

# ภาคผนวกที่ 5

## เอกสารการสอบเทียบเครื่องมือ

- |        |     |   |
|--------|-----|---|
| เอกสาร | 5-1 | เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศในบรรยากาศ |
| เอกสาร | 5-2 | เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงทั่วไป      |
| เอกสาร | 5-3 | เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพน้ำ             |

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

| รายการตรวจวัด              | เครื่องมือเก็บตัวอย่าง  | เครื่องมือตรวจวิเคราะห์                                   |
|----------------------------|---|---|
|                            | ชื่อเครื่องมือ  | ชื่อเครื่องมือ  |
| <b>คุณภาพอากาศ</b>         |   |   |
| - TSP                      | - High Volume Air Sampler<br>No. B08, B10, B11 B20, B39                                     | - Digital Balance   |
| - PM <sub>10</sub>         | - High Volume Air PM-10 Sampler<br>No. B02, B03, B12, B29, R15                              | - Digital Balance   |
| - PM <sub>2.5</sub>        | - High Volume Air PM-2.5 Sampler<br>No. PM2.5-04, PM2.5-06, PM2.5-07,<br>PM2.5-09, PM2.5-10 | - Digital Balance   |
| - NO <sub>2</sub>          | - NO <sub>2</sub> Analyzer<br>No. B02, B16, B20, B21, B22                                   | - NO <sub>2</sub> Analyzer<br>No. B02, B16, B20, B21, B22 |
| - SO <sub>2</sub>          | - SO <sub>2</sub> Analyzer<br>No. B11, R01, R02, R03, R05                                   | - SO <sub>2</sub> Analyzer<br>No. B11, R01, R02, R03, R05 |
| - CO                       | - CO Analyzer<br>No. B02, B04, B06, B13, B15  | - CO Analyzer<br>No. B07, B08, B10, B11, B14              |
| <b>2. ระดับเสียงทั่วไป</b> |   |   |
| - L <sub>eq</sub> 24 hr    | - Acoustic Calibrator   | -   |
| - L <sub>eq</sub> 8 hrs    | - Sound Level Meter   |   |
| - L <sub>max</sub>         | No. ACO-B04, B15, B45   |   |
| - L <sub>dn</sub>          | No.CR-B07, B08, B09   |   |
| - L <sub>90</sub>          |   |   |
| - ระดับเสียงรบกวน          |   |   |
| <b>คุณภาพน้ำ</b>           |   |   |
| - Temperature              | -   | - Thermometer   |
| - pH                       | -   | - pH Meter  |
| - Conductivity             | -   | - Conductivity Meter                                      |
| - SS                       | -   | - Digital Balance   |
| - TDS                      | -   | - Digital Balance   |
| - DO                       | -   | - ICP   |
| - BOD <sub>5</sub>         | -   | - Digital Balance   |
| - Grease & Oil             | -   | - Digital Balance   |



## เอกสารที่ 5-1

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศในบรรยากาศ



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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 : 3611

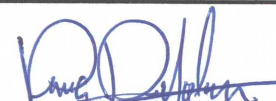
### Calibration Data

| 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        | 04/11/2024       | y = 1.163x-2.904                       | 0.998          |
| B02                          | B02        | 04/11/2024       | y = 1.132x+0.834                       | 0.998          |
| B03                          | B03        | 05/11/2024       | y = 1.135x-2.920                       | 0.999          |
| B04                          | B04        | 01/11/2024       | y = 1.183x-3.418                       | 0.999          |
| B05                          | B05        | 05/11/2024       | y = 1.187x-5.657                       | 0.999          |
| B06                          | B06        | 05/11/2024       | y = 1.143x-1.432                       | 0.996          |
| B07                          | B07        | 05/11/2024       | y = 1.203x-6.640                       | 0.998          |
| B08                          | B08        | 01/11/2024       | y = 1.151x-3.986                       | 0.998          |
| B09                          | B09        | 04/11/2024       | y = 1.193x-5.144                       | 0.998          |
| B10                          | B10        | 05/11/2024       | y = 1.172x-1.576                       | 0.998          |
| B11                          | B11        | 05/11/2024       | y = 1.167x-3.909                       | 0.997          |
| B12                          | B12        | 06/11/2024       | y = 1.159x-3.861                       | 0.999          |
| B13                          | B13        | 01/11/2024       | y = 1.122x-2.328                       | 0.998          |
| B14                          | B14        | 01/11/2024       | y = 1.177x-3.556                       | 0.996          |
| B15                          | B15        | 01/11/2024       | y = 1.181x-3.355                       | 0.999          |
| B16                          | B16        | 06/11/2024       | y = 1.182x-5.201                       | 0.996          |
| B17                          | B17        | 06/11/2024       | y = 1.147x-1.345                       | 0.998          |
| B18                          | B18        | 01/11/2024       | y = 1.180x-4.634                       | 0.998          |
| B19                          | B19        | 04/11/2024       | y = 1.164x-4.313                       | 0.997          |
| B20                          | B20        | 04/11/2024       | y = 1.161x-3.097                       | 0.998          |
| B21                          | B21        | 01/11/2024       | y = 1.141x-3.592                       | 0.997          |
| B22                          | B22        | 05/11/2024       | y = 1.182x-5.917                       | 0.997          |
| B23                          | B23        | 05/11/2024       | y = 1.173x-3.417                       | 0.997          |
| B24                          | B24        | 05/11/2024       | y = 1.077x-0.363                       | 0.998          |
| B25                          | B25        | 01/11/2024       | y = 1.055x+2.460                       | 0.999          |
| B26                          | B26        | 01/11/2024       | y = 1.120x-2.009                       | 0.998          |
| B27                          | B27        | 04/11/2024       | y = 1.167x-4.826                       | 0.999          |
| B28                          | B28        | 04/11/2024       | y = 1.196x-6.003                       | 0.997          |
| B29                          | B29        | 01/11/2024       | y = 1.153x-1.833                       | 0.997          |
| B30                          | B30        | 04/11/2024       | y = 1.155x-2.149                       | 0.996          |
| B31                          | B31        | 04/11/2024       | y = 1.148x-3.317                       | 0.998          |
| B32                          | B32        | 05/11/2024       | y = 1.124x-1.205                       | 0.996          |
| B33                          | B33        | 05/11/2024       | y = 1.186x-3.999                       | 0.996          |
| B34                          | B34        | 01/11/2024       | y = 1.147x-3.571                       | 0.998          |

Calibrated by :

  
(Mr. Adul Dangklom)

Approved by :

  
(Mr. Peera Detudom)



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## High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

### Calibration Data

| High Volume Air Sampler Data |            | Calibration Data |  |                |
|------------------------------|------------|------------------|--|----------------|
| Recorder No.                 | Blower No. | Date             | Actual Flowrate (ft <sup>3</sup> /min) | R <sup>2</sup> |
| B35                          | B35        | 04/11/2024       | y = 1.159x-2.093                       | 0.999          |
| B36                          | B36        | 04/11/2024       | y = 1.167x-3.333                       | 0.996          |
| B37                          | B37        | 06/11/2024       | y = 1.152x-2.051                       | 0.997          |
| B38                          | B38        | 04/11/2024       | y = 1.144x-4.581                       | 0.998          |
| B39                          | B39        | 05/11/2024       | y = 1.160x-3.397                       | 0.997          |
| B40                          | B40        | 01/11/2024       | y = 1.168x-3.661                       | 0.996          |
| B41                          | B41        | 04/11/2024       | y = 1.150x-2.581                       | 0.999          |
| B42                          | B42        | 04/11/2024       | y = 1.177x-4.883                       | 0.997          |
| B43                          | B43        | 01/11/2024       | y = 1.165x-3.033                       | 0.998          |
| B44                          | B44        | 05/11/2024       | y = 1.173x-1.743                       | 0.999          |
| R01                          | R01        | 04/11/2024       | y = 1.134x-3.385                       | 0.998          |
| R02                          | R02        | 04/11/2024       | y = 1.173x-4.742                       | 0.998          |
| R03                          | R03        | 04/11/2024       | y = 1.166x-4.405                       | 0.998          |
| R04                          | R04        | 01/11/2024       | y = 1.133x-2.807                       | 0.998          |
| R05                          | R05        | 01/11/2024       | y = 1.148x-2.112                       | 0.997          |
| R06                          | R06        | 01/11/2024       | y = 1.196x-4.533                       | 0.998          |
| R07                          | R07        | 01/11/2024       | y = 1.082x+0.340                       | 0.999          |
| R08                          | R08        | 01/11/2024       | y = 1.112x-1.862                       | 0.997          |
| R09                          | R09        | 04/11/2024       | y = 1.166x-3.534                       | 0.997          |
| R10                          | R10        | 04/11/2024       | y = 1.191x-4.707                       | 0.998          |
| R11                          | R11        | 05/11/2024       | y = 1.170x-4.815                       | 0.997          |
| R12                          | R12        | 05/11/2024       | y = 1.138x-3.913                       | 0.998          |
| R13                          | R13        | 05/11/2024       | y = 1.105x-2.238                       | 0.998          |
| R14                          | R14        | 06/11/2024       | y = 1.183x-3.021                       | 0.999          |
| R15                          | R15        | 06/11/2024       | y = 1.190x-5.879                       | 0.999          |
| R16                          | R16        | 06/11/2024       | y = 1.137x-3.608                       | 0.999          |
| R17                          | R17        | 01/11/2024       | y = 1.140x-2.475                       | 0.998          |
| R18                          | R18        | 01/11/2024       | y = 1.142x-2.703                       | 0.998          |
| R19                          | R19        | 01/11/2024       | y = 1.134x-4.199                       | 0.999          |
| R20                          | R20        | 04/11/2024       | y = 1.147x-3.807                       | 0.998          |

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





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## High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

### 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        | 01/11/2024       | y = 1.151x-1.106                       | 0.997          |
| B02                    | B02        | 04/11/2024       | y = 1.075x+1.368                       | 0.999          |
| B03                    | B03        | 04/11/2024       | y = 1.172x-3.506                       | 0.998          |
| B04                    | B04        | 05/11/2024       | y = 1.180x-5.127                       | 0.999          |
| B05                    | B05        | 01/11/2024       | y = 1.177x-4.054                       | 0.997          |
| B06                    | B06        | 04/11/2024       | y = 1.129x-2.114                       | 0.996          |
| B07                    | B07        | 04/11/2024       | y = 1.152x-2.091                       | 0.996          |
| B08                    | B08        | 01/11/2024       | y = 1.167x-2.006                       | 0.998          |
| B09                    | B09        | 01/11/2024       | y = 1.174x-3.358                       | 0.998          |
| B10                    | B10        | 01/11/2024       | y = 1.186x-4.531                       | 0.999          |
| B11                    | B11        | 04/11/2024       | y = 1.169x-4.146                       | 0.996          |
| B12                    | B12        | 05/11/2024       | y = 1.186x-4.531                       | 0.999          |
| B13                    | B13        | 04/11/2024       | y = 1.133x-1.566                       | 0.996          |
| B14                    | B14        | 05/11/2024       | y = 1.182x-4.388                       | 0.998          |
| B15                    | B15        | 01/11/2024       | y = 1.130x-1.046                       | 0.999          |
| B16                    | B16        | 04/11/2024       | y = 1.146x+0.731                       | 0.996          |
| B17                    | B17        | 04/11/2024       | y = 1.179x-3.236                       | 0.998          |
| B18                    | B18        | 05/11/2024       | y = 1.151x-1.687                       | 0.999          |
| B19                    | B19        | 05/11/2024       | y = 1.121x-0.436                       | 0.999          |
| B20                    | B20        | 05/11/2024       | y = 1.148x-3.271                       | 0.999          |
| B21                    | B21        | 01/11/2024       | y = 1.134x+0.091                       | 0.998          |
| B22                    | B22        | 04/11/2024       | y = 1.178x-3.448                       | 0.997          |
| B23                    | B23        | 01/11/2024       | y = 1.154x-1.979                       | 0.997          |
| B24                    | B24        | 01/11/2024       | y = 1.145x-1.926                       | 0.998          |
| B25                    | B25        | 06/11/2024       | y = 1.159x-3.107                       | 0.999          |
| B26                    | B26        | 06/11/2024       | y = 1.136x-2.099                       | 0.997          |
| B27                    | B27        | 04/11/2024       | y = 1.174x-5.717                       | 0.997          |
| B28                    | B28        | 05/11/2024       | y = 1.141x-2.949                       | 0.996          |
| B29                    | B29        | 05/11/2024       | y = 1.180x-5.201                       | 0.996          |
| B30                    | B30        | 04/11/2024       | y = 1.153x-3.408                       | 0.997          |
| B31                    | B31        | 04/11/2024       | y = 1.181x+0.341                       | 0.999          |
| B32                    | B32        | 04/11/2024       | y = 1.153x-1.684                       | 0.996          |
| B33                    | B33        | 01/11/2024       | y = 1.142x-3.219                       | 0.997          |
| B34                    | B34        | 01/11/2024       | y = 1.177x-1.129                       | 0.996          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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## High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

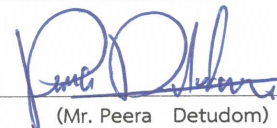
### Calibration Data

| High Volume PM-10 Data |            | Calibration Data |  |                |
|------------------------|------------|------------------|--|----------------|
| Recorder No.           | Blower No. | Date             | Actual Flowrate (ft <sup>3</sup> /min) | R <sup>2</sup> |
| R01                    | R01        | 01/11/2024       | y = 1.175x-5.215                       | 0.998          |
| R02                    | R02        | 01/11/2024       | y = 1.157x-3.322                       | 0.996          |
| R03                    | R03        | 06/11/2024       | y = 1.147x-4.899                       | 0.998          |
| R04                    | R04        | 06/11/2024       | y = 1.158x-5.443                       | 0.997          |
| R05                    | R05        | 01/11/2024       | y = 1.128x-3.926                       | 0.997          |
| R06                    | R06        | 01/11/2024       | y = 1.135x-2.508                       | 0.996          |
| R07                    | R07        | 06/11/2024       | y = 1.156x-2.437                       | 0.996          |
| R08                    | R08        | 06/11/2024       | y = 1.163x-5.100                       | 0.998          |
| R09                    | R09        | 01/11/2024       | y = 1.142x-4.291                       | 0.996          |
| R10                    | R10        | 01/11/2024       | y = 1.184x-4.270                       | 0.999          |
| R11                    | R11        | 01/11/2024       | y = 1.140x-1.292                       | 0.997          |
| R12                    | R12        | 01/11/2024       | y = 1.182x-4.934                       | 0.998          |
| R13                    | R13        | 05/11/2024       | y = 1.130x-1.455                       | 0.997          |
| R14                    | R14        | 04/11/2024       | y = 1.177x-4.675                       | 0.996          |
| R15                    | R15        | 04/11/2024       | y = 1.144x-4.059                       | 0.998          |
| R16                    | R16        | 01/11/2024       | y = 1.163x-2.835                       | 0.997          |
| R17                    | R17        | 04/11/2024       | y = 1.178x-3.580                       | 0.996          |
| R18                    | R18        | 04/11/2024       | y = 1.136x-3.484                       | 0.997          |
| R19                    | R19        | 06/11/2024       | y = 1.166x-4.037                       | 0.996          |
| R20                    | R20        | 06/11/2024       | y = 1.152x-4.500                       | 0.997          |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

  
(Mr. Peera Detudom)



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| CALIBRATION REPORT                              |  |                        |   |
|---|--|------------------------|---|
| PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC) |  |                        |   |
| DATE :  | 21 November 2024                             | BRAND :                | BGI                                       |
| MODEL :   | PQ200  | SERIAL NO.             | 160810-4 (VSCC)                           |
| NO.   | PM2.5-04                                     |                        |   |
| CALIBRATING CONDITION                           |  |                        |   |
| Pressure  | 1011   | mmbar                  | Temp. 24.5 °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)



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| CALIBRATION REPORT                              |  |                        |   |
|---|--|------------------------|---|
| PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC) |  |                        |   |
| DATE :  | 21 November 2024                             | BRAND :                | BGI                                       |
| MODEL :   | PQ200  | SERIAL NO.             | 164589 (VSCC)                             |
| NO.   | PM2.5-06                                     |                        |   |
| CALIBRATING CONDITION                           |  |                        |   |
| Pressure  | 1011   | mmbar                  | Temp. 24.5 °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   | 16.68  | 0.120                  | 16.70                                     |

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom )

Approved by : Peera Detudom  
(Mr.Peera Detudom)





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| CALIBRATION REPORT                              |  |                        |   |
|---|--|------------------------|---|
| PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC) |  |                        |   |
| DATE :  | 21 November 2024                             | BRAND :                | BGI                                       |
| MODEL :   | PQ200  | SERIAL NO.             | 152099 (VSCC)                             |
| NO.   | PM2.5-07                                     |                        |   |
| CALIBRATING CONDITION                           |  |                        |   |
| Pressure  | 1011   | mmbar                  | Temp. 24.5 °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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| CALIBRATION REPORT                              |  |                        |   |
|---|--|------------------------|---|
| PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC) |  |                        |   |
| DATE :  | 21 November 2024                             | BRAND :                | BGI                                       |
| MODEL :   | PQ200  | SERIAL NO.             | 152125 (VSCC)                             |
| NO.   | PM2.5-09                                     |                        |   |
| CALIBRATING CONDITION                           |  |                        |   |
| Pressure  | 1011   | mmbar                  | Temp. 24.5 °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)



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| CALIBRATION REPORT                              |  |                        |   |
|---|--|------------------------|---|
| PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC) |  |                        |   |
| DATE :  | 21 November 2024                             | BRAND :                | BGI                                       |
| MODEL :   | PQ200  | SERIAL NO.             | 164598 (VSCC)                             |
| NO.   | PM2.5-10                                     |                        |   |
| CALIBRATING CONDITION                           |  |                        |   |
| Pressure  | 1011   | mmbar                  | Temp. 24.5 °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   | 16.66  | 0.240                  | 16.70                                     |

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom )

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



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| CALIBRATION REPORT   |                                   |                   |                            |                                |            |
|--|-----------------------------------|-------------------|----------------------------|--------------------------------|------------|
| CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER |                                   |                   |                            |                                |            |
| DATE :   | 21 November 2024                  | BRAND :           | API                        | MODEL :                        | 200A       |
| NO.  | NOX-B02                           | SERIAL NO.        | 2409                       |                                |            |
| Calibrator (Dilution System)                                     |                                   |                   |                            |                                |            |
| Brand  | : API                             |                   |                            | Model                          | : 700      |
| Last Cal. Date   | : 05 August 2024                  |                   |                            | Serial No.                     | : 911      |
| 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.                      | 24.5                           | °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                                 | 0.11              | -                          | 0                              | -          |
| NO Span  | 400                               | 399.8             | -0.050                     | 400.0                          | 1.008      |
| NO <sub>x</sub> Span   | 400                               | 400.2             | 0.050                      | 400.0                          | 1.012      |
| 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  | 511                               | cc/min            | 500 ± 50                   |                                |            |
| OZONE FLOW   | 79                                | cc/min            | 80 ± 15                    |                                |            |
| PMT  | 103.3                             | mV                | -20 - 150                  |                                |            |
| AZERO  | 94.1                              | mV                | -20 - 150                  |                                |            |
| HVPS   | 674                               | V                 | 420 - 900 constant         |                                |            |
| RCELL TEMP   | 50.2                              | °C                | 50 ± 1                     |                                |            |
| BOX TEMP   | 29.1                              | °C                | 8 - 48                     |                                |            |
| PMT TEMP   | 7.3                               | °C                | 7 ± 2                      |                                |            |
| MOLY TEMP  | 315.2                             | °C                | 315 ± 5                    |                                |            |
| RCELL PRESS  | 8.3                               | 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  | 1.012                             | -                 | 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 : (Signature)  
(Mr.Peera Detudom)



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| CALIBRATION REPORT   |                                   |                   |                            |                                |            |
|--|-----------------------------------|-------------------|----------------------------|--------------------------------|------------|
| CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER |                                   |                   |                            |                                |            |
| DATE :   | 21 November 2024                  | BRAND :           | API                        | MODEL :                        | 200E       |
| NO.  | NOX-B16                           | SERIAL NO.        | 249                        |                                |            |
| Calibrator (Dilution System)                                     |                                   |                   |                            |                                |            |
| Brand  | : API                             |                   |                            | Model                          | : 700      |
| Last Cal. Date   | : 05 August 2024                  |                   |                            | Serial No.                     | : 911      |
| 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.                      | 24.5                           | °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  | 508                               | cc/min            | 500 ± 50                   |                                |            |
| OZONE FLOW   | 78                                | cc/min            | 80 ± 15                    |                                |            |
| PMT  | 103.2                             | mV                | -20 - 150                  |                                |            |
| AZERO  | 94.0                              | mV                | -20 - 150                  |                                |            |
| HVPS   | 671                               | V                 | 420 - 900 constant         |                                |            |
| RCELL TEMP   | 50.0                              | °C                | 50 ± 1                     |                                |            |
| BOX TEMP   | 28.8                              | °C                | 8 - 48                     |                                |            |
| PMT TEMP   | 7.1                               | °C                | 7 ± 2                      |                                |            |
| MOLY TEMP  | 315.4                             | °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   | 0.6                               | 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  
(Mr.Peera Detudom)





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| CALIBRATION REPORT   |                                   |                   |                            |                                |         |
|--|-----------------------------------|-------------------|----------------------------|--------------------------------|---------|
| CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER |                                   |                   |                            |                                |         |
| DATE :   | 21 November 2024                  | BRAND :           | API                        | MODEL :                        | TML-41M |
| NO.  | NOX-B20                           | SERIAL NO.        | N02782                     |                                |         |
| Calibrator (Dilution System)                                     |                                   |                   |                            |                                |         |
| Brand  | : API                             |                   | Model                      | : 700                          |         |
| Last Cal. Date   | : 05 August 2024                  |                   | Serial No.                 | : 911                          |         |
| 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.                      | 24.5                           | °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                          | 1.007   |
| NO <sub>x</sub> Span   | 400                               | 400.1             | 0.025                      | 400.0                          | 1.011   |
| 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  | 504                               | cc/min            | 500 ± 50                   |                                |         |
| OZONE FLOW   | 78                                | cc/min            | 80 ± 15                    |                                |         |
| PMT  | 103.0                             | mV                | -20 - 150                  |                                |         |
| AZERO  | 93.7                              | mV                | -20 - 150                  |                                |         |
| HVPS   | 673                               | V                 | 420 - 900 constant         |                                |         |
| RCELL TEMP   | 50.4                              | °C                | 50 ± 1                     |                                |         |
| BOX TEMP   | 29.3                              | °C                | 8 - 48                     |                                |         |
| PMT TEMP   | 7.5                               | °C                | 7 ± 2                      |                                |         |
| MOLY TEMP  | 314.7                             | °C                | 315 ± 5                    |                                |         |
| RCELL PRESS  | 8.4                               | IN-Hg-A           | 2 - 10 constant            |                                |         |
| SAMPLE PRESS   | 28.6                              | IN-Hg-A           | 25 - 30 constant           |                                |         |
| NO Span Conc   | 400                               | PPB               | 20 - 20,000                |                                |         |
| NO <sub>x</sub> Span Conc  | 400                               | PPB               | 20 - 20,000                |                                |         |
| NO Slope   | 1.007                             | -                 | 1.0 ± 0.3                  |                                |         |
| NO <sub>x</sub> Slope  | 1.011                             | -                 | 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)



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| CALIBRATION REPORT   |                                   |                   |                            |                                |            |
|--|-----------------------------------|-------------------|----------------------------|--------------------------------|------------|
| CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER |                                   |                   |                            |                                |            |
| DATE :   | 21 November 2024                  | BRAND :           | API                        | MODEL :                        | TML-41M    |
| NO.  | NOX-B21                           | SERIAL NO.        | N02374                     |                                |            |
| Calibrator (Dilution System)                                     |                                   |                   |                            |                                |            |
| Brand  | : API                             |                   |                            | Model                          | : 700      |
| Last Cal. Date   | : 05 August 2024                  |                   |                            | Serial No.                     | : 911      |
| 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.                      | 24.5                           | °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                               | 399.7             | -0.075                     | 400.0                          | 1.005      |
| NO <sub>x</sub> Span   | 400                               | 399.9             | -0.025                     | 400.0                          | 1.009      |
| 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  | 510                               | cc/min            | 500 ± 50                   |                                |            |
| OZONE FLOW   | 79                                | cc/min            | 80 ± 15                    |                                |            |
| PMT  | 103.1                             | mV                | -20 - 150                  |                                |            |
| AZERO  | 93.9                              | mV                | -20 - 150                  |                                |            |
| HVPS   | 670                               | V                 | 420 - 900 constant         |                                |            |
| RCELL TEMP   | 50.5                              | °C                | 50 ± 1                     |                                |            |
| BOX TEMP   | 29.2                              | °C                | 8 - 48                     |                                |            |
| PMT TEMP   | 7.4                               | °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   | 1.005                             | -                 | 1.0 ± 0.3                  |                                |            |
| NO <sub>x</sub> Slope  | 1.009                             | -                 | 1.0 ± 0.3                  |                                |            |
| NO Offset  | 1.1                               | 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 :

(Mr.Peera Detudom)





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| CALIBRATION REPORT   |                                   |                   |                            |                                |         |
|--|-----------------------------------|-------------------|----------------------------|--------------------------------|---------|
| CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER |                                   |                   |                            |                                |         |
| DATE :   | 21 November 2024                  | BRAND :           | API                        | MODEL :                        | TML-41M |
| NO.  | NOX-B22                           | SERIAL NO.        | NO1618                     |                                |         |
| Calibrator (Dilution System)                                     |                                   |                   |                            |                                |         |
| Brand  | : API                             |                   | Model                      | : 700                          |         |
| Last Cal. Date   | : 05 August 2024                  |                   | Serial No.                 | : 911                          |         |
| 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.                      | 24.5                           | °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                                 | 0.11              | -                          | 0                              | -       |
| NO Span  | 400                               | 400.1             | 0.025                      | 400.0                          | 1.010   |
| NO <sub>x</sub> Span   | 400                               | 400.2             | 0.050                      | 400.0                          | 1.013   |
| 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  | 509                               | cc/min            | 500 ± 50                   |                                |         |
| OZONE FLOW   | 79                                | cc/min            | 80 ± 15                    |                                |         |
| PMT  | 103.4                             | mV                | -20 - 150                  |                                |         |
| AZERO  | 94.2                              | mV                | -20 - 150                  |                                |         |
| HVPS   | 675                               | V                 | 420 - 900 constant         |                                |         |
| RCELL TEMP   | 50.1                              | °C                | 50 ± 1                     |                                |         |
| BOX TEMP   | 29.0                              | °C                | 8 - 48                     |                                |         |
| PMT TEMP   | 7.2                               | °C                | 7 ± 2                      |                                |         |
| MOLY TEMP  | 315.1                             | °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  | 1.013                             | -                 | 1.0 ± 0.3                  |                                |         |
| NO Offset  | 1.7                               | 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)



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| CALIBRATION REPORT                                   |                                      |                   |                                |                                |        |
|--|--------------------------------------|-------------------|--------------------------------|--------------------------------|--------|
| SO <sub>2</sub> FLUORESCENT ANALYZER                 |                                      |                   |                                |                                |        |
| DATE :   | 21 November 2024                     | BRAND :           | TELEDYNE                       | MODEL :                        | TML-50 |
| NO.  | SO <sub>2</sub> -B11                 | SERIAL NO.        | SO2187                         |                                |        |
| Calibrator (Dilution System)                         |                                      |                   |                                |                                |        |
| Brand  | : API                                |                   | Model                          | : 700                          |        |
| Last Cal. Date                                       | : 05 August 2024                     |                   | Serial No.                     | : 911                          |        |
| 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.                          | 24.5                           | °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                                | 400.2             | 0.050                          | 400.0                          | 1.014  |
| 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   | 28.5                                 | in-Hg             | 25-35                          |                                |        |
| SAMPLE FLOW  | 659                                  | cc/min            | 650 ± 10%                      |                                |        |
| PMT  | 103.1                                | mV                | -20-150 with Zero Air          |                                |        |
| UV LAMP  | 3019.5                               | mV                | 1000-4900                      |                                |        |
| STR. LGT   | 61.7                                 | PPB               | <100                           |                                |        |
| DRK PMT  | 63.1                                 | mV                | -50 - 200                      |                                |        |
| DRK LMP  | 57.9                                 | mV                | -50 - 200                      |                                |        |
| HVPS   | 675                                  | V                 | 550-900 constant               |                                |        |
| DCPS   | 2529                                 | mV                | 2500 ± 200                     |                                |        |
| RCELL TEMP   | 50.3                                 | °C                | 50 ± 1                         |                                |        |
| BOX TEMP   | 29.1                                 | °C                | 5-40                           |                                |        |
| PMT TEMP   | 7.2                                  | °C                | 7 ± 2.0                        |                                |        |
| SO <sub>2</sub> Span Conc                            | 400                                  | PPB               | 20-20,000                      |                                |        |
| SO <sub>2</sub> Slope                                | 1.014                                | -                 | 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.Adut Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)





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| CALIBRATION REPORT                                 |                                      |                   |                                |                                |            |
|--|--------------------------------------|-------------------|--------------------------------|--------------------------------|------------|
| SO <sub>2</sub> FLUORESCENT ANALYZER               |                                      |                   |                                |                                |            |
| DATE :   | 21 November 2024                     | BRAND :           | API                            | MODEL :                        | 100E       |
| NO.  | SO <sub>2</sub> -R01                 | SERIAL NO.        | 3415                           |                                |            |
| Calibrator (Dilution System)                       |                                      |                   |                                |                                |            |
| Brand  | : API                                |                   |                                | Model                          | : 700      |
| Last Cal. Date                                     | : 05 August 2024                     |                   |                                | Serial No.                     | : 911      |
| 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.                          | 24.5                           | °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                                       | 28.4                                 | in-Hg             | 25-35                          |                                |            |
| SAMPLE FLOW  | 660                                  | cc/min            | 650 ± 10%                      |                                |            |
| PMT  | 103.2                                | mV                | -20-150 with Zero Air          |                                |            |
| UV LAMP  | 3028.7                               | mV                | 1000-4900                      |                                |            |
| STR. LGT   | 61.5                                 | PPB               | <100                           |                                |            |
| DRK PMT  | 62.9                                 | mV                | -50 - 200                      |                                |            |
| DRK LMP  | 57.6                                 | mV                | -50 - 200                      |                                |            |
| HVPS   | 674                                  | V                 | 550-900 constant               |                                |            |
| DCPS   | 2515                                 | mV                | 2500 ± 200                     |                                |            |
| RCELL TEMP   | 50.1                                 | °C                | 50 ± 1                         |                                |            |
| BOX TEMP   | 29.4                                 | °C                | 5-40                           |                                |            |
| PMT TEMP   | 7.5                                  | °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                             | 21.9                                 | 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)



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| CALIBRATION REPORT                                 |                                      |                   |                                |                                |            |
|--|--------------------------------------|-------------------|--------------------------------|--------------------------------|------------|
| SO <sub>2</sub> FLUORESCENT ANALYZER               |                                      |                   |                                |                                |            |
| DATE :   | 21 November 2024                     | BRAND :           | API                            | MODEL :                        | 100E       |
| NO.  | SO <sub>2</sub> -R02                 | SERIAL NO.        | 3431                           |                                |            |
| Calibrator (Dilution System)                       |                                      |                   |                                |                                |            |
| Brand  | : API                                |                   |                                | Model                          | : 700      |
| Last Cal. Date                                     | : 05 August 2024                     |                   |                                | Serial No.                     | : 911      |
| 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.                          | 24.5                           | °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 100E SO <sub>2</sub> Analyzer Check list |                                      |                   |                                |                                |            |
| Test Values  | Observed Value                       | Units             | Nominal Range                  |                                |            |
| RANGE  | 500                                  | PPB               | 0-500                          |                                |            |
| SAMPLE PRESS                                       | 28.7                                 | in-Hg             | 25-35                          |                                |            |
| SAMPLE FLOW  | 654                                  | cc/min            | 650 ± 10%                      |                                |            |
| PMT  | 103.3                                | mV                | -20-150 with Zero Air          |                                |            |
| UV LAMP  | 3034.1                               | mV                | 1000-4900                      |                                |            |
| STR. LGT   | 61.8                                 | PPB               | <100                           |                                |            |
| DRK PMT  | 63.3                                 | mV                | -50 - 200                      |                                |            |
| DRK LMP  | 58.0                                 | mV                | -50 - 200                      |                                |            |
| HVPS   | 671                                  | 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                              | 1.010                                | -                 | 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)



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# CALIBRATION REPORT

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

DATE : 21 November 2024

BRAND : API

MODEL : 100E

NO. SO<sub>2</sub>-R03

SERIAL NO. 3488

### Calibrator (Dilution System)

Brand : API Model : 700  
Last Cal. Date : 05 August 2024 Serial No. : 911

### 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. 24.5 °C % RH 50

### CALIBRATION SETTING

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

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

| Test Values               | Observed Value | Units  | Nominal Range                  |
|---------------------------|----------------|--------|--------------------------------|
| RANGE                     | 500            | PPB    | 0-500                          |
| SAMPLE PRESS              | 28.6           | in-Hg  | 25-35                          |
| SAMPLE FLOW               | 658            | cc/min | 650 ± 10%                      |
| PMT                       | 103.0          | mV     | -20-150 with Zero Air          |
| UV LAMP                   | 3012.3         | mV     | 1000-4900                      |
| STR. LGT                  | 61.9           | PPB    | <100                           |
| DRK PMT                   | 63.4           | mV     | -50 - 200                      |
| DRK LMP                   | 58.2           | mV     | -50 - 200                      |
| HVPS                      | 670            | V      | 550-900 constant               |
| DCPS                      | 2517           | mV     | 2500 ± 200                     |
| RCELL TEMP                | 50.4           | °C     | 50 ± 1                         |
| BOX TEMP                  | 29.5           | °C     | 5-40                           |
| PMT TEMP                  | 7.3            | °C     | 7 ± 2.0                        |
| SO <sub>2</sub> Span Conc | 400            | PPB    | 20-20,000                      |
| SO <sub>2</sub> Slope     | 1.008          | -      | 1.0 ± 0.3                      |
| SO <sub>2</sub> Offset    | 21.7           | 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 : Peera Detudom  
(Mr.Peera Detudom)

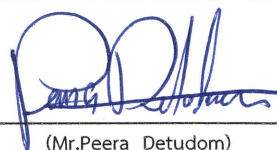




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| CALIBRATION REPORT                                 |                                      |                   |                                |                                |            |
|--|--------------------------------------|-------------------|--------------------------------|--------------------------------|------------|
| SO <sub>2</sub> FLUORESCENT ANALYZER               |                                      |                   |                                |                                |            |
| DATE :   | 21 November 2024                     | BRAND :           | API                            | MODEL :                        | 100E       |
| NO.  | SO <sub>2</sub> -R05                 |                   |                                | SERIAL NO.                     | 3490       |
| Calibrator (Dilution System)                       |                                      |                   |                                |                                |            |
| Brand  | : API                                |                   |                                | Model                          | : 700      |
| Last Cal. Date                                     | : 05 August 2024                     |                   |                                | Serial No.                     | : 911      |
| 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.                          | 24.5                           | °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                          | 1.012      |
| 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  | 655                                  | cc/min            | 650 ± 10%                      |                                |            |
| PMT  | 103.4                                | mV                | -20-150 with Zero Air          |                                |            |
| UV LAMP  | 30395                                | mV                | 1000-4900                      |                                |            |
| STR. LGT   | 61.6                                 | PPB               | <100                           |                                |            |
| DRK PMT  | 63.0                                 | mV                | -50 - 200                      |                                |            |
| DRK LMP  | 57.8                                 | mV                | -50 - 200                      |                                |            |
| HVPS   | 673                                  | V                 | 550-900 constant               |                                |            |
| DCPS   | 2521                                 | 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                              | 1.012                                | -                 | 1.0 ± 0.3                      |                                |            |
| SO <sub>2</sub> Offset                             | 21.8                                 | mV                | <250                           |                                |            |
| Stability at Zero                                  | 0.1                                  | PPB               | <0.2                           |                                |            |
| Stability at Span                                  | 0.2                                  | PPB               | 0.5% of reading (above 50 ppb) |                                |            |

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :   
(Mr.Peera Detudom)



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

| Calibration Report                    |                                    |                              |                                 |                                 |                   |
|---------------------------------------|------------------------------------|------------------------------|---------------------------------|---------------------------------|-------------------|
| Non-Dispersive Infrared CO Analyzer   |                                    |                              |                                 |                                 |                   |
| Date :                                | 21 November 2024                   | Brand :                      | API                             | Model :                         | 300E              |
| No.                                   | CO-B02                             |                              |                                 | Serial No.                      | 965               |
| Calibrator (Dilution System)          |                                    |                              |                                 |                                 |                   |
| Brand : API                           |                                    |                              | Model : 700                     |                                 |                   |
| Last Cal. Date : 05 August 2024       |                                    |                              | Serial No. : 911                |                                 |                   |
| Reference Standard Gas                |                                    |                              |                                 |                                 |                   |
| Standard Gas : Carbon Monoxide (CO)   |                                    |                              | Cylinder No. : D711839          |                                 |                   |
| Certified Date : 14 March 2024        |                                    | Expired Date : 14 March 2032 |                                 | Cylinder Conc. : 4,580 ppm      |                   |
| Calibrating Condition                 |                                    |                              |                                 |                                 |                   |
| Pressure                              | 1011                               | mmbar                        | Temp.                           | 24.5                            | °C                |
|                                       |                                    |                              | % RH                            | 50                              |                   |
| Calibration Setting                   |                                    |                              |                                 |                                 |                   |
| Span<br>Set Point                     | Initial Reading (Before Adj.), PPM |                              |                                 | Final Reading (After Adj.), PPM |                   |
|                                       | Expected Concentration             | Analyzer Response            |                                 | %Dif                            | Analyzer Response |
| Zero                                  | 0                                  | -0.10                        |                                 | -                               | 0                 |
| CO Span                               | 40.00                              | 40.07                        |                                 | 0.175                           | 40.00             |
| API Model 300E CO Analyzer Check List |                                    |                              |                                 |                                 |                   |
| Parameter                             | Observed Value                     | Units                        | Nominal Range                   |                                 |                   |
| Range                                 | 50                                 | PPM                          | 0-1000 ppm                      |                                 |                   |
| Stability                             | 0.10                               | PPM                          | < 1 ppm With Zero Air           |                                 |                   |
| CO Measure                            | 4016.1                             | mV                           | 2500-4800 mV                    |                                 |                   |
| CO Reference                          | 3949.5                             | mV                           | 2500-4800 mV                    |                                 |                   |
| Measure/Reference Ratio               | 1.180                              | -                            | 1.1-1.3 W/Zero Air              |                                 |                   |
| Sample Pressure                       | 28.5                               | In-Hg-A                      | ~2" < Ambient Absolute Pressure |                                 |                   |
| Sample Flow                           | 808                                | CC/Min                       | 800 ± 10%                       |                                 |                   |
| Sample Temperature                    | 48.4                               | °C                           | 48 ± 4                          |                                 |                   |
| Bench Temperature                     | 48.2                               | °C                           | 48 ± 2                          |                                 |                   |
| Wheel Temperature                     | 68.5                               | °C                           | 68 ± 2                          |                                 |                   |
| Box Temperature                       | 30.9                               | °C                           | Ambient Temp + 7 ± 10           |                                 |                   |
| Photo-Drive                           | 3040.1                             | mV                           | 250 mV to 4750 mV               |                                 |                   |
| Slope                                 | 1.017                              | -                            | 1.0 ± 0.3                       |                                 |                   |
| Offset                                | 0.2                                | -                            | 0 ± 0.3                         |                                 |                   |

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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## Calibration Report

### Non-Dispersive Infrared CO Analyzer

Date : 21 November 2024

Brand : API

Model : 300E

No. CO-B04

Serial No. 3089

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2024

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Carbon Monoxide (CO)

Cylinder No. : D711839

Certified Date : 14 March 2024

Expired Date : 14 March 2032

Cylinder Conc. : 4,580 ppm

#### Calibrating Condition

Pressure 1011 mmbar

Temp. 24.5 °C

% RH 50

#### Calibration Setting

| Span Set Point | Initial Reading (Before Adj.), PPM |                   |        | Final Reading (After Adj.), PPM |
|----------------|------------------------------------|-------------------|--------|---------------------------------|
|                | Expected Concentration             | Analyzer Response | %Dif   | Analyzer Response               |
| Zero           | 0                                  | 0.10              | -      | 0                               |
| CO Span        | 40.00                              | 39.94             | -0.150 | 40.00                           |

#### API Model 300E CO Analyzer Check List

| Parameter               | Observed Value | Units   | Nominal Range                   |
|-------------------------|----------------|---------|---------------------------------|
| Range                   | 50             | PPM     | 0-1000 ppm                      |
| Stability               | 0.10           | PPM     | < 1 ppm With Zero Air           |
| CO Measure              | 4017.2         | mV      | 2500-4800 mV                    |
| CO Reference            | 3948.9         | mV      | 2500-4800 mV                    |
| Measure/Reference Ratio | 1.180          | -       | 1.1-1.3 W/Zero Air              |
| Sample Pressure         | 28.6           | In-Hg-A | ~2" < Ambient Absolute Pressure |
| Sample Flow             | 805            | CC/Min  | 800 ± 10%                       |
| Sample Temperature      | 48.2           | °C      | 48 ± 4                          |
| Bench Temperature       | 48.0           | °C      | 48 ± 2                          |
| Wheel Temperature       | 68.3           | °C      | 68 ± 2                          |
| Box Temperature         | 30.7           | °C      | Ambient Temp + 7 ± 10           |
| Photo-Drive             | 3029.5         | mV      | 250 mV to 4750 mV               |
| Slope                   | 1.017          | -       | 1.0 ± 0.3                       |
| Offset                  | 0.2            | -       | 0 ± 0.3                         |

Calibrated by :

Adul Dangklom

(Mr.Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)

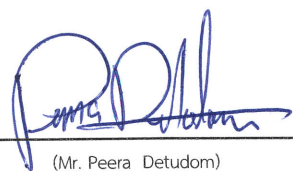




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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

| Calibration Report                    |                                    |                              |                                 |                                 |      |
|---------------------------------------|------------------------------------|------------------------------|---------------------------------|---------------------------------|------|
| Non-Dispersive Infrared CO Analyzer   |                                    |                              |                                 |                                 |      |
| Date :                                | 21 November 2024                   | Brand :                      | API                             | Model :                         | 300E |
| No.                                   | CO-B06                             |                              |                                 | Serial No.                      | 3117 |
| Calibrator (Dilution System)          |                                    |                              |                                 |                                 |      |
| Brand : API                           |                                    |                              | Model : 700                     |                                 |      |
| Last Cal. Date : 05 August 2024       |                                    |                              | Serial No. : 911                |                                 |      |
| Reference Standard Gas                |                                    |                              |                                 |                                 |      |
| Standard Gas : Carbon Monoxide (CO)   |                                    |                              | Cylinder No. : D711839          |                                 |      |
| Certified Date : 14 March 2024        |                                    | Expired Date : 14 March 2032 |                                 | Cylinder Conc. : 4,580 ppm      |      |
| Calibrating Condition                 |                                    |                              |                                 |                                 |      |
| Pressure : 1011 mmbar                 |                                    | Temp. : 24.5 °C              |                                 | % RH : 50                       |      |
| Calibration Setting                   |                                    |                              |                                 |                                 |      |
| Span Set Point                        | Initial Reading (Before Adj.), PPM |                              |                                 | Final Reading (After Adj.), PPM |      |
|                                       | Expected Concentration             | Analyzer Response            | %Dif                            | Analyzer Response               |      |
| Zero                                  | 0                                  | 0.11                         | -                               | 0                               |      |
| CO Span                               | 40.00                              | 40.03                        | 0.075                           | 40.00                           |      |
| API Model 300E CO Analyzer Check List |                                    |                              |                                 |                                 |      |
| Parameter                             | Observed Value                     | Units                        | Nominal Range                   |                                 |      |
| Range                                 | 50                                 | PPM                          | 0-1000 ppm                      |                                 |      |
| Stability                             | 0.10                               | PPM                          | < 1 ppm With Zero Air           |                                 |      |
| CO Measure                            | 4014.6                             | mV                           | 2500-4800 mV                    |                                 |      |
| CO Reference                          | 3947.4                             | mV                           | 2500-4800 mV                    |                                 |      |
| Measure/Reference Ratio               | 1.180                              | -                            | 1.1-1.3 W/Zero Air              |                                 |      |
| Sample Pressure                       | 28.4                               | In-Hg-A                      | ~2" < Ambient Absolute Pressure |                                 |      |
| Sample Flow                           | 810                                | CC/Min                       | 800 ± 10%                       |                                 |      |
| Sample Temperature                    | 48.5                               | °C                           | 48 ± 4                          |                                 |      |
| Bench Temperature                     | 48.2                               | °C                           | 48 ± 2                          |                                 |      |
| Wheel Temperature                     | 68.4                               | °C                           | 68 ± 2                          |                                 |      |
| Box Temperature                       | 30.6                               | °C                           | Ambient Temp + 7 ± 10           |                                 |      |
| Photo-Drive                           | 3023.8                             | mV                           | 250 mV to 4750 mV               |                                 |      |
| Slope                                 | 1.017                              | -                            | 1.0 ± 0.3                       |                                 |      |
| Offset                                | 0.2                                | -                            | 0 ± 0.3                         |                                 |      |

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :   
(Mr. Peera Detudom)



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| Calibration Report                    |                                    |                              |                                 |                                 |      |
|---------------------------------------|------------------------------------|------------------------------|---------------------------------|---------------------------------|------|
| Non-Dispersive Infrared CO Analyzer   |                                    |                              |                                 |                                 |      |
| Date :                                | 21 November 2024                   | Brand :                      | API                             | Model :                         | 300E |
| No.                                   | CO-B13                             |                              |                                 | Serial No.                      | 176  |
| Calibrator (Dilution System)          |                                    |                              |                                 |                                 |      |
| Brand : API                           |                                    |                              | Model : 700                     |                                 |      |
| Last Cal. Date : 05 August 2024       |                                    |                              | Serial No. : 911                |                                 |      |
| Reference Standard Gas                |                                    |                              |                                 |                                 |      |
| Standard Gas : Carbon Monoxide (CO)   |                                    |                              | Cylinder No. : D711839          |                                 |      |
| Certified Date : 14 March 2024        |                                    | Expired Date : 14 March 2032 |                                 | Cylinder Conc. : 4,580 ppm      |      |
| Calibrating Condition                 |                                    |                              |                                 |                                 |      |
| Pressure                              | 1011                               | mmbar                        | Temp.                           | 24.5                            | °C   |
|                                       |                                    |                              | % RH                            | 50                              |      |
| Calibration Setting                   |                                    |                              |                                 |                                 |      |
| Span                                  | Initial Reading (Before Adj.), PPM |                              |                                 | Final Reading (After Adj.), PPM |      |
| Set Point                             | Expected Concentration             | Analyzer Response            |                                 | %Dif                            |      |
| Zero                                  | 0                                  | -0.10                        |                                 | -                               |      |
| CO Span                               | 40.00                              | 39.95                        |                                 | -0.125                          |      |
| API Model 300E CO Analyzer Check List |                                    |                              |                                 |                                 |      |
| Parameter                             | Observed Value                     | Units                        | Nominal Range                   |                                 |      |
| Range                                 | 50                                 | PPM                          | 0-1000 ppm                      |                                 |      |
| Stability                             | 0.10                               | PPM                          | < 1 ppm With Zero Air           |                                 |      |
| CO Measure                            | 4015.8                             | mV                           | 2500-4800 mV                    |                                 |      |
| CO Reference                          | 3948.1                             | mV                           | 2500-4800 mV                    |                                 |      |
| Measure/Reference Ratio               | 1.180                              | -                            | 1.1-1.3 W/Zero Air              |                                 |      |
| Sample Pressure                       | 28.7                               | In-Hg-A                      | ~2" < Ambient Absolute Pressure |                                 |      |
| Sample Flow                           | 811                                | CC/Min                       | 800 ± 10%                       |                                 |      |
| Sample Temperature                    | 48.4                               | °C                           | 48 ± 4                          |                                 |      |
| Bench Temperature                     | 48.2                               | °C                           | 48 ± 2                          |                                 |      |
| Wheel Temperature                     | 68.2                               | °C                           | 68 ± 2                          |                                 |      |
| Box Temperature                       | 30.9                               | °C                           | Ambient Temp + 7 ± 10           |                                 |      |
| Photo-Drive                           | 3037.9                             | mV                           | 250 mV to 4750 mV               |                                 |      |
| Slope                                 | 1.017                              | -                            | 1.0 ± 0.3                       |                                 |      |
| Offset                                | 0.2                                | -                            | 0 ± 0.3                         |                                 |      |

Calibrated by :

Adul Dangklom

(Mr.Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)





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| Calibration Report                    |                                    |                              |                                 |                                 |      |
|---------------------------------------|------------------------------------|------------------------------|---------------------------------|---------------------------------|------|
| Non-Dispersive Infrared CO Analyzer   |                                    |                              |                                 |                                 |      |
| Date :                                | 21 November 2024                   | Brand :                      | API                             | Model :                         | 300E |
| No.                                   | CO-B15                             |                              |                                 | Serial No.                      | 226  |
| Calibrator (Dilution System)          |                                    |                              |                                 |                                 |      |
| Brand : API                           |                                    |                              | Model : 700                     |                                 |      |
| Last Cal. Date : 05 August 2024       |                                    |                              | Serial No. : 911                |                                 |      |
| Reference Standard Gas                |                                    |                              |                                 |                                 |      |
| Standard Gas : Carbon Monoxide (CO)   |                                    |                              | Cylinder No. : D711839          |                                 |      |
| Certified Date : 14 March 2024        |                                    | Expired Date : 14 March 2032 |                                 | Cylinder Conc. : 4,580 ppm      |      |
| Calibrating Condition                 |                                    |                              |                                 |                                 |      |
| Pressure                              | 1011                               | mmbar                        | Temp.                           | 24.5                            | °C   |
|                                       |                                    |                              |                                 | % RH                            | 50   |
| Calibration Setting                   |                                    |                              |                                 |                                 |      |
| Span                                  | Initial Reading (Before Adj.), PPM |                              |                                 | Final Reading (After Adj.), PPM |      |
| Set Point                             | Expected Concentration             | Analyzer Response            |                                 | %Dif                            |      |
| Zero                                  | 0                                  | 0.10                         |                                 | -                               |      |
| CO Span                               | 40.00                              | 39.97                        |                                 | -0.075                          |      |
| API Model 300E CO Analyzer Check List |                                    |                              |                                 |                                 |      |
| Parameter                             | Observed Value                     | Units                        | Nominal Range                   |                                 |      |
| Range                                 | 50                                 | PPM                          | 0-1000 ppm                      |                                 |      |
| Stability                             | 0.10                               | PPM                          | < 1 ppm With Zero Air           |                                 |      |
| CO Measure                            | 4016.7                             | mV                           | 2500-4800 mV                    |                                 |      |
| CO Reference                          | 3947.9                             | mV                           | 2500-4800 mV                    |                                 |      |
| Measure/Reference Ratio               | 1.180                              | -                            | 1.1-1.3 W/Zero Air              |                                 |      |
| Sample Pressure                       | 28.5                               | In-Hg-A                      | ~2" < Ambient Absolute Pressure |                                 |      |
| Sample Flow                           | 806                                | CC/Min                       | 800 ± 10%                       |                                 |      |
| Sample Temperature                    | 48.3                               | °C                           | 48 ± 4                          |                                 |      |
| Bench Temperature                     | 48.1                               | °C                           | 48 ± 2                          |                                 |      |
| Wheel Temperature                     | 68.4                               | °C                           | 68 ± 2                          |                                 |      |
| Box Temperature                       | 30.8                               | °C                           | Ambient Temp + 7 ± 10           |                                 |      |
| Photo-Drive                           | 3032.3                             | mV                           | 250 mV to 4750 mV               |                                 |      |
| Slope                                 | 1.017                              | -                            | 1.0 ± 0.3                       |                                 |      |
| Offset                                | 0.2                                | -                            | 0 ± 0.3                         |                                 |      |

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)





CERTIFICATE No : 24M2227

REFERENCE No : 72448-1

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** : 08-Mar-24

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 14-Mar-24

**RECEIVED DATE** : 08-Mar-24





CERTIFICATE No : 24M2227

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA05/50 RECEIVED DATE : 08-Mar-24  
AIR PRESSURE : 1010mbar  $\pm$  1mbar CALIBRATION DATE : 08-Mar-24  
AMBIENT TEMPERATURE : 25°C  $\pm$  1°C RELATIVE HUMIDITY : 53 %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  | M2302013S      | 02-Feb-25 |
| 2) STANDARD WEIGHT     | E2    | 15843     | M2302014S      | 02-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

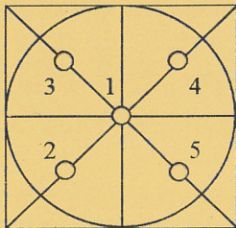
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 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              | 0.02001             | -0.00001       | 0.000065               |
| 0.10              | 0.10002             | -0.00002       | 0.000066               |
| 0.20              | 0.20001             | -0.00001       | 0.000066               |
| 0.50              | 0.50001             | -0.00001       | 0.000065               |
| 1.00              | 1.00003             | -0.00003       | 0.000066               |
| 2.00              | 2.00001             | -0.00001       | 0.000067               |
| 5.00              | 5.00001             | -0.00001       | 0.000068               |
| 10.00             | 9.99994             | 0.00006        | 0.000070               |
| 20.00             | 20.00008            | -0.00008       | 0.000078               |
| 50.00             | 50.0000             | 0.0000         | 0.00013                |
| 100.00            | 100.0001            | -0.0001        | 0.00019                |
| 120.00            | 120.0001            | -0.0001        | 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



## เอกสารที่ 5-2

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงทั่วไป



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

## 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 :  $(23 + 3) ^\circ\text{C}$

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 Keithley 2015-P S/N4106495.  
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 : 22 Feb. 2024

Date of Calibration : 4 Mar. 2024

1 / 2

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

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

FM.BL.MTC.002 Rev.4

#### Head Office

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

Tel. (66) 0 2577 9000

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

#### Office/Laboratory

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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



**Request No.** 21-67/0304

**MTC No.** EEL. BP. 109/0267

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 2 |
|-----------------------------|---------------------------------------|------------------------|---------------------|--|
| 1/2 inch Bruel&Kjaer 4180   | 93.85                                 | -0.15                  | $\pm 0.10$          | $\pm 0.75$ 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   | 999.9                      | -0.1                   | $\pm 1.5$           | $\pm 2.0\%$                              |

**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   | 1.65                             | $\pm 0.50$         | $\pm 4.0\%$                              |

**Note :** 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

**Calibrated by :**

.....  
(Mr. Weerachai Deechaiyae)

**Approved by :**

.....  
(Mr. Prawate Kluaypa)  
Director

**Electrical and Electronic Standards Laboratory**

**Industrial Metrology and Testing Service Centre**

**Date of Calibration** : 4 Mar. 2024

**Date of Issue** : 5 Mar. 2024

**Ref :** 2011267022200795001

End of Certificate

2 / 2

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**Head Office**

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**Office/Laboratory**

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E-mail : mtc@tistr.or.th

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Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th



Request No. 21-67/0304

MTC No. EEL. BP. 110/0267

## 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 : Acoustic Calibrator

Manufacturer : Cirrus

Model : CR:515

Serial No. : 92002

### 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 Keithley 2015-P S/N 4106495.

7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

**Calibration Procedure:** CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was 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 : 22 Feb. 2024

Date of Calibration : 5 Mar. 2024

1 / 2

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FM.BL.MTC.002 Rev.4

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E-mail : sumalee@tistr.or.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0304

MTC No. EEL. BP. 110/0267

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   | 94.04                                 | 0.04                   | $\pm 0.10$          | $\pm 0.40$ 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   | 1000.3                     | 0.3                    | $\pm 1.5$           | $\pm 1.0\%$                              |

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   | 1.70                             | $\pm 0.50$         | $\pm 3.0\%$                              |

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 : 5 Mar. 2024

Date of Issue : 6 Mar. 2024

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 2011267022200795002

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.4

Head Office

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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 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\_462/24

## 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 | 04 March 2024 |
|                   |                | Due Date         | 04 March 2025 |

### 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   | 21 November 2024 | 93.9                | 93.9             |
| ACO-B15  | ACO   | 6236  | 00222300   | 21 November 2024 | 94.0                | 93.9             |
| ACO-B45  | ACO   | 6236  | 00222304   | 21 November 2024 | 93.9                | 93.9             |
| Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR) |       |       |            |                  | 93.85 ± 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 แขวงจันทบุรี 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\_462\_1/24

## Sound Level Meter Calibration Report

### Acoustic Calibrator Data

|                   |                |                  |               |
|-------------------|----------------|------------------|---------------|
| Brand             | CIRRUS         | Number           | AC-CR01/63    |
| Model             | CR515          | Serial No.       | 92002         |
| Calibration Range | 94 dB, 1000 Hz | Last Calibration | 05 March 2024 |
|                   |                | Due Date         | 05 March 2025 |

### Calibration Data

| Sound Level Meter Data   |        |        |            | Calibration Data |                     |                  |
|--|--------|--------|------------|------------------|---------------------|------------------|
| SLM No.  | Brand  | Model  | Serial No. | Date             | Actual Reading [dB] |                  |
|  |        |        |            |                  | Before Adjustment   | After Adjustment |
| CR-B07   | Cirrus | CR161B | G301167    | 21 November 2024 | 93.9                | 94.0             |
| CR-B08   | Cirrus | CR161B | G301397    | 21 November 2024 | 94.0                | 94.0             |
| CR-B09   | Cirrus | CR161B | G301401    | 21 November 2024 | 94.0                | 94.0             |
| Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR) |        |        |            |                  | 94.04 ± 0.10 dB     |                  |

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)

### เอกสารที่ 5-3

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพน้ำ

## Certificate of Calibration

**Certificate No. :** 67-400037-2

**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 :** 23 January 2024

**Date of Calibration :** 03 February 2024

**Date of Issue :** 03 February 2024

**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-0016-22 | 07 Feb 2024 | 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 :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

**Certificate No. :** 67-400037-2

**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 0.4336 °C

| Standard Reading<br>( °C ) | UUC Reading<br>( °C ) | Correction<br>( °C ) | Uncertainty<br>( ± °C ) |
|----------------------------|-----------------------|----------------------|-------------------------|
| 20.5609                    | 20                    | 0.6                  | 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%

- oOo -





**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 : 24E6416

REFERENCE No : 73694-1

PAGE : 1 OF 3

**Certificate of Calibration**

**EQUIPMENT** : pH METER

**MANUFACTURER** : HANNA

**MODEL** : HI 3512

**SERIAL No** : TH118035

**ID No** : pH 04/56

**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** : 27-Jun-24

**APPROVED BY** : PONGSAK J.

**ISSUED DATE** : 27-Jun-24

**RECEIVED DATE** : 24-Jun-24

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





# 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 : 24E6416

PAGE : 2 OF 3

## Calibration Report

EQUIPMENT : pH METER  
MANUFACTURER : HANNA  
ID No : pH 04/56  
RECEIVED DATE : 24-Jun-24  
AMBIENT TEMPERATURE : 23 ° C ± 3 ° C  
MODEL : HI 3512  
SERIAL NUMBER : TH118035  
CALIBRATION DATE : 27-Jun-24  
RELATIVE HUMIDITY : 50 % RH ± 10% RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD BASED ON WI-TQ-062 AND WI-TQ-063. THE DISPLAY UNIT WAS TESTED BY GENERATING STANDARD VOLTAGE TO THE UNIT AND READING THE VALUE COMPARED WITH THE CALCULATED VALUE. THE DISPLAY AND ELECTROD WAS CALIBRATED BY USING STANDARD pH BUFFER
2. REFERENCE STANDARD INSTRUMENTS :-

| <u>INSTRUMENT</u>         | <u>MODEL</u> | <u>SERIAL No/</u><br><u>LOT No</u> | <u>CERTIFICATE No</u> | <u>DUE DATE</u> |
|---------------------------|--------------|------------------------------------|-----------------------|-----------------|
| 1) pH STANDARD SOLUTION   | 00651-06     | CC784945                           | 4880-14413915         | 24-Aug-25       |
| 2) pH STANDARD SOLUTION   | 00651-08     | CC785578                           | 4881-14430633         | 31-Aug-25       |
| 3) pH STANDARD SOLUTION   | 00651-10     | CC787086                           | 4882-14483317         | 21-Sep-25       |
| 4) PROCESS CALIBRATOR     | CA150        | 91S6079                            | 24E1251               | 09-Apr-25       |
| 5) BATH                   | 260014       | 1247 48074                         | 23T9014               | 13-Sep-24       |
| 6) THERMOMETER WITH PROBE | 421504       | 55000379                           | 23T9623               | 13-Sep-24       |

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 SI UNIT MAINTAINED AT :-
  - NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.
  - NATIONAL INSTUTITE OF METROLOGY (THAILAND)

### RESULT OF CALIBRATION : ADJUSTMENT

#### 1. DISPLAY UNIT ONLY

SLOPE FACTOR  $k = 2.303 RT/F = 59 \text{ mV/pH}$

| mV<br>APPLIED | UUC<br>READING (mV) | CORRECTION<br>(mV) | UUC<br>READING (pH) | UNCERTAINTY OF<br>MEASUREMENT<br>(± mV) | COVERAGE<br>FACTOR<br>k |
|---------------|---------------------|--------------------|---------------------|---|-------------------------|
| 414.11        | 414.8               | -0.69              | -0.115              | 0.15                                    | 2.00                    |
| 354.95        | 355.5               | -0.55              | 0.884               | 0.15                                    | 2.00                    |
| 295.80        | 296.4               | -0.60              | 1.885               | 0.15                                    | 2.00                    |
| 236.64        | 237.1               | -0.46              | 2.886               | 0.15                                    | 2.00                    |
| 177.48        | 178.0               | -0.52              | 3.887               | 0.15                                    | 2.00                    |
| 118.32        | 118.8               | -0.48              | 4.887               | 0.15                                    | 2.00                    |
| 59.16         | 59.6                | -0.44              | 5.887               | 0.15                                    | 2.00                    |
| 0.00          | 0.4                 | -0.40              | 6.888               | 0.15                                    | 2.00                    |
| -59.16        | -58.7               | -0.46              | 8.101               | 0.15                                    | 2.00                    |
| -118.32       | -117.9              | -0.42              | 9.345               | 0.15                                    | 2.00                    |
| -177.48       | -177.4              | -0.08              | 10.589              | 0.15                                    | 2.00                    |
| -236.64       | -236.4              | -0.24              | 11.834              | 0.15                                    | 2.00                    |
| -295.80       | -294.5              | -1.30              | 13.077              | 0.15                                    | 2.00                    |
| -354.95       | -354.7              | -0.25              | 14.322              | 0.15                                    | 2.00                    |
| -414.11       | -413.9              | -0.21              | 15.565              | 0.15                                    | 2.00                    |

END OF CALIBRATION REPORT PAGE 2 OF 3





# 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 : 24E6416

PAGE : 3 OF 3

## Calibration Report

### RESULT OF CALIBRATION (CONTINUE):

#### 2. DISPLAY UNIT WITH pH ELECTRODE S/N: 09081C6M

| STANDARD pH<br>BUFFER SOLUTION<br>(pH) | UUC READING<br>(pH) | CORRECTION<br>(pH) | VALUE<br>BEFORE<br>ADJUSTMENT | UNCERTAINTY OF<br>MEASUREMENT<br>( $\pm$ pH) | COVERAGE<br>FACTOR<br>k |
|--|---------------------|--------------------|-------------------------------|--|-------------------------|
| 4.015                                  | 4.011               | 0.004              | 3.905                         | 0.012  | 2.00                    |
| 7.003                                  | 7.003               | 0.000              | 6.972                         | 0.012  | 2.00                    |
| 10.009                                 | 10.014              | -0.005             | 9.570                         | 0.014  | 2.00                    |

#### 3. DISPLAY UNIT WITH TEMPERATURE

| STANDARD<br>READING<br>( $^{\circ}$ C) | UUC READING<br>( $^{\circ}$ C) | CORRECTION<br>( $^{\circ}$ C) | VALUE<br>BEFORE<br>ADJUSTMENT | UNCERTAINTY OF<br>MEASUREMENT<br>( $\pm$ $^{\circ}$ C) | COVERAGE<br>FACTOR<br>k |
|--|--------------------------------|-------------------------------|-------------------------------|--|-------------------------|
| 25.004                                 | 25.0                           | 0.004                         | ---                           | 0.0085   | 2.00                    |

#### 4. PERCENT SLOPE 100%

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT



## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : CONDUCTIVITY METER  
MANUFACTURER : METTLER TOLEDO  
MODEL / TYPE : SEVEN COMPACT S230  
SERIAL NO. : C141708983/5821320179  
CLID. NO. : 272300452  
JOB CONTROL NO. : 240213016389  
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

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

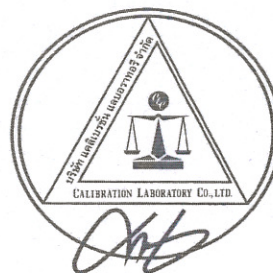
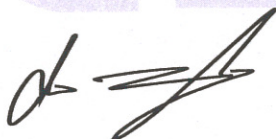
DATE OF RECEIVED : 13 February 2024

DATE OF ISSUED : 16 February 2024

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

Calibrated By :

Sukgasem Seehanart  
Calibration Engineer



Approved By :

Mongkol Yotsoontorn

Authorized Signatory

16 February 2024

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. Q24016389

F3-011-05/12-23

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@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



NSC-TISI-TIS 17025  
CALIBRATION 0059  
CLC

## REPORT OF CALIBRATION FOR

NOMENCLATURE : CONDUCTIVITY METER  
MANUFACTURER : METTLER TOLEDO  
MODEL / TYPE : SEVEN COMPACT S230  
SERIAL NO. : C141708983/5821320179  
DATE OF CALIBRATION : 13 February 2024

### 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 under procedure No. **WI-305-244**. The calibration was performed 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 F200-A-8 S/N. 014433/03.
6. IPRT, ASL Model T100-250-1D S/N. L0193A-1-1.

Certificate No. Q24016389

F3-011-05/12-23

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@clccalibration



## 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. Q23136342, Due Date 20 December 2024.
5. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 0203/67, Due Date 07 December 2024.
6. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).  
Certificate No. TT-0136-23, Due Date 12 December 2024.

## UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2,00$  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)"





**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 |
|--------------------------------|--------------------------------------|----------------------------|
| *84.00 µS/cm                   | 84.05 µS/cm [Cell Constant 0.548589] | ± 1.00 µS/cm               |
| 1414.0 µS/cm                   | 1415 µS/cm [Cell Constant 0.548589]  | ± 21.0 µS/cm               |
| 12.83 mS/cm                    | 12.75 mS/cm [Cell Constant 0.548589] | ± 0.19 mS/cm               |

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

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

### \*2. Temperature Result [ Probe Conductivity ]

| Immersion depth (mm) | Actual Temperature ( °C ) | DUC Reading ( °C ) | Correction ( °C ) | Uncertainty ± ( °C ) |
|----------------------|---------------------------|--------------------|-------------------|----------------------|
| 100                  | 25.00                     | 24.9               | +0.10             | 0.07                 |

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. Q24016389

F3-011-05/12-23

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CERTIFICATE No : 24M2229  
REFERENCE No : 72448-3

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

ID No : BA 09/61

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 : 08-Mar-24

APPROVED BY :  PONGSAK J.

ISSUED DATE : 14-Mar-24

RECEIVED DATE : 08-Mar-24





CERTIFICATE No : 24M2229

PAGE : 2 OF 2

## Calibration Report

**EQUIPMENT** : DIGITAL BALANCE **MODEL** : BSA224S-CW  
**MANUFACTURER** : SARTORIUS **S/N** : 36591843  
**ID No** : BA 09/61 **RECEIVED DATE** : 08-Mar-24  
**AIR PRESSURE** : 1010mbar  $\pm$  1mbar **CALIBRATION DATE** : 08-Mar-24  
**AMBIENT TEMPERATURE** : 25° C  $\pm$  1° C **RELATIVE HUMIDITY** : 55 %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 :-

| <u>INSTRUMENT</u>      | <u>MODEL</u> | <u>SERIAL No</u> | <u>CERTIFICATE No</u> | <u>DUE DATE</u> |
|------------------------|--------------|------------------|-----------------------|-----------------|
| 1) STANDARD WEIGHT SET | E2           | QK-I-151         | M2302013S             | 02-Feb-25       |
| 2) STANDARD WEIGHT     | E2           | 15843            | M2302014S             | 02-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

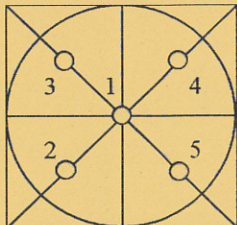
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

| NOMINAL VALUE (g) | BALANCE READING (g) | CORRECTION (g) | UNCERTAINTY ( $\pm$ g) |
|-------------------|---------------------|----------------|------------------------|
| 0.0               | 0.0000              | 0.0000         | 0.000082               |
| 0.1               | 0.1000              | 0.0000         | 0.000083               |
| 0.2               | 0.2000              | 0.0000         | 0.000083               |
| 0.5               | 0.5000              | 0.0000         | 0.000083               |
| 1.0               | 1.0000              | 0.0000         | 0.000084               |
| 2.0               | 2.0000              | 0.0000         | 0.000084               |
| 5.0               | 5.0000              | 0.0000         | 0.000086               |
| 10.0              | 10.0000             | 0.0000         | 0.000089               |
| 20.0              | 20.0001             | -0.0001        | 0.000094               |
| 50.0              | 50.0000             | 0.0000         | 0.00012                |
| 100.0             | 100.0001            | -0.0001        | 0.00019                |
| 200.0             | 200.0000            | 0.0000         | 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





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

|   |   |  |
|---|---|--|
| <b>Customer :</b> <u>S.P.S.Consulting Service Co.,Ltd</u> | Date Tested: <u>July 4, 2024</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 4, 2025</u>   |  |
| <u>Jompol Chatuchak, Bangkok 1090</u>                     | Date Last Certified: <u>January 4, 2024</u>   |  |
| <b>User Name:</b> <u>K.Phenpha Viphasthawat</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>September 30, 2024</u>          |
| <u>VIS Wavecal solution</u>  | <u>N930-2946</u>          | <u>January 30, 2025</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 4, 2024**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 4, 2024

| PARAMETER                               |           | SPECIFICATION     |                | FINAL VALUE    |     |
|---|-----------|-------------------|----------------|----------------|-----|
| <b>Spectral Resolution : UV</b>         | <b>As</b> | <b>193.696 nm</b> | $\leq 0.007$   | <u>0.00550</u> |     |
|   | <b>Ni</b> | <b>231.604 nm</b> | $\leq 0.008$   | <u>0.00714</u> |     |
|   | <b>Ni</b> | <b>341.476 nm</b> | $\leq 0.012$   | <u>0.00790</u> |     |
| <b>Spectral Resolution : VIS</b>        | <b>La</b> | <b>408.672 nm</b> | $\leq 0.020$   | <u>0.01655</u> |     |
|   | <b>Ba</b> | <b>455.403 nm</b> | $\leq 0.025$   | <u>0.02391</u> |     |
| <b>Precision</b>                        |           |                   |                |                |     |
|   | <b>As</b> | <b>193.656 nm</b> | % RSD < 1.0    | <u>0.72</u>    | %   |
|   | <b>Zn</b> | <b>213.856 nm</b> | % RSD < 1.0    | <u>0.66</u>    | %   |
|   | <b>Mn</b> | <b>257.610 nm</b> | % RSD < 1.0    | <u>0.30</u>    | %   |
|   | <b>La</b> | <b>379.478 nm</b> | % RSD < 1.0    | <u>0.98</u>    | %   |
|   | <b>Ba</b> | <b>455.403 nm</b> | % RSD < 1.0    | <u>0.95</u>    | %   |
|   | <b>Ba</b> | <b>493.408 nm</b> | % RSD < 1.0    | <u>0.78</u>    | %   |
| <b>Detection Limits : Axial</b>         | <b>Tl</b> | <b>190.080 nm</b> | 3(sd)          | <u>6.22</u>    | ppb |
|   | <b>As</b> | <b>193.696 nm</b> | 3(sd)          | <u>6.44</u>    | ppb |
|   | <b>Pb</b> | <b>220.353 nm</b> | 3(sd)          | <u>2.06</u>    | ppb |
| <b>Detection Limits : Radial</b>        | <b>As</b> | <b>193.696 nm</b> | 3(sd)          | <u>78.26</u>   | ppb |
|   | <b>Zn</b> | <b>213.856 nm</b> | 3(sd)          | <u>2.07</u>    | ppb |
|   | <b>Mn</b> | <b>257.610 nm</b> | 3(sd)          | <u>0.52</u>    | ppb |
|   | <b>La</b> | <b>379.478 nm</b> | 3(sd)          | <u>2.63</u>    | ppb |
|   | <b>Ba</b> | <b>455.403 nm</b> | 3(sd)          | <u>0.08</u>    | ppb |
|   | <b>Ba</b> | <b>493.408 nm</b> | 3(sd)          | <u>0.75</u>    | ppb |
| <b>BEC : Axial (IB X 500)/(IS-IB)</b>   | <b>Cd</b> | <b>226.502 nm</b> | $\leq 150$ ppb | <u>64.72</u>   |     |
| <b>BEC : Radial (IB X 1000)/(IS-IB)</b> | <b>Mn</b> | <b>257.610 nm</b> | $\leq 45$ ppb  | <u>15.04</u>   |     |



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

SERIAL NUMBER 077C7042401DATE TESTED July 4, 2024**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