratio             | 0.52 ± 0.04          | 0.51    | Not Applicable |


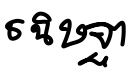
#### 10. Review:

- ☒ 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.

## Additional Comments

| Additional Comments Regarding the PM |   |
|--------------------------------------|---|
| Zeeman Ratio                         | $= \frac{\text{Atomic Signal (Peak area)}}{\text{Atomic Signal (Peak area)} + \text{Background Signal (Peak area)}}$ $= \frac{0.1442}{0.1442+0.1337}$ $= 0.518$ |

## Review

|   |   |
|---|---|
| <i>The preventive maintenance checks and if applicable performance tests for PinAAcle 900T have been completed.</i>             |   |
| <i>This PinAAcle 900T Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.</i> |   |
| <b>Review of Preventive Maintenance:</b>  |   |
| Authorized PerkinElmer Representative:  | <div style="text-align: center; font-size: 1.5em; margin-bottom: 10px;">  </div> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;">Date:</div> <div style="width: 35%; text-align: center;">18 DEC 2025</div> </div> <div style="text-align: right; font-size: 0.8em;">(DD-MMM-YYYY)</div> |
| Authorized Customer Representative:   | <div style="text-align: center; font-size: 1.5em; margin-bottom: 10px;">  </div> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;">Date:</div> <div style="width: 35%; text-align: center;">18 DEC 2025</div> </div> <div style="text-align: right; font-size: 0.8em;">(DD-MMM-YYYY)</div> |



# 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 : CONDUCTIVITY METER  
MANUFACTURER : METTLER TOLEDO  
MODEL / TYPE : SEVEN COMPACT S230  
SERIAL NO. : C141708983/5821320179[CD 05/65]  
CLID. NO. : 272300452  
JOB CONTROL NO. : 250204013412  
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 : 04 February 2025

DATE OF ISSUED : 06 February 2025

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

Calibrated By : Sukgasem Sechanart

Wenick Inchaisri

Calibration Engineer

Approved By :

Mongkol Yotsoontorn

Authorized Signatory

06 February 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. Q25013412

F3-011-05/12-23

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@clccalibration



## REPORT OF CALIBRATION

### FOR

|                     |   |                                 |
|---------------------|---|---------------------------------|
| NOMENCLATURE        | : | CONDUCTIVITY METER              |
| MANUFACTURER        | : | METTLER TOLEDO                  |
| MODEL / TYPE        | : | SEVEN COMPACT S230              |
| SERIAL NO.          | : | C141708983/5821320179[CD 05/65] |
| DATE OF CALIBRATION | : | 05 February 2025                |

---

#### ENVIRONMENT CONDITIONS :

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

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

#### PROCEDURE USED :

This instrument [ Conductivity Meter ] was calibrated under procedure No. **WI-305-130**.

The calibration was performed by direct measurement with Certified Reference Material (CRM) and Reference Material (RM) .

This instrument [Temperature] was calibrated by comparison with Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

1. Conductivity Solution , Hanna Product Code HI 7033L Lot Number 7830.
2. Potassium Chloride Solution ( nominal 1.41 mS/cm )
3. Potassium Chloride Solution ( nominal 12.8 mS/cm )
4. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
5. Precision Thermometer, ASL Model F201 S/N. 016168/09.
6. IPRT, ASL Model T100-250-1D S/N. PO106346-I-13.





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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 Hanna instruments.

Certificate No. 20F21 , Due Date June 2025 .

2. The measurements are traceable to International System of Units (SI) , through Sigma-Aldrich Canada Co.

Certificate No. HC30595403 , Due Date 31 January 2026 .

3. The measurements are traceable to International System of Units (SI) , through Sigma-Aldrich Canada Co.

Certificate No. HC20111554 , Due Date 30 September 2025.

4. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co , Ltd.

Certificate No. Q24120999, Due Date 26 November 2025.

5. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 0424/67, Due Date 21 February 2025.

6. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).

Certificate No. TT-0035-24, Due Date 01 March 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. Q25013412

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@clccalibration

## 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 Conductivity Meter.

### CALIBRATION DATA

#### 1. Conductivity Solution Test @ 25°C

| Standard Conductivity Solution | DUC Reading                                     | Uncertainty of Measurement | k Factor |
|--------------------------------|---|----------------------------|----------|
| *84.00 $\mu\text{S/cm}$        | 84.02 $\mu\text{S/cm}$ [Cell Constant 0.548589] | $\pm 1.00 \mu\text{S/cm}$  | 2,00     |
| 1414.0 $\mu\text{S/cm}$        | 1414 $\mu\text{S/cm}$ [Cell Constant 0.548589]  | $\pm 21.0 \mu\text{S/cm}$  | 2,00     |
| 12.83 mS/cm                    | 12.84 mS/cm [Cell Constant 0.548589]            | $\pm 0.19 \text{ mS/cm}$   | 2,00     |

Note. The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 02 Page 91 of 138

\* means Calibrations marked "Not TISI Accredited" in this Certificate have been included for completeness.

#### \*2. TEMPERATURE RESULT

| Immersion depth<br>(mm) | Actual Temperature<br>(°C) | DUC Reading<br>(°C) | Correction<br>(°C) | Uncertainty<br>$\pm$ (°C) |
|-------------------------|----------------------------|---------------------|--------------------|---------------------------|
| 100                     | 25.01                      | 24.9                | +0.11              | 0.07                      |

Technical Note. Type of sensor : Conductivity Probe

Probe Ø 12 mm

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

Note. \* means Calibrations marked "Not TISI Accredited" in this Certificate have been included for completeness.

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

### End of Certificate ###

Certificate No. Q25013412

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MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwack Rd. Bangpai Bangkac Bangkok 10160  
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



## CALIBRATION CERTIFICATE

Certificate No. : S2024090374-0003

Date Issued : 23-Sep-24

**Customer** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

**Equipment** : Incubator

**Manufacturer** : BINDER

**Model** : BD 115

**Serial No.** : 12-16967

**ID No./Tag No.** : IN 05/56

**Date Received** : 16-Sep-24

**Date Calibrated** : 16-Sep-24

**Calibrated by** : Anusak Songliam

### Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

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

### Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by:

*Saroyuth T.*  
(Saroyuth Tochua)





Certificate No. : S2024090374-0003

Environment : Ambient Temperature : Start record 23.7 °C, Stop record 23.5 °C  
Relative Humidity : Start record 54.6 %RH, Stop record 54.4 %RH

| Calibration Temperature (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Stability <sup>1</sup> (°C) | Measured Uniformity <sup>2</sup> (°C) | Overall Variation <sup>3</sup> (°C) |
|------------------------------|--------------------------|-----------------------------|--------------------------------------|---------------------------------------|-------------------------------------|
| 35                           | 35.0                     | 35.0                        | 0.04                                 | 0.21                                  | 0.38                                |
| 41.5                         | 41.5                     | 41.5                        | 0.07                                 | 0.19                                  | 0.30                                |

Without adjustment

| Calibration Temperature (°C) | STD No. 1 (°C) | STD No. 2 (°C) | STD No. 3 (°C) | STD No. 4 (°C) | STD No. 5 (°C) | STD No. 6 (°C) | STD No. 7 (°C) | STD No. 8 (°C) | STD No. 9 (°C) | Uncertainty <sup>4</sup> (±°C) |
|------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------------------------|
| 35                           | 34.81          | 35.12          | 34.93          | 34.92          | 35.02          | 34.82          | 34.92          | 35.13          | 34.98          | 0.23                           |
| 41.5                         | 41.31          | 41.49          | 41.33          | 41.34          | 41.41          | 41.31          | 41.52          | 41.32          | 41.46          | 0.23                           |

Decision Rule with Guard Band

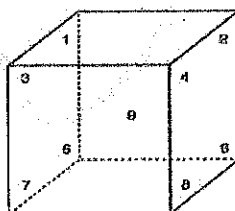
| Calibration Temperature (°C) | No. 1 | No. 2 | No. 3 | No. 4 | No. 5 | No. 6 | No. 7 | No. 8 | No. 9 | MPE (±°C) |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------|
| 35                           | Pass  | Pass  | Pass  | Pass  | Pass  | Pass  | Pass  | Pass  | Pass  | 0.5       |
| 41.5                         | Pass  | Pass  | Pass  | Pass  | Pass  | Pass  | Pass  | Pass  | Pass  | 0.5       |

Pass =  $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$       MPE = Maximum Permissible Error

Fail =  $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. 0



Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202407373-0005 for Temperature Indicator with Sensor Serial No. US37020317, Due 31-Jan-25

- Notes :
1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.
  2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.
  3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.
  4. The uncertainty of measurement is included temperature stability.
  5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

End of Certificate



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkac Bangkok 10160  
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



## CALIBRATION CERTIFICATE

Page 1 of 2

Certificate No. : S2025070410-0003

Date Issued : 24-Jul-25

**Customer** : S.P.S. CONSULTING SERVICE CO., LTD.  
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,  
Bangkok 10900

**Equipment** : Incubator

**Manufacturer** : BINDER

**Model** : BD 115

**Serial No.** : 12-16967

**ID No./Tag No.** : IN 05/56

**Date Received** : 22-Jul-25

**Date Calibrated** : 22-Jul-25

**Calibrated by** : Auttapol Kunaumpal

### Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

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

### Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by:

K. Nathang  
(Nathapong Krudaum)



**Certificate No. :** S2025070410-0003

**Environment :** Ambient Temperature : Start record 25.1 °C, Stop record 25.1 °C  
Relative Humidity : Start record 48.9 %RH, Stop record 49.3 %RH

| Calibration Temperature<br>(°C) | Setting Temperature<br>(°C) | Indicating Temperature<br>(°C) | Measured Stability <sup>1</sup><br>(°C) | Measured Uniformity <sup>2</sup><br>(°C) | Overall Variation <sup>3</sup><br>(°C) |
|---------------------------------|-----------------------------|--------------------------------|---|--|--|
| 35                              | 35.0                        | 35.0                           | 0.13                                    | 0.37                                     | 0.57                                   |
| 41.5                            | 41.5                        | 41.5                           | 0.10                                    | 0.35                                     | 0.49                                   |

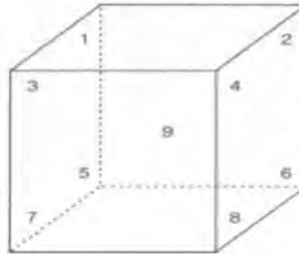
Without adjustment

| Calibration Temperature<br>(°C) | STD No. 1<br>(°C) | STD No. 2<br>(°C) | STD No. 3<br>(°C) | STD No. 4<br>(°C) | STD No. 5<br>(°C) | STD No. 6<br>(°C) | STD No. 7<br>(°C) | STD No. 8<br>(°C) | STD No. 9<br>(°C) | Uncertainty <sup>4</sup><br>(±°C) |
|---------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----------------------------------|
| 35                              | 34.97             | 34.91             | 34.96             | 34.82             | 34.81             | 34.86             | 34.83             | 35.11             | 34.95             | 0.23                              |
| 41.5                            | 41.51             | 41.37             | 41.40             | 41.26             | 41.27             | 41.42             | 41.43             | 41.53             | 41.50             | 0.23                              |

**STD = Standard**

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. OFF



Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

**Measurement Standards Used & Traceability :**

The International System of Units (SI) through

MIT Certificate No. L202412300-0027 for Temperature Indicator with Sensor Serial No. US37020317, Due 09-Sep-25

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

**End of Certificate**





CERTIFICATE No : 25T2261

REFERENCE No : 76365-8

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : WATER BATH

MANUFACTURER : MEMMERT

MODEL : WNB29

SERIAL No : L614.0123


ID No : WB 05/58

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 : SUCHART S.

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 : 25T2261

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
ID NUMBER : WB 05/58  
RECEIVED DATE : 07-Mar-25  
AMBIENT TEMPERATURE : 24 °C ± 1 °C

MODEL : WNB29  
SERIAL NUMBER : L614.0123  
CALIBRATION DATE : 07-Mar-25  
RELATIVE HUMIDITY : 51 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

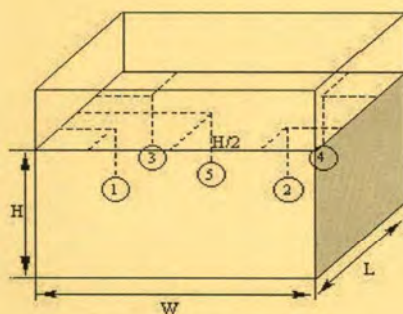
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.

2. REFERENCE STANDARD INSTRUMENTS :-

| INSTRUMENT              | MODEL | SERIAL No | CERTIFICATE No | DUE DATE  |
|-------------------------|-------|-----------|----------------|-----------|
| 1) DATA LOGGER WITH RTD | 2625A | 6603614   | 24T6473        | 01-Jul-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



PROBE INSTALLATION  
POSITION IN THE BATH

### GENERAL INFORMATION

|   |
|---|
| Overall Variation of Ambient Temperature around the Bath (°C) : 0.6 |
| Overall Variation of Line Voltage (V) : 12                          |
| Instrument Condition : Normal                                       |
| Bath Inner Size (W*L*H) : 60*40*10 cm                               |

### BATH PERFORMANCE

| Calibration Point (°C) | Controller Temperature (°C) | Temperature Stability (±°C) | Radius Uniformity (°C) | Axial Uniformity (°C) | Overall Variation (°C) |
|------------------------|-----------------------------|-----------------------------|------------------------|-----------------------|------------------------|
| 50.0                   | 50.2                        | 0.06                        | 0.05                   | 0.03                  | 0.16                   |
| 60.0                   | 60.2                        | 0.06                        | 0.08                   | 0.04                  | 0.17                   |

### TEMPERATURE MEASUREMENT ACCURACY TEST

| Controller Temp (°C) | Indicating Temp (°C) | Measured Temperature (°C) at Spread Locations |       |       |       |        | Uncertainty (± °C) |
|----------------------|----------------------|---|-------|-------|-------|--------|--------------------|
|                      |                      | #1  | #2    | #3    | #4    | Ref. 5 |                    |
| 50.2                 | 50.2                 | 49.84   | 49.88 | 49.86 | 49.88 | 49.89  | 0.15               |
| 60.2                 | 60.2                 | 59.83   | 59.84 | 59.85 | 59.86 | 59.91  | 0.16               |

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

NOTE 2 : 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. : SP25026

Pages : 1 of 4

## Calibration Certificate

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

คุณภาพกากตะกอน



## MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

### FLOW INJECTION MERCURY SYSTEMS MODEL

#### FIAS 100

|                   |   |                                       |                          |
|-------------------|---|---------------------------------------|--------------------------|
| <b>Customer :</b> | <u>S.P.S.Consulting Service Co.,Ltd</u> | <b>Date Tested:</b>                   | <u>July 1, 2025</u>      |
|                   |   | <b>Recommendation Recertification</b> |                          |
| <b>Address :</b>  | <u>7 Soi Phaholyothin 24</u>            | <b>Period</b>                         | <u>6</u> Months          |
|                   | <u>Paholyothin Road</u>                 | <b>Recertification Due:</b>           | <u>January 1, 2026</u>   |
|                   | <u>Jompol Chatuchak, Bangkok 10900</u>  | <b>Date Last Certified:</b>           | <u>January 6, 2025</u>   |
| <b>User Name:</b> | <u>K.Phenpha Viphasawat</u>             | <b>Visit Number:</b>                  | <u>1 of 2</u>            |
| <b>Phone:</b>     | <u>083-9269252</u>                      | <b>PerkinElmer Phone:</b>             | <u>02-719-6420 ext 8</u> |
| <b>Fax:</b>       | <u>02-513-4221</u>                      | <b>PerkinElmer Fax:</b>               | <u>02-318-5597</u>       |

#### CONFIGURATION TESTED

| MODEL           | SERIAL NUMBER       | SOFTWARE                     |
|-----------------|---------------------|------------------------------|
| <u>FIAS 100</u> | <u>100S14090404</u> | <u>Syngistix version 7.3</u> |
| <u> </u>        | <u> </u>            | <u> </u>                     |
| <u> </u>        | <u> </u>            | <u> </u>                     |
| <u> </u>        | <u> </u>            | <u> </u>                     |
| <u> </u>        | <u> </u>            | <u> </u>                     |

| TEST STANDARD USED      | PART NUMBER     | EXPIRATION DATE     |
|-------------------------|-----------------|---------------------|
| <u>Mercury (Hg) Std</u> | <u>N9300174</u> | <u>JUN 30, 2026</u> |
| <u> </u>                | <u> </u>        | <u> </u>            |
| <u> </u>                | <u> </u>        | <u> </u>            |

# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

## FLOW INJECTION MERCURY SYSTEMS MODEL

### FIAS 100

**SERIAL NUMBER** 100S14090404

**DATE TESTED** July 1, 2025

#### 1. INSTRUMENT CHECKS

A. The light part, quartz windows and detector. Clean if necessary.

☐ OK

B. Inspect the mercury lamp. Alignment if necessary.

☐ OK

C. Inspect the mercury filter. Replace if necessary.

☐ OK

D. Inspect and clean or replace the dust filter.

☐ OK

E. Inspect peristaltic pump tubes. Replace if necessary.

☐ OK

#### 2. ELECTRONICS CHECKS

A. Electronic power supplies

+ 5 Volts ( $\pm 0.3$ )

+ 4.98 Volts

+ 15 Volts ( $\pm 1.0$ )

+ 15.03 Volts

- 15 Volts ( $\pm 1.0$ )

- 15.07 Volts

+ 40 Volts ( $\pm 1.0$ )

+ 40.02 Volts

#### 3. GAS SYSTEM CHECK

A. Leak test all internal and external gas box joints.

☐ OK

B. Inspect solenoid valve and pressure switch.

☐ OK

C. Inspect non return valve. Replace sleeve if necessary.

☐ OK

D. Inspect flow meter and needle valve. Clean if necessary.

☐ OK

#### 4. MECHANICAL CHECKS

A. Inspect pump motor and pump roller.

☐ OK

B. Inspect and clean switching valve.

☐ OK

C. Inspect, clean and lubricant autosample.

☐ OK

# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

## FLOW INJECTION MERCURY SYSTEMS MODEL

### FIAS 100

|   |                     |                            |                         |
|---|---------------------|----------------------------|-------------------------|
| <b>SERIAL NUMBER</b>                                    | <u>100S14090404</u> | <b>DATE TESTED</b>         | <u>July 1, 2025</u>     |
| <b>PARAMETER</b>  |                     | <b>SPECIFICATION</b>       | <b>ACTUAL VALUE</b>     |
| <b>5. PERFORMANCE TEST</b>                              |                     |                            |                         |
| A. Baseline Noise Test                                  |                     |                            |                         |
| (measure peak area at 10 replicates without any sample) |                     |                            |                         |
|   | SD                  | $\leq 0.0015 \text{ A*s}$  | <u>0.0025</u> A*s       |
| B. Sensitivity Check                                    |                     |                            |                         |
| (10 ppb Hg Standard at 11 replicates)                   |                     |                            |                         |
|   | Mean Absorbance     | $\geq 0.0800 \text{ Abs.}$ | <u>0.1201</u> Abs.      |
| C. Characteristic mass( $m_0$ )                         |                     |                            |                         |
| (10 ppb Hg Standard at 11 replicates)                   |                     |                            |                         |
|   | $m_0$               | $\leq 314 \text{ pg}$      | <u>183.2</u> pg/0.0044A |
| D. Precision Check (%RSD)                               |                     |                            |                         |
| (10 ppb Hg Standard at 11 replicates)                   |                     |                            |                         |
|   | %RSD                | $\leq 2.5 \%$              | <u>1.65</u> %           |



# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

## FLOW INJECTION MERCURY SYSTEMS MODEL

### FIAS 100

**SERIAL NUMBER** 100S14090404**DATE TESTED** July 1, 2025

Remarks :

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This is to certify that the above tests have been performed and the configuration tested



meets



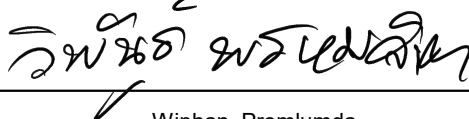
does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,  
including warranty terms.

### Service Department PerkinElmer Ltd.

Customer Service Engineer:



(

Wiphan Promlumda

)

Service Engineer



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

|   |   |                      |
|---|---|----------------------|
| <b>Customer :</b> <u>S.P.S.Consulting Service Co.,Ltd</u> | Date Tested: <u>July 1, 2025</u>              |                      |
|   | Recommendation Recertification                |                      |
| <b>Address :</b> <u>7 Soi Phaholyothin 24</u>             | Period <u>6</u>                               | Months <u>Months</u> |
| <u>Paholyothin Road</u>                                   | Recertification Due: <u>January 1, 2026</u>   |                      |
| <u>Jompol Chatuchak, Bangkok 1090</u>                     | Date Last Certified: <u>January 6, 2025</u>   |                      |
| <b>User Name:</b> <u>K.Phenpha Vipasthawatt</u>           | Visit Number: <u>1of 2</u>                    |                      |
| <b>Phone:</b> <u>083-9269252</u>                          | PerkinElmer Phone: <u>02-719-6420 ext 206</u> |                      |
| <b>Fax:</b> <u>02-513-4221</u>                            | PerkinElmer Fax: <u>02-318-5597</u>           |                      |

| CONFIGURATION TESTED         |                           | ACCESSORIES/COMPONENT NOT INCLUDED |
|------------------------------|---------------------------|------------------------------------|
| <b>MODEL</b>                 | <b>SERIAL NUMBER</b>      |                                    |
| <u>OPTIMA 5300DV</u>         | <u>077C7042401</u>        |                                    |
| <b>TESTED EQUIPMENT</b>      | <b>CALIBRATION NUMBER</b> | <b>EXPIRATION</b>                  |
| <u>IPV Methods</u>           |                           |                                    |
| <b>TEST STANDARD USED</b>    | <b>PART NUMBER</b>        | <b>EXPIRATION DATE</b>             |
| <u>Multielement Standard</u> | <u>N069-1579</u>          | <u>December 30, 2024</u>           |
| <u>Wavecal Solution</u>      | <u>N058-2152</u>          | <u>March 30, 2024</u>              |
| <u>VIS Wavecal solution</u>  | <u>N930-2946</u>          | <u>February 28, 2024</u>           |
| <u>Instrument Cal. STD4</u>  | <u>N930-0221</u>          | <u>November 30, 2024</u>           |
| <b>CUSTOMER SUPPLIED</b>     | <b>COMMENTS</b>           | <b>CUSTOMER INITIALS</b>           |
| <u>2 % HNO3</u>              |                           |                                    |
| <u>10 % HNO3</u>             |                           |                                    |



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER** 077C7042401**DATE TESTED** July 1, 2025**1. MECHANICAL CHECKS**

A. Inspect and clean all fans and filters.

☐ OK

B. Inspect and replace as necessary, all torch components including the RF coil.

☐ OK

C. Inspect all tubing for sign of clacking or leaking.

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK**2. OPTICAL CHECKS**

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK**3. COOLING SYSTEM CHECKS**

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A**4. PERFORMANCE CHECKS**

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER :** 077C7042401
**DATE TESTED :** July 1, 2025

| PARAMETER                               |                      | SPECIFICATION  |       | FINAL VALUE    |     |
|---|----------------------|----------------|-------|----------------|-----|
| <b>Spectral Resolution : UV</b>         | <b>As</b> 193.696 nm | $\leq 0.007$   |       | <u>0.00570</u> |     |
|   | <b>Ni</b> 231.604 nm | $\leq 0.008$   |       | <u>0.00734</u> |     |
|   | <b>Ni</b> 341.476 nm | $\leq 0.012$   |       | <u>0.00763</u> |     |
| <b>Spectral Resolution : VIS</b>        | <b>La</b> 408.672 nm | $\leq 0.020$   |       | <u>0.01627</u> |     |
|   | <b>Ba</b> 455.403 nm | $\leq 0.025$   |       | <u>0.02428</u> |     |
| <b>Precision</b>                        |                      |                |       |                |     |
|   | <b>As</b> 193.656 nm | % RSD          | < 1.0 | <u>0.82</u>    | %   |
|   | <b>Zn</b> 213.856 nm | % RSD          | < 1.0 | <u>0.83</u>    | %   |
|   | <b>Mn</b> 257.610 nm | % RSD          | < 1.0 | <u>0.20</u>    | %   |
|   | <b>La</b> 379.478 nm | % RSD          | < 1.0 | <u>0.89</u>    | %   |
|   | <b>Ba</b> 455.403 nm | % RSD          | < 1.0 | <u>0.92</u>    | %   |
|   | <b>Ba</b> 493.408 nm | % RSD          | < 1.0 | <u>0.75</u>    | %   |
| <b>Detection Limits : Axial</b>         | <b>Tl</b> 190.080 nm | 3(sd)          |       | <u>10.65</u>   | ppb |
|   | <b>As</b> 193.696 nm | 3(sd)          |       | <u>2.48</u>    | ppb |
|   | <b>Pb</b> 220.353 nm | 3(sd)          |       | <u>3.09</u>    | ppb |
| <b>Detection Limits : Radial</b>        | <b>As</b> 193.696 nm | 3(sd)          |       | <u>331.50</u>  | ppb |
|   | <b>Zn</b> 213.856 nm | 3(sd)          |       | <u>0.98</u>    | ppb |
|   | <b>Mn</b> 257.610 nm | 3(sd)          |       | <u>0.34</u>    | ppb |
|   | <b>La</b> 379.478 nm | 3(sd)          |       | <u>2.54</u>    | ppb |
|   | <b>Ba</b> 455.403 nm | 3(sd)          |       | <u>2.19</u>    | ppb |
|   | <b>Ba</b> 493.408 nm | 3(sd)          |       | <u>4.32</u>    | ppb |
| <b>BEC : Axial (IB X 500)/(IS-IB)</b>   | <b>Cd</b> 226.502 nm | $\leq 150$ ppb |       | <u>140.03</u>  |     |
| <b>BEC : Radial (IB X 1000)/(IS-IB)</b> | <b>Mn</b> 257.610 nm | $\leq 45$ ppb  |       | <u>24.17</u>   |     |



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

SERIAL NUMBER 077C7042401DATE TESTED July 1, 2025**Remarks :**

Commissioning follow as commissioning performance sheets.

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This is to certify that the above tests have been performed and the configuration tested



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,  
including warranty terms.

**Service Department PerkinElmer Ltd.****Authorized Representative:**

( Wiphan Promlumda )

Service Engineer

คุณภาพดิน





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

|   |   |                      |
|---|---|----------------------|
| <b>Customer :</b> <u>S.P.S.Consulting Service Co.,Ltd</u> | Date Tested: <u>July 1, 2025</u>              |                      |
|   | Recommendation Recertification                |                      |
| <b>Address :</b> <u>7 Soi Phaholyothin 24</u>             | Period <u>6</u>                               | Months <u>Months</u> |
| <u>Paholyothin Road</u>                                   | Recertification Due: <u>January 1, 2026</u>   |                      |
| <u>Jompol Chatuchak, Bangkok 1090</u>                     | Date Last Certified: <u>January 6, 2025</u>   |                      |
| <b>User Name:</b> <u>K.Phenpha Vipasthawatt</u>           | Visit Number: <u>1of 2</u>                    |                      |
| <b>Phone:</b> <u>083-9269252</u>                          | PerkinElmer Phone: <u>02-719-6420 ext 206</u> |                      |
| <b>Fax:</b> <u>02-513-4221</u>                            | PerkinElmer Fax: <u>02-318-5597</u>           |                      |

| CONFIGURATION TESTED         |                           | ACCESSORIES/COMPONENT NOT INCLUDED |
|------------------------------|---------------------------|------------------------------------|
| <b>MODEL</b>                 | <b>SERIAL NUMBER</b>      |                                    |
| <u>OPTIMA 5300DV</u>         | <u>077C7042401</u>        |                                    |
| <b>TESTED EQUIPMENT</b>      | <b>CALIBRATION NUMBER</b> | <b>EXPIRATION</b>                  |
| <u>IPV Methods</u>           |                           |                                    |
| <b>TEST STANDARD USED</b>    | <b>PART NUMBER</b>        | <b>EXPIRATION DATE</b>             |
| <u>Multielement Standard</u> | <u>N069-1579</u>          | <u>December 30, 2024</u>           |
| <u>Wavecal Solution</u>      | <u>N058-2152</u>          | <u>March 30, 2024</u>              |
| <u>VIS Wavecal solution</u>  | <u>N930-2946</u>          | <u>February 28, 2024</u>           |
| <u>Instrument Cal. STD4</u>  | <u>N930-0221</u>          | <u>November 30, 2024</u>           |
| <b>CUSTOMER SUPPLIED</b>     | <b>COMMENTS</b>           | <b>CUSTOMER INITIALS</b>           |
| <u>2 % HNO3</u>              |                           |                                    |
| <u>10 % HNO3</u>             |                           |                                    |



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER** 077C7042401**DATE TESTED** July 1, 2025**1. MECHANICAL CHECKS**

A. Inspect and clean all fans and filters.

☐ OK

B. Inspect and replace as necessary, all torch components including the RF coil.

☐ OK

C. Inspect all tubing for sign of clacking or leaking.

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK**2. OPTICAL CHECKS**

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK**3. COOLING SYSTEM CHECKS**

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A**4. PERFORMANCE CHECKS**

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER :** 077C7042401
**DATE TESTED :** July 1, 2025

| PARAMETER                               |                      | SPECIFICATION |       | FINAL VALUE    |     |
|---|----------------------|---------------|-------|----------------|-----|
| <b>Spectral Resolution : UV</b>         | <b>As</b> 193.696 nm | ≤ 0.007       |       | <u>0.00570</u> |     |
|   | <b>Ni</b> 231.604 nm | ≤ 0.008       |       | <u>0.00734</u> |     |
|   | <b>Ni</b> 341.476 nm | ≤ 0.012       |       | <u>0.00763</u> |     |
| <b>Spectral Resolution : VIS</b>        | <b>La</b> 408.672 nm | ≤ 0.020       |       | <u>0.01627</u> |     |
|   | <b>Ba</b> 455.403 nm | ≤ 0.025       |       | <u>0.02428</u> |     |
| <b>Precision</b>                        |                      |               |       |                |     |
|   | <b>As</b> 193.656 nm | % RSD         | < 1.0 | <u>0.82</u>    | %   |
|   | <b>Zn</b> 213.856 nm | % RSD         | < 1.0 | <u>0.83</u>    | %   |
|   | <b>Mn</b> 257.610 nm | % RSD         | < 1.0 | <u>0.20</u>    | %   |
|   | <b>La</b> 379.478 nm | % RSD         | < 1.0 | <u>0.89</u>    | %   |
|   | <b>Ba</b> 455.403 nm | % RSD         | < 1.0 | <u>0.92</u>    | %   |
|   | <b>Ba</b> 493.408 nm | % RSD         | < 1.0 | <u>0.75</u>    | %   |
| <b>Detection Limits : Axial</b>         | <b>Tl</b> 190.080 nm | 3(sd)         |       | <u>10.65</u>   | ppb |
|   | <b>As</b> 193.696 nm | 3(sd)         |       | <u>2.48</u>    | ppb |
|   | <b>Pb</b> 220.353 nm | 3(sd)         |       | <u>3.09</u>    | ppb |
| <b>Detection Limits : Radial</b>        | <b>As</b> 193.696 nm | 3(sd)         |       | <u>331.50</u>  | ppb |
|   | <b>Zn</b> 213.856 nm | 3(sd)         |       | <u>0.98</u>    | ppb |
|   | <b>Mn</b> 257.610 nm | 3(sd)         |       | <u>0.34</u>    | ppb |
|   | <b>La</b> 379.478 nm | 3(sd)         |       | <u>2.54</u>    | ppb |
|   | <b>Ba</b> 455.403 nm | 3(sd)         |       | <u>2.19</u>    | ppb |
|   | <b>Ba</b> 493.408 nm | 3(sd)         |       | <u>4.32</u>    | ppb |
| <b>BEC : Axial (IB X 500)/(IS-IB)</b>   | <b>Cd</b> 226.502 nm | ≤ 150 ppb     |       | <u>140.03</u>  |     |
| <b>BEC : Radial (IB X 1000)/(IS-IB)</b> | <b>Mn</b> 257.610 nm | ≤ 45 ppb      |       | <u>24.17</u>   |     |





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

SERIAL NUMBER 077C7042401DATE TESTED July 1, 2025**Remarks :**

Commissioning follow as commissioning performance sheets.

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This is to certify that the above tests have been performed and the configuration tested



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,  
including warranty terms.

**Service Department PerkinElmer Ltd.****Authorized Representative:**

( Wiphan Promlumda )

Service Engineer

ระดับความร้อนในสถานประกอบการ



ID LINE : IEC17025



## Certificate of Calibration

Certificate Number : SPR24100363-5

Page : 1 of 3

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

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEH060047

ID. Number : B05

### Environmental Conditions

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

Received Date : 21 Oct 2024

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

Calibration Date : 21 Oct 2024

Location of Calibration : In-Lab

Recommend Due Date : 21 Oct 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 22 Oct 2024

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Surasak Ritthikaew

Calibration Officer

Approved by :

( Mr.Prayoon Topart )

Authorized Signatory





ID LINE : IEC17025



## Calibration Report

Certificate Number : SPR24100363-5

Page : 2 of 3

### Reference Standards

| Equipment Name    | Model  | Serial No. | Certificate No. | Due. Date   |
|-------------------|--------|------------|-----------------|-------------|
| Humidity Chamber  | TH-80S | N/A        | SPR24020149-7   | 23 Feb 2025 |
| THERMO-HYGROMETER | 5020A  | A47046     | QR24-0167       | 26 Jan 2025 |

### Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd





ID LINE : IEC17025



## Result of Calibration

Certificate Number : SPR24100363-5

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error | Uncertainty ( ± ) |
|---------------------|------------------|-------------|-------|-------------------|
| 30.0                | 30.014           | 30.1        | 0.086 | 0.20              |
| 35.0                | 35.012           | 35.1        | 0.088 | 0.20              |
| 40.0                | 40.017           | 40.1        | 0.083 | 0.20              |

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error | Uncertainty ( ± ) |
|---------------------|------------------|-------------|-------|-------------------|
| 30.0                | 30.014           | 30.1        | 0.086 | 0.20              |
| 35.0                | 35.012           | 35.1        | 0.088 | 0.20              |
| 40.0                | 40.017           | 40.1        | 0.083 | 0.20              |

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

| Humidity Setting | Standard Reading | UUC Reading | Error | Uncertainty ( ± ) |
|------------------|------------------|-------------|-------|-------------------|
| 30.0             | 30.014           | 30.2        | 0.186 | 0.20              |
| 35.0             | 35.012           | 35.2        | 0.188 | 0.20              |
| 40.0             | 40.017           | 40.2        | 0.183 | 0.20              |

### Note :

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2$ , providing a level of confidence approximately 95%.

- End of Certificate -



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

Heat B\_329\_1

| Heat Stress WBGT Meter Verification Report                           |                      |                     |                      |
|--|----------------------|---------------------|----------------------|
| Verification Data  |                      |                     |                      |
| Heat Stress WBGT Meter No.   | : B05                | Verification Date   | : 12 July 2025       |
| Brand  | : Quest Technologies | Ambient Temp.       | : 24.5 °C            |
| Model  | : QUESTemp 34        | Barometric Pressure | : 1011 mmbar         |
| Serial No.   | : TEH060047          | Relative Humidity   | : 49 %               |
| Verification Module (Electronic Sensor Check) :                      |                      |                     |                      |
| Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C |                      |                     |                      |
| Result of Verification : Without Adjustment                          |                      |                     |                      |
| Wet Probe Temperature Measurement                                    |                      |                     |                      |
| Verification Module Reading (°C)                                     | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 12.5   | 12.3                 | 0.2                 | ± 0.5                |
| Dry Probe Temperature Measurement                                    |                      |                     |                      |
| Verification Module Reading (°C)                                     | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 47.1   | 47.2                 | -0.1                | ± 0.5                |
| Globe Probe Temperature Measurement                                  |                      |                     |                      |
| Verification Module Reading (°C)                                     | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 69.3   | 69.2                 | 0.1                 | ± 0.5                |
| UUC* = UNIT UNDER CALIBRATION  |                      |                     |                      |

Verified 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.  
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

Heat B\_446\_1

| Heat Stress WBGT Meter Verification Report                                    |                      |                     |                      |
|---|----------------------|---------------------|----------------------|
| Verification Data   |                      |                     |                      |
| Heat Stress WBGT Meter No.  | : B05                | Verification Date   | : 10 September 2025  |
| Brand   | : Quest Technologies | Ambient Temp.       | : 24.5 °C            |
| Model   | : QUESTemp 34        | Barometric Pressure | : 1011 mmbar         |
| Serial No.  | : TEH060047          | Relative Humidity   | : 49 %               |
| Verification Module (Electronic Sensor Check) :                               |                      |                     |                      |
| Verification Module No. : 21    WB = 12.5 °C,    DB = 47.1 °C,    G = 69.3 °C |                      |                     |                      |
| Result of Verification : Without Adjustment                                   |                      |                     |                      |
| Wet Probe Temperature Measurement   |                      |                     |                      |
| Verification Module Reading (°C)  | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 12.5  | 12.6                 | -0.1                | ± 0.5                |
| Dry Probe Temperature Measurement   |                      |                     |                      |
| Verification Module Reading (°C)  | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 47.1  | 46.9                 | 0.2                 | ± 0.5                |
| Globe Probe Temperature Measurement   |                      |                     |                      |
| Verification Module Reading (°C)  | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 69.3  | 69.2                 | 0.1                 | ± 0.5                |
| UUC* = UNIT UNDER CALIBRATION   |                      |                     |                      |

Verified by : Adul Dangklom  
(Mr. Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)



## Certificate of Calibration

Certificate Number : SPR25030358-1

Page : 1 of 3

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

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEG040059

ID. Number : B07

### Environmental Conditions

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

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

Location of Calibration : In-Lab

Calibration Procedure : SP-CPT-04-13

Received Date : 19 Mar 2025

Calibration Date : 22 Mar 2025

Recommend Due Date : 22 Mar 2026

Date of Issue : 23 Mar 2025

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr. Navaporn Uengseng

Calibration Officer

Approved by :

( Mr. Pootthipong A. )

Authorized Signatory





## Calibration Report

Certificate Number : SPR25030358-1

Page : 2 of 3

### Reference Standards

| Equipment Name    | Model  | Serial No. | Certificate No. | Due. Date   |
|-------------------|--------|------------|-----------------|-------------|
| Humidity Chamber  | TH-80S | N/A        | SPR25010173-14  | 30 Jan 2026 |
| THERMO-HYGROMETER | 5020A  | A47046     | TMU2500342      | 29 Jan 2026 |

### Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

NA - NA Caltechnologies Co., Ltd.



## Result of Calibration

Certificate Number : SPR25030358-1

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 30.015           | 29.9        | -0.115 | 0.20              |
| 35.0                | 35.012           | 34.9        | -0.112 | 0.20              |
| 40.0                | 40.016           | 39.9        | -0.116 | 0.20              |

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 30.015           | 29.8        | -0.215 | 0.20              |
| 35.0                | 35.012           | 34.8        | -0.212 | 0.20              |
| 40.0                | 40.016           | 39.8        | -0.216 | 0.20              |

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 30.015           | 29.9        | -0.115 | 0.20              |
| 35.0                | 35.012           | 34.9        | -0.112 | 0.20              |
| 40.0                | 40.016           | 39.9        | -0.116 | 0.20              |

### Note:

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2$ , providing a level of confidence approximately 95%.

- End of Certificate -





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

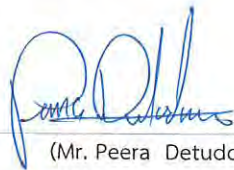
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

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

Heat B\_329\_2

| Heat Stress WBGT Meter Verification Report                           |                      |                     |                      |
|--|----------------------|---------------------|----------------------|
| Verification Data  |                      |                     |                      |
| Heat Stress WBGT Meter No.   | : B07                | Verification Date   | : 12 July 2025       |
| Brand  | : Quest Technologies | Ambient Temp.       | : 24.5 °C            |
| Model  | : QUESTemp 34        | Barometric Pressure | : 1011 mmbar         |
| Serial No.   | : TEG040059          | Relative Humidity   | : 49 %               |
| Verification Module (Electronic Sensor Check) :                      |                      |                     |                      |
| Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C |                      |                     |                      |
| Result of Verification : Without Adjustment                          |                      |                     |                      |
| Wet Probe Temperature Measurement                                    |                      |                     |                      |
| Verification Module Reading (°C)                                     | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 12.5   | 12.6                 | -0.1                | ± 0.5                |
| Dry Probe Temperature Measurement                                    |                      |                     |                      |
| Verification Module Reading (°C)                                     | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 47.1   | 47.0                 | 0.1                 | ± 0.5                |
| Globe Probe Temperature Measurement                                  |                      |                     |                      |
| Verification Module Reading (°C)                                     | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 69.3   | 69.3                 | 0.0                 | ± 0.5                |
| UUC* = UNIT UNDER CALIBRATION  |                      |                     |                      |

Verified by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :   
(Mr. Peera Detudom)



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

Heat B\_446\_2

| Heat Stress WBGT Meter Verification Report                                    |                      |                     |                      |
|---|----------------------|---------------------|----------------------|
| Verification Data   |                      |                     |                      |
| Heat Stress WBGT Meter No.  | : B07                | Verification Date   | : 10 September 2025  |
| Brand   | : Quest Technologies | Ambient Temp.       | : 24.5 °C            |
| Model   | : QUESTemp 34        | Barometric Pressure | : 1011 mmbar         |
| Serial No.  | : TEG040059          | Relative Humidity   | : 49 %               |
| Verification Module (Electronic Sensor Check) :                               |                      |                     |                      |
| Verification Module No. : 21    WB = 12.5 °C,    DB = 47.1 °C,    G = 69.3 °C |                      |                     |                      |
| Result of Verification : Without Adjustment                                   |                      |                     |                      |
| Wet Probe Temperature Measurement   |                      |                     |                      |
| Verification Module Reading (°C)  | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 12.5  | 12.6                 | -0.1                | ± 0.5                |
| Dry Probe Temperature Measurement   |                      |                     |                      |
| Verification Module Reading (°C)  | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 47.1  | 47.0                 | 0.1                 | ± 0.5                |
| Globe Probe Temperature Measurement   |                      |                     |                      |
| Verification Module Reading (°C)  | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 69.3  | 69.3                 | 0.0                 | ± 0.5                |
| UUC* = UNIT UNDER CALIBRATION   |                      |                     |                      |

Verified by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)





ID LINE : IEC17025



## Certificate of Calibration

Certificate Number : SPR24100363-3

Page : 1 of 3

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

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEL080034

ID. Number : B11

### Environmental Conditions

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

Received Date : 21 Oct 2024

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

Calibration Date : 21 Oct 2024

Location of Calibration : In-Lab

Recommend Due Date : 21 Oct 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 22 Oct 2024

### Method of Calibration

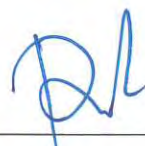
This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chatchai Kittisopha

Calibration Officer

Approved by :

  
( Mr.Prayoon Topart )

Authorized Signatory



ID LINE : IEC17025



## Calibration Report

Certificate Number : SPR24100363-3

Page : 2 of 3

### Reference Standards

| Equipment Name    | Model  | Serial No. | Certificate No. | Due. Date   |
|-------------------|--------|------------|-----------------|-------------|
| Humidity Chamber  | TH-80S | N/A        | SPR24020149-7   | 23 Feb 2025 |
| THERMO-HYGROMETER | 5020A  | A47046     | QR24-0167       | 26 Jan 2025 |

### Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd





ID LINE : IEC17025



## Result of Calibration

Certificate Number : SPR24100363-3

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error | Uncertainty ( ± ) |
|---------------------|------------------|-------------|-------|-------------------|
| 30.0                | 30.021           | 30.3        | 0.279 | 0.20              |
| 35.0                | 35.018           | 35.3        | 0.282 | 0.20              |
| 40.0                | 40.019           | 40.3        | 0.281 | 0.20              |

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error | Uncertainty ( ± ) |
|---------------------|------------------|-------------|-------|-------------------|
| 30.0                | 30.021           | 30.2        | 0.179 | 0.20              |
| 35.0                | 35.018           | 35.2        | 0.182 | 0.20              |
| 40.0                | 40.019           | 40.2        | 0.181 | 0.20              |

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error | Uncertainty ( ± ) |
|---------------------|------------------|-------------|-------|-------------------|
| 30.0                | 30.021           | 30.2        | 0.179 | 0.20              |
| 35.0                | 35.018           | 35.2        | 0.182 | 0.20              |
| 40.0                | 40.019           | 40.2        | 0.181 | 0.20              |

### Note :

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2$ , providing a level of confidence approximately 95%.

- End of Certificate -



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

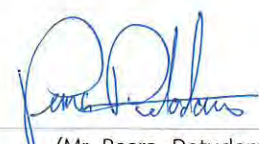
Heat B\_329\_3

| Heat Stress WBGT Meter Verification Report                           |                      |                     |                      |
|--|----------------------|---------------------|----------------------|
| Verification Data  |                      |                     |                      |
| Heat Stress WBGT Meter No.   | : B11                | Verification Date   | : 12 July 2025       |
| Brand  | : Quest Technologies | Ambient Temp.       | : 24.5 °C            |
| Model  | : QUESTemp 34        | Barometric Pressure | : 1011 mmbar         |
| Serial No.   | : TEL080034          | Relative Humidity   | : 49 %               |
| Verification Module (Electronic Sensor Check) :                      |                      |                     |                      |
| Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C |                      |                     |                      |
| Result of Verification : Without Adjustment                          |                      |                     |                      |
| Wet Probe Temperature Measurement                                    |                      |                     |                      |
| Verification Module Reading (°C)                                     | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 12.5   | 12.5                 | 0.0                 | ± 0.5                |
| Dry Probe Temperature Measurement                                    |                      |                     |                      |
| Verification Module Reading (°C)                                     | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 47.1   | 46.9                 | 0.2                 | ± 0.5                |
| Globe Probe Temperature Measurement                                  |                      |                     |                      |
| Verification Module Reading (°C)                                     | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 69.3   | 69.2                 | 0.1                 | ± 0.5                |
| UUC* = UNIT UNDER CALIBRATION  |                      |                     |                      |

Verified by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

  
(Mr. Peera Detudom)





ID LINE : IEC17025



# Certificate of Calibration

Certificate Number : SPR25030358-5

Page : 1 of 3

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

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEH090208

ID. Number : R08

### Environmental Conditions

Ambient Temperature : 23 °C  $\pm$  2 °C

Received Date : 19 Mar 2025

Relative Humidity : 50 %  $\pm$  15 %

Calibration Date : 27 Mar 2025

Location of Calibration : In-Lab

Recommend Due Date : 27 Mar 2026

Calibration Procedure : SP-CPT-04-13

Date of Issue : 28 Mar 2025

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Surasak Ritthikaew

Calibration Officer

Approved by :

( Mr.Prayoon Topart )

Authorized Signatory



## Calibration Report

Certificate Number : SPR25030358-5

Page : 2 of 3

### Reference Standards

| Equipment Name    | Model  | Serial No. | Certificate No. | Due. Date   |
|-------------------|--------|------------|-----------------|-------------|
| Humidity Chamber  | TH-80S | N/A        | SPR25010173-14  | 30 Jan 2026 |
| THERMO-HYGROMETER | 5020A  | A47046     | TMU2500342      | 29 Jan 2026 |

### Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

NA - NA Caltechnologies Co., Ltd.





## Result of Calibration

Certificate Number : SPR25030358-5

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 29.995           | 29.8        | -0.195 | 0.20              |
| 35.0                | 34.990           | 34.8        | -0.190 | 0.20              |
| 40.0                | 39.985           | 39.8        | -0.185 | 0.20              |

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 29.995           | 29.7        | -0.295 | 0.20              |
| 35.0                | 34.990           | 34.7        | -0.290 | 0.20              |
| 40.0                | 39.985           | 39.7        | -0.285 | 0.20              |

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

| Humidity Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|------------------|------------------|-------------|--------|-------------------|
| 30.0             | 29.995           | 29.8        | -0.195 | 0.20              |
| 35.0             | 34.990           | 34.8        | -0.190 | 0.20              |
| 40.0             | 39.985           | 39.8        | -0.185 | 0.20              |

### Note :

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2$ , providing a level of confidence approximately 95%.

- End of Certificate -

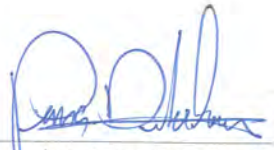


บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด  
S.P.S. CONSULTING SERVICE CO., LTD.  
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com.,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

Heat B\_446\_6

| Heat Stress WBGT Meter Verification Report                           |                      |                     |                      |
|--|----------------------|---------------------|----------------------|
| Verification Data  |                      |                     |                      |
| Heat Stress WBGT Meter No.   | : R08                | Verification Date   | : 10 September 2025  |
| Brand  | : Quest Technologies | Ambient Temp.       | : 24.5 °C            |
| Model  | : QUESTemp 34        | Barometric Pressure | : 1011 mmbar         |
| Serial No.   | : TEH090208          | Relative Humidity   | : 49 %               |
| Verification Module (Electronic Sensor Check) :                      |                      |                     |                      |
| Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C |                      |                     |                      |
| Result of Verification : Without Adjustment                          |                      |                     |                      |
| Wet Probe Temperature Measurement                                    |                      |                     |                      |
| Verification Module Reading (°C)                                     | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 12.5   | 12.7                 | -0.2                | ± 0.5                |
| Dry Probe Temperature Measurement                                    |                      |                     |                      |
| Verification Module Reading (°C)                                     | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 47.1   | 47.1                 | 0.0                 | ± 0.5                |
| Globe Probe Temperature Measurement                                  |                      |                     |                      |
| Verification Module Reading (°C)                                     | UUC* Reading (°C)    | Correction (°C)     | Tolerance Limit (°C) |
| 69.3   | 69.4                 | -0.1                | ± 0.5                |
| UUC* = UNIT UNDER CALIBRATION  |                      |                     |                      |

Verified by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :   
(Mr. Peera Detudom)



คุณภาพอากาศในสถานประกอบการ



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 : 136164

#### Environmental Conditions

Temperature  
Pressure

25  
1010

± 3  
± 15

°C  
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> |
| B01                | SKC   | 224-PCXR4 | 262101     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,501 | 2,003 | 1.003x - 4.236               | 1.000          |
| B02                | SKC   | 224-PCXR4 | 626166     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,506 | 2,007 | 1.001x + 1.555               | 1.000          |
| B03                | SKC   | 224-PCXR4 | 612968     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,499 | 2,002 | 1.004x - 11.638              | 0.999          |
| B04                | SKC   | 224-PCXR4 | 602804     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,502 | 1,998 | 1.002x - 3.373               | 1.000          |
| B05                | SKC   | 224-PCXR4 | 612693     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,504 | 2,008 | 1.008x - 9.160               | 1.000          |
| B06                | SKC   | 224-PCXR4 | 262188     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,505 | 2,003 | 1.001x - 3.965               | 1.000          |
| B07                | SKC   | 224-PCXR4 | 626262     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,494 | 2,000 | 0.997x + 3.261               | 1.000          |
| B08                | SKC   | 224-PCXR4 | 626100     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,502 | 2,004 | 1.009x - 15.922              | 0.999          |
| B09                | SKC   | 224-PCXR4 | 626479     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,499 | 2,005 | 1.005x - 9.935               | 1.000          |
| B10                | SKC   | 224-PCXR4 | 091950     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,507 | 2,001 | 1.008x - 15.634              | 1.000          |
| B11                | SKC   | 224-PCXR8 | 564315     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,495 | 2,002 | 1.004x - 7.274               | 1.000          |
| B12                | SKC   | 224-PCXR4 | 034656     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,507 | 2,005 | 1.007x - 13.608              | 0.999          |
| B13                | SKC   | 224-PCXR4 | 602073     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,504 | 2,007 | 1.006x - 6.161               | 1.000          |
| B14                | SKC   | 224-PCXR4 | 626313     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,503 | 2,004 | 1.001x - 3.361               | 1.000          |
| B15                | SKC   | 224-PCXR4 | 626474     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,506 | 2,005 | 1.008x - 12.821              | 0.999          |
| B16                | SKC   | 224-PCXR4 | 626477     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,509 | 1,995 | 0.999x - 0.595               | 1.000          |
| B17                | SKC   | 224-PCXR4 | 626860     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,497 | 1,996 | 1.000x - 1.613               | 1.000          |
| B18                | SKC   | 224-PCXR4 | 691484     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,499 | 1,995 | 1.003x - 9.955               | 0.999          |
| B19                | SKC   | 224-PCXR4 | 691599     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,508 | 1,994 | 1.001x - 1.127               | 1.000          |
| B20                | SKC   | 224-PCXR4 | 691587     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,505 | 1,997 | 1.004x - 9.596               | 1.000          |
| B21                | SKC   | 224-PCXR4 | 691531     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,504 | 1,999 | 1.002x - 3.125               | 1.000          |
| B22                | SKC   | 224-PCXR4 | 691654     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,505 | 1,992 | 1.003x - 9.240               | 0.999          |
| B23                | SKC   | 224-PCXR4 | 798393     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 992             | 1,498 | 1,993 | 0.999x - 3.941               | 1.000          |
| B24                | SKC   | 224-PCXR4 | 626363     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,506 | 1,994 | 1.003x - 9.084               | 0.999          |
| B25                | SKC   | 224-PCXR4 | 798489     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,497 | 2,004 | 0.998x + 5.100               | 1.000          |
| B26                | SKC   | 224-PCXR4 | 798479     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,504 | 1,998 | 0.997x + 5.575               | 1.000          |
| B27                | SKC   | 224-PCXR4 | 691673     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,508 | 1,991 | 1.002x - 8.556               | 0.999          |
| B28                | SKC   | 224-PCXR4 | 691570     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,504 | 2,001 | 1.000x + 2.897               | 1.000          |
| B29                | SKC   | 224-PCXR4 | 626472     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,502 | 2,004 | 1.001x - 1.675               | 1.000          |
| B30                | SKC   | 224-PCXR4 | 691489     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,510 | 2,007 | 1.010x - 13.764              | 0.999          |
| B31                | SKC   | 224-PCXR4 | 691509     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 996             | 1,499 | 1,991 | 0.997x + 0.891               | 1.000          |
| B32                | SKC   | 224-PCXR4 | 091567     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,497 | 1,996 | 0.996x + 3.273               | 1.000          |
| B33                | SKC   | 224-PCXR4 | 091756     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,505 | 1,992 | 1.000x - 4.228               | 0.999          |
| B34                | SKC   | 224-PCXR4 | 612962     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,508 | 2,011 | 1.007x - 5.447               | 1.000          |
| B35                | SKC   | 224-PCXR4 | 602682     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,506 | 1,991 | 0.997x + 1.603               | 0.999          |
| B36                | SKC   | 224-PCXR4 | 626164     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,498 | 2,002 | 1.004x - 8.113               | 1.000          |
| B37                | SKC   | 224-PCXR4 | 626256     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,508 | 2,001 | 1.005x - 10.431              | 1.000          |
| B38                | SKC   | 224-PCXR4 | 626167     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,497 | 1,993 | 0.999x - 0.639               | 1.000          |
| B39                | SKC   | 224-PCXR4 | 034637     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,503 | 1,991 | 1.002x - 7.186               | 0.999          |
| B40                | SKC   | 224-PCXR4 | 798349     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,494 | 1,990 | 1.000x - 7.405               | 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.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร 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 : 136164

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.) |       |       |                              |                |
|                    |       |           |            |                  | 1                  | 2     | 3     | 1               | 2     | 3     | y                            | R <sup>2</sup> |
| B41                | SKC   | 224-PCXR4 | 612669     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,498 | 2,001 | 1.001x - 3.597               | 1.000          |
| B42                | SKC   | 224-PCXR4 | 626041     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,499 | 2,007 | 1.005x - 8.012               | 1.000          |
| B43                | SKC   | 224-PCXR4 | 034636     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,506 | 1,997 | 0.993x + 10.787              | 1.000          |
| B44                | SKC   | 224-PCXR8 | 529341     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,502 | 2,009 | 1.010x - 14.387              | 1.000          |
| B45                | SKC   | 224-PCXR8 | 529594     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,509 | 1,991 | 0.992x + 12.045              | 1.000          |
| B46                | SKC   | 224-PCXR8 | 566743     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,505 | 2,000 | 1.006x - 13.608              | 0.999          |
| B47                | SKC   | 224-PCXR8 | 566747     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,504 | 1,998 | 1.004x - 7.545               | 1.000          |
| B48                | SKC   | 224-PCXR8 | 566753     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,494 | 1,996 | 0.998x - 0.387               | 1.000          |
| B49                | SKC   | 224-PCXR8 | 566780     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,499 | 1,995 | 1.005x - 13.932              | 0.999          |
| B50                | SKC   | 224-PCXR8 | 500400     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,006           | 1,498 | 2,008 | 1.002x - 1.667               | 1.000          |
| B51                | SKC   | 224-PCXR8 | 500363     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,505 | 2,002 | 1.008x - 17.209              | 0.999          |
| B52                | SKC   | 224-PCXR8 | 093186     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 994             | 1,496 | 1,998 | 1.003x - 7.976               | 1.000          |
| B53                | SKC   | 224-PCXR8 | 707670     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,512 | 2,002 | 1.004x - 6.981               | 1.000          |
| B54                | SKC   | 224-PCXR3 | 509821     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,503 | 2,006 | 1.009x - 17.041              | 0.999          |
| B55                | SKC   | 224-PCXR3 | 510710     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,501 | 1,993 | 0.996x + 2.606               | 1.000          |
| B56                | SKC   | 224-PCXR3 | 511450     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,012           | 1,502 | 2,008 | 0.997x + 9.801               | 1.000          |
| B57                | SKC   | 224-PCXR3 | 510798     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,493 | 2,004 | 1.003x - 2.925               | 1.000          |
| B58                | SKC   | 224-PCXR3 | 509852     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,004           | 1,499 | 1,997 | 1.001x - 8.640               | 0.999          |
| B59                | SKC   | 224-PCXR3 | 509862     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,504 | 2,001 | 0.999x + 4.160               | 1.000          |
| B60                | SKC   | 224-PCXR3 | 512655     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,502 | 2,008 | 1.007x - 9.991               | 1.000          |
| B61                | SKC   | 224-PCXR3 | 503915     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,491 | 1,995 | 1.003x - 8.373               | 1.000          |
| B62                | SKC   | 224-PCXR3 | 505975     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,498 | 2,001 | 1.002x - 4.813               | 1.000          |
| B63                | SKC   | 224-PCXR3 | 511432     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,503 | 1,996 | 1.008x - 19.707              | 0.999          |
| B64                | SKC   | 224-PCXR3 | 508302     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,494 | 1,992 | 0.993x + 6.854               | 1.000          |
| B65                | SKC   | 224-PCXR3 | 508310     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,000           | 1,505 | 2,001 | 1.003x - 8.089               | 0.999          |
| B66                | SKC   | 224-PCXR3 | 509861     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,495 | 1,996 | 0.992x + 10.934              | 1.000          |
| B67                | SKC   | 224-PCXR3 | 506295     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,509 | 1,997 | 1.001x - 4.236               | 1.000          |
| B68                | SKC   | 224-PCXR3 | 505872     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,491 | 2,001 | 1.000x - 1.187               | 1.000          |
| B69                | SKC   | 224-PCXR3 | 508375     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,006           | 1,505 | 1,998 | 1.005x - 11.342              | 0.999          |
| B70                | SKC   | 224-PCXR3 | 510623     | 03/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,508 | 1,997 | 1.001x - 1.890               | 1.000          |
| B71                | SKC   | 224-PCXR3 | 508367     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,506 | 2,004 | 1.006x - 12.521              | 0.999          |
| B72                | SKC   | 224-PCXR3 | 505977     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,007           | 1,496 | 1,998 | 0.991x + 11.538              | 1.000          |
| B73                | SKC   | 224-PCXR3 | 512606     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,498 | 1,995 | 0.996x + 0.711               | 1.000          |
| B74                | SKC   | 224-PCXR3 | 505993     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,497 | 1,998 | 1.002x - 6.570               | 1.000          |
| B75                | SKC   | 224-PCXR3 | 509820     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,499 | 1,996 | 0.999x - 0.923               | 1.000          |
| B76                | SKC   | 224-PCXR3 | 509811     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 997             | 1,502 | 2,003 | 1.007x - 11.834              | 1.000          |
| B77                | SKC   | 224-PCXR3 | 508301     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 1,005           | 1,505 | 1,993 | 1.000x - 3.349               | 0.999          |
| B78                | SKC   | 224-PCXR3 | 510677     | 04/07/2025       | 1,000              | 1,500 | 2,000 | 999             | 1,509 | 1,998 | 1.004x - 9.791               | 0.999          |
| B79                | SKC   | 224-PCXR3 | 510920     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 998             | 1,498 | 1,994 | 0.997x + 2.162               | 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.  
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)



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

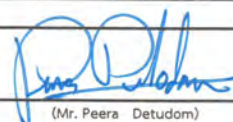
Temperature : 25  $\pm$  3  $^{\circ}$ C  
Pressure : 1010  $\pm$  15 mmbar

| Personal Pump Data |       |           |            | Calibration Data |                    |       |       |                 |       |       |                              |                |
|--------------------|-------|-----------|------------|------------------|--------------------|-------|-------|-----------------|-------|-------|------------------------------|----------------|
| No.                | Brand | Model     | Serial No. | Date             | Flow Rate (mL/min) |       |       |                 |       |       | Value From Calibration Curve |                |
|                    |       |           |            |                  | Setting            |       |       | Actual (Q std.) |       |       |                              |                |
|                    |       |           |            |                  | 1                  | 2     | 3     | 1               | 2     | 3     | y                            | R <sup>2</sup> |
| R40                | SKC   | 224-PCXR4 | 612753     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,003           | 1,503 | 1,994 | 1.004x - 11.618              | 0.999          |
| R41                | SKC   | 224-PCXR4 | 626140     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,495 | 1,993 | 1.008x - 22.708              | 0.999          |
| R42                | SKC   | 224-PCXR4 | 626463     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 1,001           | 1,497 | 1,991 | 0.994x + 7.539               | 1.000          |
| R43                | SKC   | 224-PCXR4 | 626129     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,007           | 1,507 | 2,001 | 1.005x - 8.869               | 0.999          |
| R44                | SKC   | 224-PCXR4 | 602753     | 01/07/2025       | 1,000              | 1,500 | 2,000 | 1,002           | 1,499 | 1,997 | 0.999x - 0.384               | 1.000          |
| R45                | SKC   | 224-PCXR4 | 626137     | 02/07/2025       | 1,000              | 1,500 | 2,000 | 995             | 1,508 | 2,007 | 1.008x - 11.542              | 1.000          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

  
(Mr. Peera Detudom)



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

### 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-B01          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 498.8           | 1001.4 | 2005.7 | 0.996x + 4.876               | 1.000          |
| H-B02          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 501.6           | 1001.3 | 1997.6 | 0.997x + 5.643               | 1.000          |
| H-B03          | Dwyer | VFB-65 | 03/07/2025       | 500                 | 1,000 | 2,000 | 499.3           | 1001.9 | 1990.3 | 0.998x + 3.307               | 0.999          |
| H-B04          | Dwyer | VFB-65 | 04/07/2025       | 500                 | 1,000 | 2,000 | 501.3           | 997.3  | 2005.9 | 1.000x + 1.052               | 1.000          |
| H-B05          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 501.6           | 998.8  | 2005.5 | 1.003x - 1.210               | 1.000          |
| H-B06          | Dwyer | VFB-65 | 03/07/2025       | 500                 | 1,000 | 2,000 | 500.9           | 1001.3 | 1990.6 | 0.997x + 5.814               | 0.999          |
| H-B07          | Dwyer | VFB-65 | 04/07/2025       | 500                 | 1,000 | 2,000 | 501.9           | 1001.7 | 2009.2 | 0.999x - 1.217               | 1.000          |
| H-B08          | Dwyer | VFB-65 | 04/07/2025       | 500                 | 1,000 | 2,000 | 499.0           | 998.4  | 2006.7 | 1.002x - 9.084               | 0.999          |
| H-B09          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 498.8           | 1000.5 | 1998.8 | 1.001x - 1.402               | 1.000          |
| H-B10          | Dwyer | VFB-65 | 02/07/2025       | 500                 | 1,000 | 2,000 | 500.2           | 1000.6 | 2001.7 | 0.999x + 3.178               | 1.000          |

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Mr. 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.

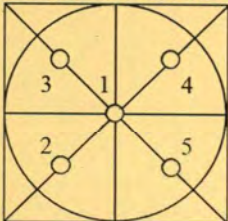
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

**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







## 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



ระดับเสียงในสถานประกอบการ



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.

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

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

#### Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,  
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

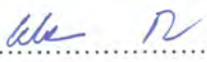
| Standard Microphone<br>Type | Measured Total Distortion<br>(%) | Uncertainty<br>(%) | Tolerance limit<br>IEC60942:2003 Class 1 |
|-----------------------------|----------------------------------|--------------------|--|
| 1/2 inch Bruel&Kjaer 4180   | 0.95                             | $\pm 0.50$ 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

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 Kluaypa)  
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

2 / 2

The results relate only to the items tested/calibrated or value assigned.  
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FM.BL.MTC.002 Rev.5

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

Office/Laboratory

668 Mu 2 Tambon Bangpoornai, Amphoe Muang Samutprakan,  
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





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

Noise B\_328/25

## 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-B18  | ACO   | 6236  | 00172048   | 12 July 2025     | 93.7                | 93.9             |
| ACO-B29  | ACO   | 6236  | 00182011   | 12 July 2025     | 93.7                | 93.9             |
| ACO-B36  | ACO   | 6236  | 00192027   | 12 July 2025     | 93.9                | 93.9             |
| ACO-B41  | ACO   | 6236  | 00192032   | 12 July 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)



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

Noise B\_445\_3/25

## 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-B29  | ACO   | 6236  | 00182011   | 10 September 2025 | 93.8                | 93.9             |
| ACO-B33  | ACO   | 6236  | 00182015   | 10 September 2025 | 93.9                | 93.9             |
| ACO-B41  | ACO   | 6236  | 00192032   | 10 September 2025 | 93.7                | 93.9             |
| ACO-R40  | ACO   | 6236  | 00192052   | 10 September 2025 | 93.8                | 93.9             |
| ACO-R41  | ACO   | 6236  | 00192053   | 10 September 2025 | 93.9                | 93.9             |
| ACO-R52  | ACO   | 6236  | 00192064   | 10 September 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)

ปริมาณเสียงสะสมติดตัวบุคคล





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0562

MTC No. EEL. BP. 72/0767

## CALIBRATION CERTIFICATE

Submitted by : S.P.S Consulting Services 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 : 31 Jul. 2024

Date of Calibration : 6 Aug. 2024

1/2

The results relate only to the items tested/calibrated or value assigned.  
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FM.BL.MTC.002 Rev.4

#### Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

#### Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

#### Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0562

MTC No. EEL. BP. 72/0767

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   | 114.03                                | 0.03                   | $\pm 0.10$          | $\pm 0.75$ 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   | 0.27                             | $\pm 0.50$         | $\pm 4.0\%$                              |

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 Khuaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 6 Aug. 2024

Date of Issue : 7 Aug. 2024

Ref : 2011267073102836003

End of Certificate

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

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FM.BL.MTC.002 Rev.4

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand

Tel. (66) 0 2577 9000

Fax. (66) 0 2577 9009

E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand

Tel. (66) 0 2323 1672-80 ext. 115, 116

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร 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 Dose B\_328\_1/25

## 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 | 06 August 2024 |
|                   |                 | Due Date         | 06 August 2025 |

### Calibration Data

| Sound Level Meter Data   |         |          |            | Calibration Data |                     |                  |
|--|---------|----------|------------|------------------|---------------------|------------------|
| SLM No.  | Brand   | Model    | Serial No. | Date             | Actual Reading [dB] |                  |
|  |         |          |            |                  | Before Adjustment   | After Adjustment |
| NMD-B08  | SVANTEK | SV-104IS | 80818      | 12 July 2025     | 113.9               | 114.0            |
| NMD-B11  | SVANTEK | SV-104IS | 80831      | 12 July 2025     | 114.1               | 114.0            |
| NMD-B16  | SVANTEK | SV-104IS | 106120     | 12 July 2025     | 114.0               | 114.0            |
| NMD-B20  | SVANTEK | SV-104IS | 106131     | 12 July 2025     | 114.0               | 114.0            |
| Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR) |         |          |            |                  | 114.03± 0.10 dB     |                  |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera 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

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FM.BL.MTC.002 Rev.5

### Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

### Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,  
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. 21-68/0514

MTC No. EEL. BP. 34/0868

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

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

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FM.BL.MTC.002 Rev.5

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,  
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



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

Noise Dose B\_445\_1/25

## 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 | 22 August 2025 |
|                   |                 | Due Date         | 22 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-B04  | SVANTEK | SV-104IS | 80854      | 10 September 2025 | 114.1               | 114.0            |
| NMD-B05  | SVANTEK | SV-104IS | 80856      | 10 September 2025 | 114.0               | 114.0            |
| NMD-B06  | SVANTEK | SV-104IS | 80816      | 10 September 2025 | 114.1               | 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)