



Certificate of Calibration

METHOD 6 PRE-TEST CONSOLE CALIBRATION 5-POINT METRIC UNIT

Meter Console Information

Console Model : XC-60B-V
Console Serial Number : 0708023
DGM Model : SK25
DGM Serial Number : 8002471

Calibration Conditions

Barometric Pressure(mm.Hg) : 761.5
Ambient Temperature(°C) : 24.5
Relative Humidity(%) : 71.4
Altitude(m) : 1.8

Factors/Conversions

Std. Temp(K) : 293
Std. Press. (mm Hg) : 760
K1 (K/mm Hg) : 0.386

Reference Equipment

WTM Model : DGM-200H
Serial : 000026
Cal. Due Date : 25 Jun 24
Gamma : 1.0000

Metering Console

| Run Time (seconds) | Flow Meter | Volume(L) | | Meter Temperature(°C) | |
|-----------------------|------------|-------------------------------|-----------------------------|-------------------------------|-----------------------------|
| | | Initial (V _{mi}) | Final (V _{mf}) | Initial (t _{mi}) | Final (t _{mf}) |
| 8.00 | Air 4 lpm | 7081.0 | 7090.0 | 24.0 | 24.0 |
| 6.00 | 1.0 | 7090.0 | 7102.0 | 24.0 | 24.0 |
| 4.00 | 1.8 | 7102.0 | 7113.8 | 24.0 | 24.0 |
| 3.00 | 2.6 | 7113.8 | 7125.0 | 24.0 | 24.0 |
| 2.00 | 3.4 | 7125.0 | 7133.6 | 24.0 | 24.0 |

Reference Meter

| Volume(L) | Meter Temperature(°C) | |
|-----------|-------------------------------|-----------------------------|
| | Initial (V _{mi}) | Final (V _{mf}) |
| 0.0 | 0.0 | 9.211 |
| 0.0 | 0.0 | 12.308 |
| 0.0 | 0.0 | 11.809 |
| 0.0 | 0.0 | 11.390 |
| 0.0 | 0.0 | 8.694 |

Results of Gas Meter

| Standardized Data | | | Dry Gas Meter Calibration Factor | |
|--|--|---|----------------------------------|-------------------|
| Dry Gas Meter (V _{gas}) Litres | Reference Meter (V _{ref}) Litres | Reference Meter (Q _{ref}) Litres/min. | Value (Y) | Variation (ΔY) |
| | | | (Y) | (ΔY) |
| 8.893 | 9.100 | 1.138 | 1.023 | 0.008 |
| 11.857 | 12.158 | 2.026 | 1.025 | 0.010 |
| 11.659 | 11.667 | 2.917 | 1.001 | -0.015 |
| 11.066 | 11.253 | 3.751 | 1.017 | 0.001 |
| 8.497 | 8.589 | 4.295 | 1.011 | -0.005 |
| | | | 1.015 | Y Average |

Result of Flow Control

| Reference Meter Flowrate | Flow Meter Console Rotameter | |
|-----------------------------|--|-----------------------------------|
| | Std & Corr (Q _{ref}) Litres/min. | Variation drift Litres/min. |
| 1.1 | 1.0 | 0.138 |
| 2.0 | 1.8 | 0.226 |
| 2.9 | 2.6 | 0.317 |
| 3.8 | 3.4 | 0.351 |
| 4.3 | 4.0 | 0.295 |
| | | Drift Average |
| | | 0.085 |

SCLFAC = 0.9598

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.

(DGM) Y = 1.015

Note: Rotameter results are calculated from dry gas meter calibration

Calibrate By :

Approved By :

Date

12 Mar 24

The instruments listed and described on this certificate have been calibrated in accordance with the procedures of the National Institute of Standards and Technology (N.I.S.T.) and in reference to EPA Method 5, Section 10.3.1.

neediss
neediss Supply Instrument Co., Ltd.



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Certificate of Calibration
Method 6 Console Sensor Calibration - Metric Units

Console Information

Model #: XC-608-V
Serial #: 0708023
Units: Metric
Pick

Calibration Conditions

Pbar (mm.bar): 1015.50
Humidity (%): 71.4
Temp (°C): 24.5
Elevation (m): 1.8
Corr. Pbar (mm. Hg): 761.50

Reference Devices

TC Simulator Model: CC-VTR-SH
Reference #: 718 30G
Barometer Model: 369037
Reference #: EBARODIALSPE01
Pressure Calibrator Model: 718 30G
Reference #: 9543013

Temperature Sensors Calibration Data

| Reference Point ¹ | Reference Temp. °C | Test Thermocouple Calibrations | | | | | Reference Point Status ² |
|------------------------------|-----------------------|--------------------------------|-------------|-------------|--------------|------------|-------------------------------------|
| | | AUX °C | STACK °C | PROBE °C | FILTER °C | EXIT °C | |
| 1 | -18 | -17 | -17 | -17 | -17 | -17 | PASS |
| 2 | 38 | 38 | 38 | 38 | 38 | 38 | PASS |
| 3 | 93 | 94 | 94 | 94 | 94 | 94 | PASS |
| 4 | 149 | 150 | 150 | 150 | 150 | 150 | PASS |
| 5 | 260 | 260 | 260 | 260 | 260 | 260 | PASS |
| 6 | 371 | 370 | 371 | 371 | 371 | 371 | PASS |
| 7 | 482 | 481 | 481 | 481 | 481 | 481 | PASS |
| 8 | 593 | 592 | 592 | 592 | 592 | 592 | PASS |
| 9 | 704 | 703 | 704 | 703 | 703 | 704 | PASS |
| 10 | 816 | 816 | 816 | 816 | 816 | 816 | PASS |
| | | | | | | | PASS |
| | | | | | | | Overall Audit Status |

| Ref Point | Theoretical Temp. °C | DGM Thermocouple Sensor Reading °C | ΔT_{abs} ⁴ °C |
|----------------------|-------------------------|---------------------------------------|-------------------------------------|
| # | | | |
| Ice Water | 1 | 1.2 | 0.07% |
| Ambient ⁵ | 2 | 24.5 | 0.10% |
| | | | Maximum ³ Status |
| | | | PASS |

Internal temperature thermocouple is not audited to EPA standards, and should not be used as an official reference for ambient temperature.

Pressure Gauge / Manometer Calibration Data

| Console Vacuum Calibration | | | |
|----------------------------|------------------|----------------|-------------------------------------|
| Reference Point | Reference Vacuum | Console Vacuum | Reference Point Status ⁶ |
| # | in. Hg | in. Hg | Pass/Fail |
| 1 | -5.0 | -4.5 | PASS |
| 2 | -10.0 | -9.5 | PASS |
| 3 | -15.0 | -14.5 | PASS |

Calibrate By: _____

Approved By: _____

Date: 12 Mar 24

Notes

¹ Suggested, minimum reference points are 10 (0, 100, 200, 300, 500, 700, 900, 1100, 1500, 1900 °F), can test for more.

² For valid test results, the maximum difference between temperature and reference readings should be less than ± 5.4 °F (± 3 °C), for all thermocouples except for the stack thermocouple which should be less than $\pm 1.5\%$ absolute temperature from the reference reading and the exit thermocouple which should be less than ± 2 °F (± 1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5, Sections 6.1.1.7-6.1.1.8)

³ Do not change this cell value, it is instead based on input from Cell H6 at the top of this sheet under "Calibration Conditions"

⁴ Absolute temperature difference and other formulas are calculated based on unit input from cell C6 at the top of this sheet under "Meter Console Information"

⁵ For valid test results, the maximum difference between console and reference barometric pressure readings should be less than ± 0.1 in. Hg (± 2.5 mm Hg), (EPA Method 5, Section 6.1.2)

⁶ For valid test results, the maximum difference between console and reference vacuum readings should be less than ± 0.5 in. Hg (± 12.5 mm Hg)

⁷ For valid test results, the maximum difference between console and reference vacuum readings should be less than ± 0.05 in. H₂O (± 1.25 mm H₂O), or 5% of full scale

 **neediss**
Neediss Supply Instrument Co., Ltd





Verification Test Report

Instruments Information

Page:1/2

Analyzer Type: Flue Gas Analyser

Manufacturer: MRU

Model: Optima7

Serial No.: 320779

Calibration Gas information

Standard Gas Mid Range

| | | |
|----------|--------------------|-------|
| O2 Conc | 2.2 | %vol. |
| Cd/Ex: | 343014/Jul 24,2025 | |
| CO Conc | 99.94 | ppm |
| NO Conc | 99.69 | ppm |
| NOX Conc | 99.76 | ppm |
| SO2 Conc | 100.5 | ppm |
| CO2 Conc | 8.054 | % |
| Cd/Ex: | ED5716/May 16,2030 | |

Standard Gas High Range

| | | |
|----------|--------------------|-------|
| O2 Conc | 10.22 | %vol. |
| Cd/Ex: | 343018/Jan 10,2025 | |
| CO Conc | 594.5 | ppm |
| NO Conc | 197.2 | ppm |
| NOX Conc | 197.2 | ppm |
| SO2 Conc | 200.9 | ppm |
| CO2 Conc | 16.02 | % |
| Cd/Ex: | ND7514/Jun 21,2030 | |

Environment: Temperature 25.8 °C Humidity: 47 %RH

SO2 calibration test

| Set point | Std.gas (ppm) | Before Adj Reading(ppm) | After Adj Reading(ppm) | Difference | % error |
|-----------|---------------|-------------------------|------------------------|------------|---------|
| Low/Zero | 0.0 | 0 | 0 | 0.0 | 0.0 |
| Mid | 100.5 | 92 | 100 | -0.5 | -0.5 |
| Hight | 200.9 | 194 | 201 | 0.1 | 0.0 |

NO calibration test

| Set point | Std.gas (ppm) | Before Adj Reading(ppm) | After Adj Reading(ppm) | Difference | % error |
|-----------|---------------|-------------------------|------------------------|------------|---------|
| Low/Zero | 0.0 | 0 | 0 | 0.0 | 0.0 |
| Mid | 99.69 | 90 | 100 | 0.3 | 0.3 |
| Hight | 197.2 | 182 | 200 | 2.8 | 1.4 |

NOX calibration test

| Set point | Std.gas (ppm) | Before Adj Reading(ppm) | After Adj Reading(ppm) | Difference | % error |
|-----------|---------------|-------------------------|------------------------|------------|---------|
| Low/Zero | 0.0 | 0 | 0 | 0.0 | 0.0 |
| Mid | 99.76 | 91 | 100 | 0.2 | 0.2 |
| Hight | 197.2 | 190 | 200 | 2.8 | 1.4 |

CO2 calibration test

| Set point | Std.gas (ppm) | Before Adj Reading(ppm) | After Adj Reading(ppm) | Difference | % error |
|-----------|---------------|-------------------------|------------------------|------------|---------|
| Low/Zero | 0.0 | 0 | 0 | 0.0 | 0.0 |
| Mid | 8.054 | 9.05 | 8.07 | 0.0 | 0.2 |
| Hight | 16.0 | 17.68 | 15.97 | 0.0 | -0.3 |



This report not be reproduced except in full without the written approval of Neediss Supply Instrument Co., Ltd.

www.neediss.com

We know the best thing to save environment

บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด ผู้จัดการฝ่ายควบคุมคุณภาพ



Verification Test Report

Instruments Information

Page:2/2

Analyzer Type: Flue Gas Analyser

Manufacturer: MRU

Model: Optima7

Serial No.: 320779

Calibration Gas information

Standard Gas Mid Range

| | | |
|----------|--------------------|-------|
| O2 Conc | 2.2 | %vol. |
| Cd/Ex: | 343014/Jul 24,2025 | |
| CO Conc | 99.94 | ppm |
| NO Conc | 99.69 | ppm |
| NOX Conc | 99.76 | ppm |
| SO2 Conc | 100.5 | ppm |
| CO2 Conc | 8.054 | % |
| Cd/Ex: | ED5716/May 16,2030 | |

Standard Gas High Range

| | | |
|----------|--------------------|-------|
| O2 Conc | 10.22 | %vol. |
| Cd/Ex: | 343018/Jan 10,2025 | |
| CO Conc | 594.5 | ppm |
| NO Conc | 197.2 | ppm |
| NOX Conc | 197.2 | ppm |
| SO2 Conc | 200.9 | ppm |
| CO2 Conc | 16.02 | % |
| Cd/Ex: | ND7514/Jun 21,2030 | |

Environment: Temperature 25.8 °C Humidity: 47 %RH

CO calibration test

| Set point | Std.gas (ppm) | Before Adj Reading(ppm) | After Adj Reading(ppm) | Difference | % error |
|-----------|---------------|-------------------------|------------------------|------------|---------|
| Low/Zero | 0.0 | 0 | 0 | 0.0 | 0.0 |
| Mid | 99.94 | 101 | 99 | -0.9 | -0.9 |
| Hight | 594.5 | 607 | 601 | 6.5 | 1.1 |

O2 calibration test

| Set point | Std.gas (ppm) | Before Adj Reading(ppm) | After Adj Reading(ppm) | Difference | % error |
|-----------|---------------|-------------------------|------------------------|------------|---------|
| Low/Zero | 0.0 | 0 | 0 | 0.0 | 0.0 |
| Mid | 2.2 | 2.2 | 2.2 | 0.0 | 0.0 |
| Hight | 10.22 | 10.21 | 10.21 | 0.0 | -0.1 |

Note

Technical Data Calibration results.:Calibration reading response discrepancy

| | |
|---------------|---------------------------------|
| O2 parameter | ± 0.2 Vol-% at Range 0-21 Vol-% |
| CO2 parameter | ± 0.3 Vol-% at Range 0-CO2 Max |
| CO parameter | ± 5 % at Range 0-500 PPM |
| NO parameter | ± 5 % at Range 0-1000 PPM |
| NO2 parameter | ± 5 % at Range 0-1000 PPM |
| SO2 parameter | ± 5 % at Range 0-2000 PPM |

Calibrate By :

Approve By :

Date:

26 Feb 24



This report not be reproduced except in full, without the written approval of Neediss Supply Instrument Co., Ltd.

www.neediss.com

We know the best thing to save environment
รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
Envilab Co.,Ltd.

CAL

Calibratech Co.,Ltd.

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

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



Certificate of Calibration

Certificate No. : 67-200060-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.
540, 540/1 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Electronic Balance
Manufacturer : METTLER TOLEDO **Model :** XSR205DU
Serial No. : B911363567 **ID No. :** ELABBALANCEN06
Capacity : 220 g **Resolution :** 0.00001g/81g, 0.0001g/220g

Environment : On site calibration was carried out at the B304 Balance Room, Envilab Co., Ltd.
Ambient Temperature : (20.0 to 20.5) °C
Relative Humidity : (54.2 to 59.1) %
Air Pressure : 1013.0 mbar

Date of Received : 20 February 2024

Date of Calibration : 20 February 2024

Date of Issue : 21 February 2024

Calibrated by : Satja Sangkhum

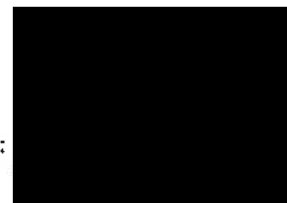
Calibration Method : In-house method CAL-M2001 based on UKAS Publication ref : LAB 14
Edition 7 - November 2022

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

Standard Weights

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

Approved by :



Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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



CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 67-200060-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

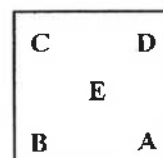
| Nominal Value (g) | Correction (g) | Uncertainty \pm (g) |
|----------------------|-------------------|--------------------------|
| 0.1 | 0.00000 | 0.000015 |
| 0.5 | 0.00001 | 0.000022 |
| 1 | 0.00000 | 0.000026 |
| 2 | 0.00001 | 0.000034 |
| 5 | -0.00001 | 0.000043 |
| 10 | 0.00000 | 0.000053 |
| 50 | 0.00003 | 0.00011 |
| 100 | 0.0001 | 0.00020 |
| 150 | 0.0001 | 0.00038 |
| 200 | 0.0002 | 0.00038 |

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 $k = 2.00$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g
A B C D E
0.00000 0.00000 0.00010 0.00000 0.00000 g



Repeatability

Load test : 200 g
Stdev. : 0.000032 g

- o O o -



บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 บางแค บางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



Environmental Laboratory

TSP High Volume Sampler Calibration

Verification Report No.

SO2400122-E001 -TSP 01

☐ PM ☒ Onsite

Site: โรงเรียนเซนต์มริ

UTM: 47P N 1582448 E 676551

Sampler: ETSP#43

Recorder: ECRAN000031073

Date: 12 Jun 24

Technical:

Approval:

CONDITIONS

Barometric Press. (hPa): 1008.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.1

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

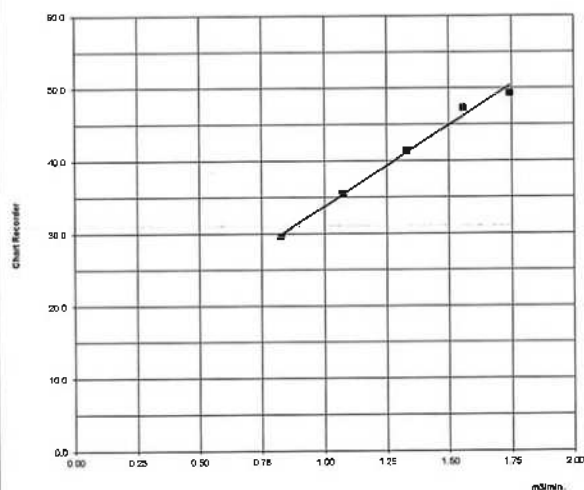
Qstd Slope: 2.02024

Qstd Intercept: -0.02667

Date Certified: 9 Feb 2024

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION Slope = 22.3118 Intercept = 11.4617 Corr. coeff. = 0.9951 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 37 50 |
|-----------------|----------|---------------|-----------|----------------|---|
| 1 | 12.56 | 1.743 | 50.0 | 49.29 | |
| 2 | 9.98 | 1.555 | 48.0 | 47.32 | |
| 3 | 7.32 | 1.334 | 42.0 | 41.41 | |
| 4 | 4.73 | 1.075 | 36.0 | 35.49 | |
| 5 | 2.79 | 0.828 | 30.0 | 29.58 | |



Calibrated by :

12 June 2024

Approved by :

12 June 2024

This report shall not be reproduced except in full, without the written approval of Envilab Co., Ltd.

www.evltesting.com

Environmental responsibility with accuracy measurement

FE-MNT-24 Rev.01/05/02/06



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Copyright © Envilab Co., Ltd. All rights reserved.

TSP High Volume Sampler Calibration

Verification Report No.

SO2400122-E001 -TSP 02

☐ PM ☒ Onsite

Site: หมู่บ้านสุขสิริ

UTM : 47P N 1584137 E 677962

Sampler: ETSP#42

Recorder: ECRAN000031078

Date: 12 Jun 24

Technical: [REDACTED]

Approval: [REDACTED]

CONDITIONS

Barometric Press. (hPa): 1008.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.1

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

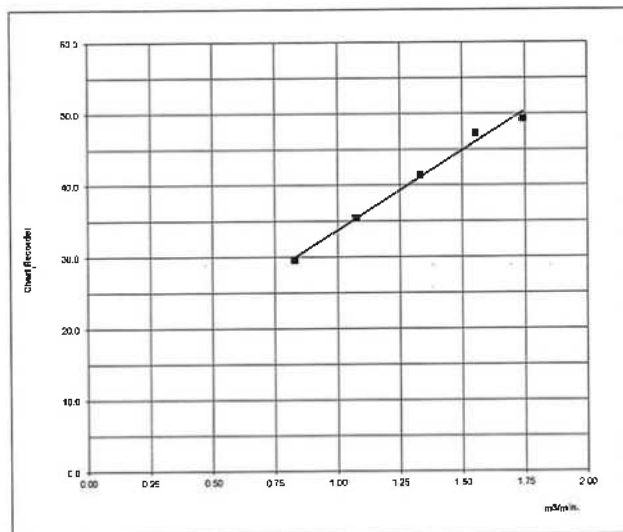
Qstd Slope: 2.02024

Qstd Intercept: -0.02667

Date Certified: 9 Feb 2024

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|--|
| 1 | 12.61 | 1.746 | 58.0 | 55.21 | |
| 2 | 9.99 | 1.556 | 52.0 | 51.27 | Slope = 30.7270 Intercept = 2.4699 Corr. coeff.= 0.9972 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 37 55 |
| 3 | 7.32 | 1.334 | 44.0 | 43.38 | |
| 4 | 4.53 | 1.052 | 36.0 | 35.49 | |
| 5 | 2.88 | 0.841 | 28.0 | 27.61 | |



Calibrated by : [REDACTED]

12 June 2024

Approved by : [REDACTED]

12 June 2024

This report shall not be reproduced except in full, without the written approval of Envilab Co., Ltd.

www.evltesting.com

Environmental responsibility with accuracy measurement

FE-MNT-24 Rev.01/01/02/06



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นโวลแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-902-3577-8 Fax: 02-902-3773 E-mail : info@evltesting.com



Envilab & Accredited Supply Instrumental

TSP High Volume Sampler Calibration

Verification Report No.

SO2400122-E001 -TSP 03

☐ PM ☒ Onsite

Site: วัดโกลนเขมม

UTM : 47P N 1585212 E 677553

Sampler: ETSP#40

Recorder: ECRAN000031066

Date: 12 Jun 24

Technical: [REDACTED]

Approval: [REDACTED]

CONDITIONS

Barometric Press. (hPa): 1002.0

Temperature (deg C): 30.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 751.6

Temperature (deg K): 303.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

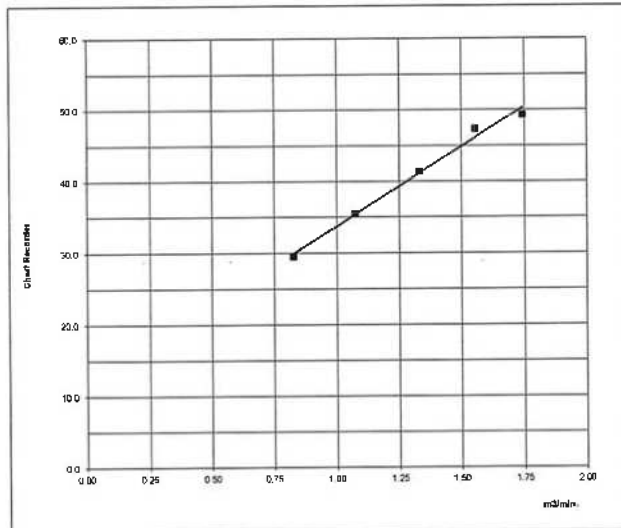
Qstd Slope: 2.02024

Qstd Intercept: -0.02667

Date Certified: 9 Feb 2024

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|---|
| 1 | 12.61 | 1.747 | 54.0 | 53.25 | |
| 2 | 10.10 | 1.565 | 50.0 | 49.31 | Slope = 29.0215 Intercept = 3.3979 Corr. coeff. = 0.9978 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 36 53 |
| 3 | 7.45 | 1.346 | 44.0 | 43.39 | |
| 4 | 4.53 | 1.052 | 34.0 | 33.53 | |
| 5 | 2.88 | 0.842 | 28.0 | 27.61 | |



Calibrated by : [REDACTED]

12 June 2024

Approved by : [REDACTED]

12 June 2024

This report shall not be reproduced except in full, without the written approval of Envilab Co., Ltd.

www.evltesting.com

Environmental responsibility with accuracy measurement

FE-MNT-24 Rev.01/01/02/06



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
EnviLab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



EnviLab is a member of the EVL Group

TSP High Volume Sampler Calibration

Verification Report No.

SO2400122-E001 -TSP 04

| | |
|------------------------------|--|
| <input type="checkbox"/> PM | <input checked="" type="checkbox"/> Onsite |
| Site: วัดดอนเตี้ย | |
| UTM : 47P N 1586144 E 680230 | |
| Sampler: ETSP#41 | |
| Recorder: ECRAN000031065 | |
| Date: 12 Jun 24 | |
| Technical: [REDACTED] | |
| Approval: [REDACTED] | |

CONDITIONS

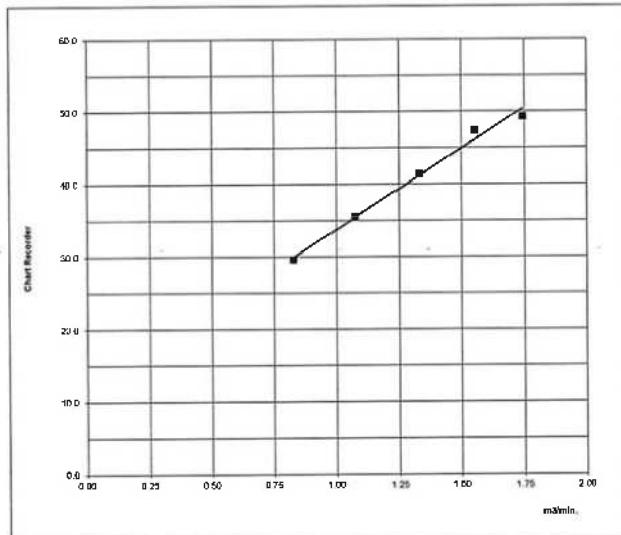
| | |
|---------------------------------|--------------------------------------|
| Barometric Press. (hPa): 1004.0 | Corrected Pressure (mm Hg): 753.1 |
| Temperature (deg C): 31.0 | Temperature (deg K): 304.0 |
| Average Press. (hPa): 1013.0 | Corrected Avg. Press. (mm Hg): 759.8 |
| Average Temp. (deg C): 30.0 | Average Temp. (deg K): 303.0 |

CALIBRATION ORIFICE

| | |
|---------------------------------|----------------------------|
| Brand: Tisch Environmental, Inc | Qstd Slope: 2.02024 |
| Model: TE-5025A | Qstd Intercept: -0.02667 |
| Serial#: 5411 | Date Certified: 9 Feb 2024 |

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|--|
| 1 | 12.87 | 1.763 | 56.0 | 55.19 | |
| 2 | 10.21 | 1.572 | 52.0 | 51.25 | Slope = 29.3885 Intercept = 3.9228 Corr. coeff.= 0.9970 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 37 54 |
| 3 | 7.52 | 1.351 | 44.0 | 43.36 | |
| 4 | 4.42 | 1.039 | 34.0 | 33.51 | |
| 5 | 2.95 | 0.851 | 30.0 | 29.57 | |



Calibrated by :

12 June 2024

Approved by :

12 June 2024

This report shall not be reproduced except in full, without the written approval of EnviLab Co., Ltd.

www.evltesting.com

Environmental responsibility with accuracy measurement

FE-MNT-24 Rev.01/01/02/6



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นไวแล็บ จำกัด 540.540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
EnviLab Co., Ltd. 540.540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



EnviLab is a leading supplier of environmental testing equipment

TSP High Volume Sampler Calibration

Verification Report No.

SO2400122-E001 -TSP 05

☒ PM ☐ Onsite

Site: ชุมชนหนองไม้ซุง

UTM : 47P N 1582555 E 677784

Sampler: ETSP#27

Recorder: 0

Date: 12 Jun 24

Technical:

Approval:

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

Qstd Slope: 2.02024

Qstd Intercept: -0.02667

Date Certified: 9 Feb 2024

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) |
|-----------------|----------|---------------|-----------|----------------|
| 1 | 12.36 | 1.726 | 50.0 | 49.22 |
| 2 | 10.12 | 1.563 | 48.0 | 47.25 |
| 3 | 7.57 | 1.354 | 42.0 | 41.35 |
| 4 | 4.28 | 1.021 | 32.0 | 31.50 |
| 5 | 2.99 | 0.856 | 28.0 | 27.58 |

LINEAR REGRESSION

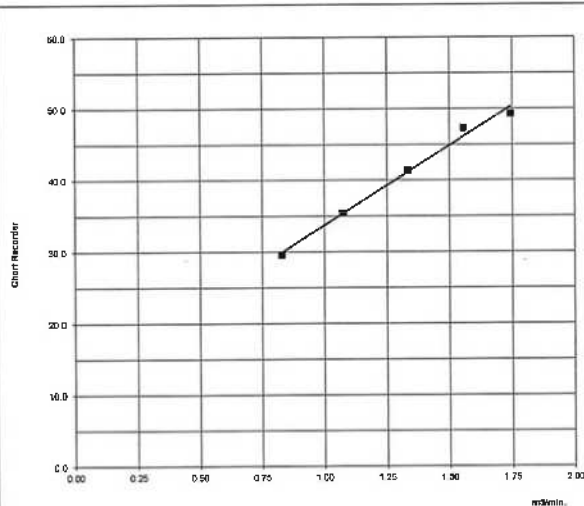
Slope = 26.1274

Intercept = 5.3035

Corr. coeff = 0.9954

of Observations: 5

Range of Chart at 1.1 - 1.7 m3/min. 35 50



Calibrated by :

12 June 2024

Approved by :

12 June 2024

This report shall not be reproduced except in full, without the written approval of EnviLab Co., Ltd.

www.evltesting.com

Environmental responsibility with accuracy measurement

FE-MNT-27 Rev.00 (01/08/63)

FE-MNT-24 Rev.01/01/02/64



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax : 02-802-3773 E-mail : info@evltesting.com



Envilab Co., Ltd. is a member of the ISO 9001:2015 certified company

PM10 High Volume Sampler Calibration

Verification Report No.

SO2400122-E001 -PM 01

| | |
|------------------------------|--|
| <input type="checkbox"/> PM | <input checked="" type="checkbox"/> Onsite |
| Site: โรงเรียนเซนต์แมรี | |
| UTM : 47P N 1582448 E 676551 | |
| Sampler: EPM10#44 | |
| Recorder: ECRDS016431075 | |
| Date: 12 Jun 24 | |
| Technical: [REDACTED] | |
| Approval: [REDACTED] | |

CONDITIONS

| | |
|---------------------------------|--------------------------------------|
| Barometric Press. (hPa): 1008.0 | Corrected Pressure (mm Hg): 756.1 |
| Temperature (deg C): 32.0 | Temperature (deg K): 305.0 |
| Average Press. (hPa): 1013.0 | Corrected Avg. Press. (mm Hg): 759.8 |
| Average Temp. (deg C): 30.0 | Average Temp. (deg K): 303.0 |

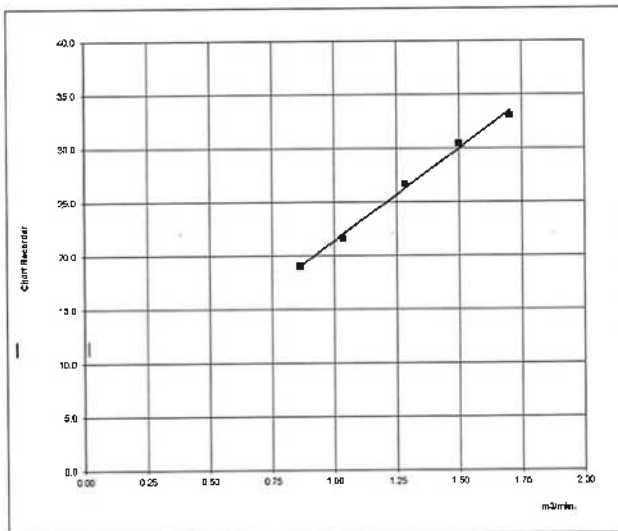
CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc
Model: TE-5025A
Serial#: 5411

Qstd Slope: 1.2654
Qstd Intercept: -0.01667
Date Certified: 9 Feb 2024

CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|-------------|-----------|----------------|----------------------------------|
| 1 | 11.34 | 1.703 | 52.0 | 33.03 | Slope = 17.2424 |
| 2 | 8.76 | 1.499 | 48.0 | 30.49 | Intercept = 4.1406 |
| 3 | 6.42 | 1.285 | 42.0 | 26.68 | Corr. coeff = 0.9970 |
| 4 | 4.16 | 1.037 | 34.0 | 21.59 | SFR = 1.143 |
| 5 | 2.87 | 0.863 | 30.0 | 19.05 | SSP = 37.55 |
| | | | | | # of Observations: 5 |
| | | | | | Range of Chart at SFR $\pm 10\%$ |
| | | | | | 35 |
| | | | | | 40 |



Calibrated by : [REDACTED]

12 June 2024

Approved by [REDACTED]

12 June 2024

This report shall not be reproduced except in full, without the written approval of Envilab Co., Ltd.

www.evltesting.com

Environmental responsibility with accuracy measurement

FE-MNT-24 Rev.03.01/02/06



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นวีแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax : 02-802-3773 E-mail : info@evltesting.com



EnviLab is a leading safety instrument

PM10 High Volume Sampler Calibration

Verification Report No.

SO2400122-E001 -PM 02

| | |
|------------------------------|----------|
| L PM | Q Onsite |
| Site: หมู่บ้านสุขสิริ | |
| UTM : 47P N 1584137 E 677962 | |
| Sampler: EPM10#33 | |
| Recorder: ECRDS016449814 | |
| Date: 12 Jun 24 | |
| Technical: [REDACTED] | |
| Approval: [REDACTED] | |

CONDITIONS

| | |
|---------------------------------|--------------------------------------|
| Barometric Press. (hPa): 1006.0 | Corrected Pressure (mm Hg): 754.6 |
| Temperature (deg C): 33.0 | Temperature (deg K): 306.0 |
| Average Press. (hPa): 1013.0 | Corrected Avg. Press. (mm Hg): 759.8 |
| Average Temp. (deg C): 30.0 | Average Temp. (deg K): 303.0 |

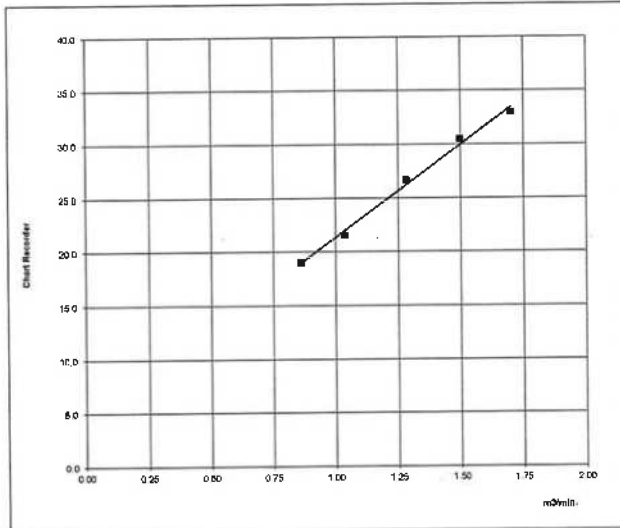
CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc
Model: TE-5025A
Serial#: 5411

Qstd Slope: 1.2654
Qstd Intercept: -0.01667
Date Certified: 9 Feb 2024

CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|-------------|-----------|----------------|----------------------------------|
| 1 | 12.28 | 1.777 | 54.0 | 34.39 | Slope = 17.2574 |
| 2 | 9.52 | 1.566 | 48.0 | 30.57 | Intercept = 3.5816 |
| 3 | 7.80 | 1.419 | 44.0 | 28.02 | Corr. coeff. = 0.9990 |
| 4 | 4.42 | 1.071 | 34.0 | 21.65 | SFR = 1.149 |
| 5 | 2.96 | 0.879 | 30.0 | 19.10 | SSP = 36.77 |
| | | | | | # of Observations: 5 |
| | | | | | Range of Chart at SFR $\pm 10\%$ |
| | | | | | 35 |
| | | | | | 39 |



Calibrated by :

12 June 2024

Approved by :

12 June 2024

This report shall not be reproduced except in full, without the written approval of Envilab Co., Ltd.

www.evltesting.com

Environmental responsibility with accuracy measurement

PM10 Cal. Rev.02 / 166 Data. Mar 31, 2020

FE-MINT-24 Rev.01/02/06



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 บางแค เขตบางแค กรุงเทพฯ 10160
EnviLab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax : 02-802-3773 E-mail : info@evltesting.com



1 x 1.5 x 3 mm (0.06 x 0.06 x 0.12 in)

PM10 High Volume Sampler Calibration

Verification Report No.

SO2400122-E001 -PM 03

☒ PM ☐ Onsite

Site: วัดโลกมณเฑียร

UTM : 47P N 1585212 E 677553

Sampler: EPM10#27

Recorder: NCRTI500904833

Date: 12 Jun 24

Technical:

Approval:

CONDITIONS

Barometric Press. (hPa): 1002.0

Temperature (deg C): 30.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 751.6

Temperature (deg K): 303.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

Qstd Slope: 1.2654

Qstd Intercept: -0.01667

Date Certified: 9 Feb 2024

CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) |
|-----------------|----------|-------------|-----------|----------------|
| 1 | 12.16 | 1.763 | 54.0 | 34.29 |
| 2 | 9.58 | 1.566 | 48.0 | 30.48 |
| 3 | 7.82 | 1.416 | 46.0 | 29.21 |
| 4 | 4.46 | 1.073 | 34.0 | 21.59 |
| 5 | 2.86 | 0.862 | 28.0 | 17.78 |

LINEAR REGRESSION

Slope = 18.4488

Intercept = 2.0197

Corr. coeff. = 0.9961

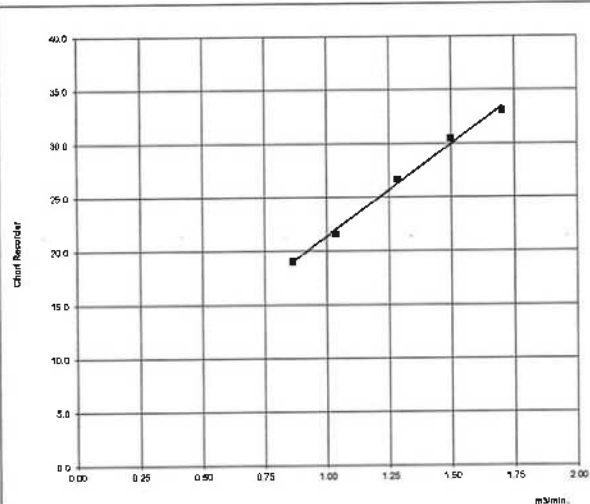
SFR = 1.142

SSP = 36.37

of Observations: 5

Range of Chart 34

at SFR $\pm 10\%$ 39



Calibrated by :

12 June 2024

Approved by :

12 June 2024

This report shall not be reproduced except in full, without the written approval of EnviLab Co., Ltd.

www.evltesting.com

Environmental responsibility with accuracy measurement
FE-MINT-24 Rev.03.05/02/66



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นไวเทสティング จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพมหานคร 10160
EnviLab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



EnviLab is a TSI Approved Supplier

PM10 High Volume Sampler Calibration

Verification Report No.

SO2400122-E001 -PM 04

☐ PM ☒ Onsite

Site: วัดโตนดเตี้ย

UTM: 47P N 1586144 E 680230

Sampler: EPM10#26

Recorder: NCRT1500904871

Date: 12 Jun 24

Technical:

Approval:

CONDITIONS

Barometric Press. (hPa): 1004.0

Temperature (deg C): 31.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.1

Temperature (deg K): 304.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

Qstd Slope: 1.2654

Qstd Intercept: -0.01667

Date Certified: 9 Feb 2024

CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) |
|-----------------|----------|-------------|-----------|----------------|
| 1 | 12.16 | 1.764 | 50.0 | 31.77 |
| 2 | 9.58 | 1.567 | 46.0 | 29.23 |
| 3 | 7.82 | 1.417 | 42.0 | 26.69 |
| 4 | 4.46 | 1.074 | 36.0 | 22.87 |
| 5 | 2.86 | 0.862 | 28.0 | 17.79 |

LINEAR REGRESSION

Slope = 14.8757

Intercept = 5.7815

Corr. coeff. = 0.9915

SFR = 1.144

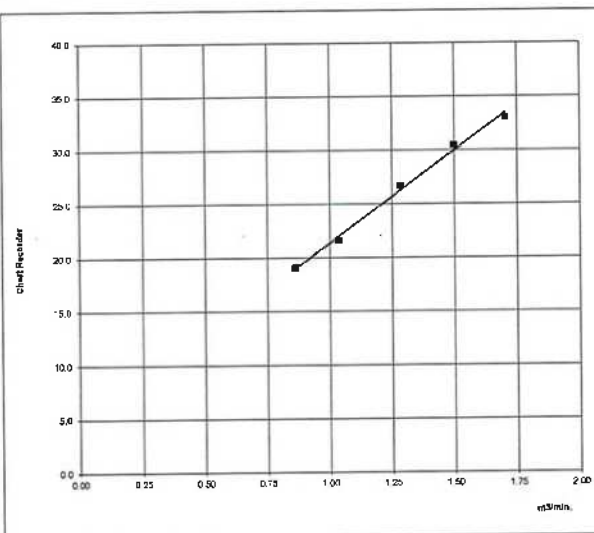
SSP = 35.88

of Observations: 5

Range of Chart at SFR $\pm 10\%$

34

38



Calibrated by :

12 June 2024

Approved by :

12 June 2024

This report shall not be reproduced except in full, without the written approval of EnviLab Co., Ltd.



www.evltesting.com

PM10 Cal. Rev.07 / Iss. Date: Mar 17, 2020

Environmental responsibility with accuracy measurement

FE-MNT-24 Rev.01:01/02/66



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
EnviLab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



Printed: 8/10/2024 10:00:00 AM

PM10 High Volume Sampler Calibration

Verification Report No.

SO2400122-E001 -PM 05

| | |
|------------------------------------|----------|
| L PM | E Onsite |
| Site: <u>ชุมชนหนองไผ่</u> | |
| UTM: <u>47P N 1582555 E 677784</u> | |
| Sampler: <u>EPM10#46</u> | |
| Recorder: <u>NCRT1500904859</u> | |
| Date: <u>12 Jun 24</u> | |
| Technical: <u>[REDACTED]</u> | |
| Approval: <u>[REDACTED]</u> | |

CONDITIONS

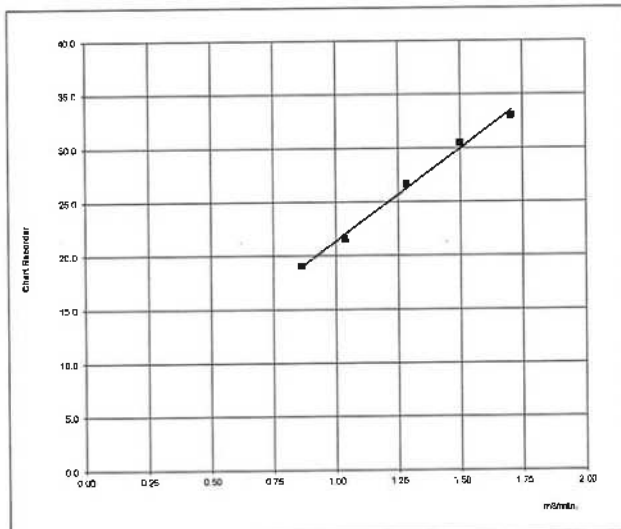
| | |
|---------------------------------|--------------------------------------|
| Barometric Press. (hPa): 1005.0 | Corrected Pressure (mm Hg): 753.8 |
| Temperature (deg C): 32.0 | Temperature (deg K): 305.0 |
| Average Press. (hPa): 1013.0 | Corrected Avg. Press. (mm Hg): 759.8 |
| Average Temp. (deg C): 30.0 | Average Temp. (deg K): 303.0 |

CALIBRATION ORIFICE

| | |
|---------------------------------|----------------------------|
| Brand: Tisch Environmental, Inc | Qstd Slope: 1.2654 |
| Model: TE-5025A | Qstd Intercept: -0.01667 |
| Serial#: 5411 | Date Certified: 9 Feb 2024 |

CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|-------------|-----------|----------------|----------------------------------|
| 1 | 12.07 | 1.760 | 52.0 | 33.08 | Slope = 15.7485 |
| 2 | 9.46 | 1.559 | 48.0 | 30.53 | Intercept = 5.6718 |
| 3 | 7.65 | 1.404 | 44.0 | 27.99 | Corr. coeff. = 0.9989 |
| 4 | 4.74 | 1.108 | 36.0 | 22.90 | SFR = 1.147 |
| 5 | 2.78 | 0.851 | 30.0 | 19.08 | SSP = 37.30 |
| | | | | | # of Observations: 5 |
| | | | | | Range of Chart at SFR $\pm 10\%$ |
| | | | | | 35 |
| | | | | | 39 |



Calibrated by :

12 June 2024

Approved by :

12 June 2024

This report shall not be reproduced except in full, without the written approval of EnviLab Co., Ltd.



www.evltesting.com

PM10 Cal. Rev.07 / Iss Date: Mar-17-2020

Environmental responsibility with accuracy measurement

FE-MNT-24 Rev.01/08/02/06



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



neediss

บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.

525 หมู่1/ห้วย 7 ตำบลหนองโพธิ์พิกุล อำเภอเมือง 10100 - 535 หมู่ 7 บางใหญ่ บางใหญ่ กรุงเทพฯ
Tel : 02-812-8128 Fax : 02-812-8129 E-mail : neediss@neediss.co.th



SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6706002

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

| | |
|--|---|
| Analyzer Type: SO2 Analyzer Model: T100 | Manufacturer API S/N: ESOAIT10002033 |
|--|---|

Calibration System

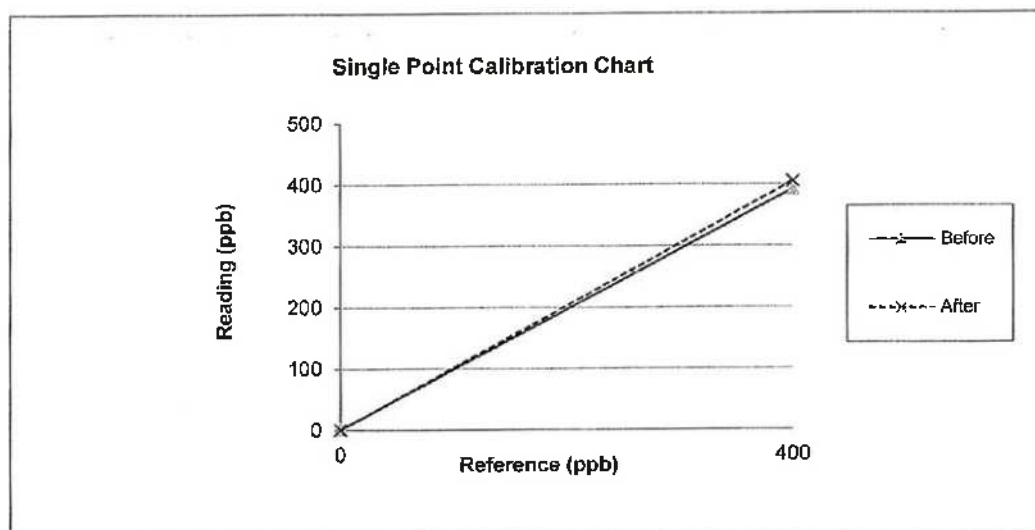
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NOx Conc 45.50 PPM NO Conc 45.50 PPM SO2 Conc 45.59 PPM CO Conc 4500 PPM Expire Date: Mar 31,2026 EB0160267 |

Environment: Temperature 26.3 °C

Humidity: 60 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (ppb) | Reading (ppb) | Drift (ppb) | Reference (ppb) | Reading (ppb) | Drift% |
| Before | 0.0 | 1.4 | 1.4 | 400.0 | 392.3 | -1.0 |
| After | 0.0 | 0.5 | 0.5 | 400.0 | 405.0 | 0.6 |



รับรองสำเนาถูกต้อง

This report shall not be reproduced except in full without the written approval of Neediss Supply Instrument Co., Ltd.

Neediss Co., Ltd. ผู้จัดการฝ่ายควบคุมคุณภาพ



neediss

บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.

538 ซอยสุขุมวิท 71 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110 538 Soi Sukhumvit 71, Bangkok 10110, Thailand
Tel: 02-2627424 Fax: 02-2627425 Email: info@neediss.com



SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6706002

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page:2/2

| Test Function Value | Normal range | Unit | Before | After | Note |
|---------------------------------|-------------------|-----------|--------|--------|---------------|
| Date | 1-Jun-24 | | | | |
| Time | 13:10 | | | | |
| Range | 50 - 20000 | PPB | 500 | 500 | |
| Stability (Zero Gas) | < 0.2 | PPB | 0.6 | 0.2 | |
| Sample Flow | 650 (+/- 50) | cc/min | 663 | 659 | |
| PMT Detector | 0 - 5000 | mV | 36.5 | 34.5 | |
| Norm PMT Detector | 0 - 5000 | mV | 34.1 | 32.8 | |
| HVPS | 400-900 constant | V | 719 | 648 | |
| DCPS | 2500 (+/- 200) | mV | - | - | |
| RCELL TEMP | 50 (+/- 1) | Dreegee C | 50 | 50 | |
| BOX TEMP | 20-40 | Dreegee C | 34.1 | 32.7 | |
| PMT TEMP | 7 (+/-1) | Dreegee C | 8.0 | 8.0 | |
| UV lamp | 1000-4900 | mV | 4034.0 | 4034.0 | |
| Lamp Ratio | 30-120 | % | 114.0 | 114.0 | |
| STR. Light (Zero Gas) | <100 | PPB | 29 | 29 | |
| Dark PMT | (-50) - (+200) | mV | 44.7 | 44.7 | |
| Dark lamp | (-50) - (+200) | mV | 5.1 | 5.1 | |
| SAMP PRES | 20-30 constant | IN-Hg-A | 28.1 | 27.8 | |
| Electric Test/Optic Test | | | | | |
| PMT Volts | 2000 (+/- 500) | mV | 2004 | 2020 | |
| SO2 Conc | 1000 (+/- 250) | PPB | 1002 | 1010 | |
| SO2 Slope | 1 (+/- 0.3) | - | 0.920 | 0.866 | |
| SO2 Offset | < 250 | mV | 65 | 130.1 | |
| Stability at Zero | < 0.2 | PPB | 0.1 | 0.1 | |
| Stability at Span | < 2 ppb @ 400 ppb | PPB | 0.6 | 0.2 | |
| Gas Test Response | | | | | |
| Zero Gas (0.00 PPB) | 0 | ppb | 1.4 | 0.5 | |
| Span Gas (400 PPB) | 400 | ppb | 392.3 | 405.0 | ± 5% of Range |

Calibrate By : _____

Approve By : _____

Date:

1-Jun-24

Date:

1-Jun-24



neediss

Neediss Supply Instrument Co., Ltd.



รับรองสำเนาถูกต้อง

This report shall not be reproduced except in full without the written approval

Envilab Co., Ltd.

ผู้จัดทำ: วิศวกรควบคุมคุณภาพ

Page:1/2

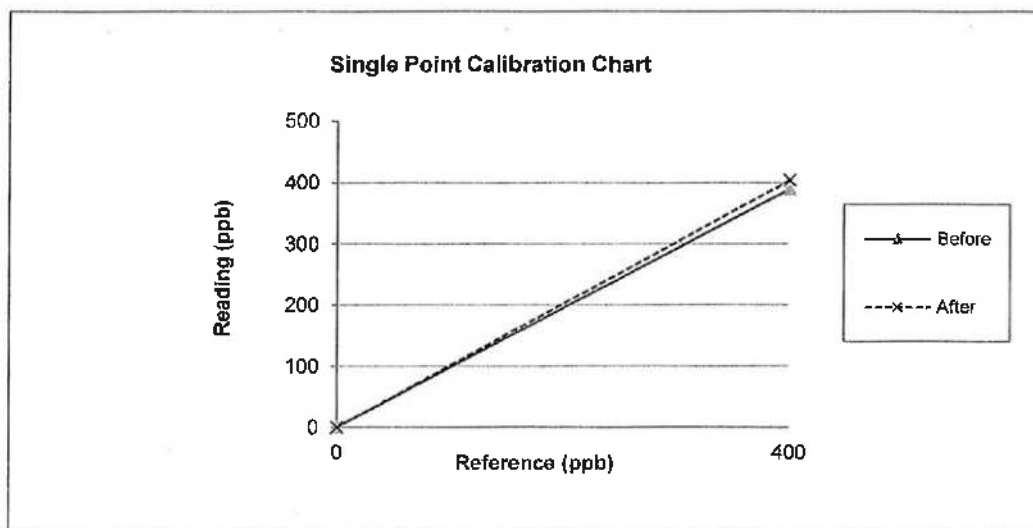
☒ PM ☐ Onsite

| | |
|--|---|
| Analyzer Type: SO2 Analyzer Model: 100E | Manufacturer API S/N: ESOAI100E01218 |
|--|---|

| Calibrator Unit | Standard Gas | |
|----------------------------|--------------|------------------------|
| Dilutor Model ESA MGC101 | NOx Conc | 45.50 PPM |
| S/N: 792 | NO Conc | 45.50 PPM |
| ZERO AIR Generator ZAG7001 | SO2 Conc | 45.59 PPM |
| S/N: 644 | CO Conc | 4500 PPM |
| | Expire Date: | Mar 31, 2026 EB0160267 |

Humidity: 61 %RH

| Status | Zero | | | Span | | |
|--------|--------------------|------------------|----------------|--------------------|------------------|--------|
| | Reference (ppb) | Reading (ppb) | Drift (ppb) | Reference (ppb) | Reading (ppb) | Drift% |
| Before | 0.0 | 0.9 | 0.9 | 400.0 | 390.0 | -1.3 |
| After | 0.0 | 0.3 | 0.3 | 400.0 | 404.0 | 0.5 |





neediss

บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.

536 หมู่ 10 ตำบล คลองเตย อำเภอ คลองเตย จังหวัด สงขลา 90110
Tel : 09-2114 2022 Fax : 09-23251 444 E-mail : info@neediss.com



SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6706004

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page:2/2

| Test Function Value | Normal range | Unit | Before | After | Note |
|---------------------------------|-------------------|-----------|--------|--------|---------------|
| Date | 1-Jun-24 | | | | |
| Time | 13:10 | | | | |
| Range | 50 - 20000 | PPB | 500 | 500 | |
| Stability (Zero Gas) | < 0.2 | PPB | 0.6 | 0.2 | |
| Sample Flow | 650 (+/- 50) | cc/min | 663 | 659 | |
| PMT Detector | 0 - 5000 | mV | 36.5 | 34.5 | |
| Norm PMT Detector | 0 - 5000 | mV | 34.1 | 32.8 | |
| HVPS | 400-900 constant | V | 719 | 648 | |
| DGPS | 2500 (+/- 200) | mV | - | - | |
| RCCELL TEMP | 50 (+/- 1) | Dreegee C | 50 | 50 | |
| BOX TEMP | 20-40 | Dreegee C | 34.1 | 32.7 | |
| PMT TEMP | 7 (+/- 1) | Dreegee C | 8.0 | 8.0 | |
| UV lamp | 1000-4900 | mV | 4034.0 | 4034.0 | |
| Lamp Ratio | 30-120 | % | 114.0 | 114.0 | |
| STR. Light (Zero Gas) | <100 | PPB | 29 | 29 | |
| Dark PMT | (-50) - (+200) | mV | 44.7 | 44.7 | |
| Dark lamp | (-50) - (+200) | mV | 5.1 | 5.1 | |
| SAMP PRES | 20-30 constant | IN-Hg-A | 28.1 | 27.8 | |
| Electric Test/Optic Test | | | | | |
| PMT Volts | 2000 (+/- 500) | mV | 2004 | 2020 | |
| SO2 Conc | 1000 (+/- 250) | PPB | 1002 | 1010 | |
| SO2 Slope | 1 (+/- 0.3) | - | 0.920 | 0.866 | |
| SO2 Offset | < 250 | mV | 65 | 130.1 | |
| Stability at Zero | < 0.2 | PPB | 0.1 | 0.1 | |
| Stability at Span | < 2 ppb @ 400 ppb | PPB | 0.6 | 0.2 | |
| Gas Test Response | | | | | |
| Zero Gas (0.00 PPB) | 0 | ppb | 0.9 | 0.3 | |
| Span Gas (400 PPB) | 400 | ppb | 390.0 | 404.0 | ± 5% of Range |

Calibrate By :

Date:

1-Jun-24

Approve By :

Date:

1-Jun-24

neediss

Neediss Supply Instrument Co.,Ltd





SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6706005

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

| | |
|--|--|
| Analyzer Type: SO2 Analyzer Model: 100E | Manufacturer: API S/N: ESOAI100E01225 |
|--|--|

Calibration System

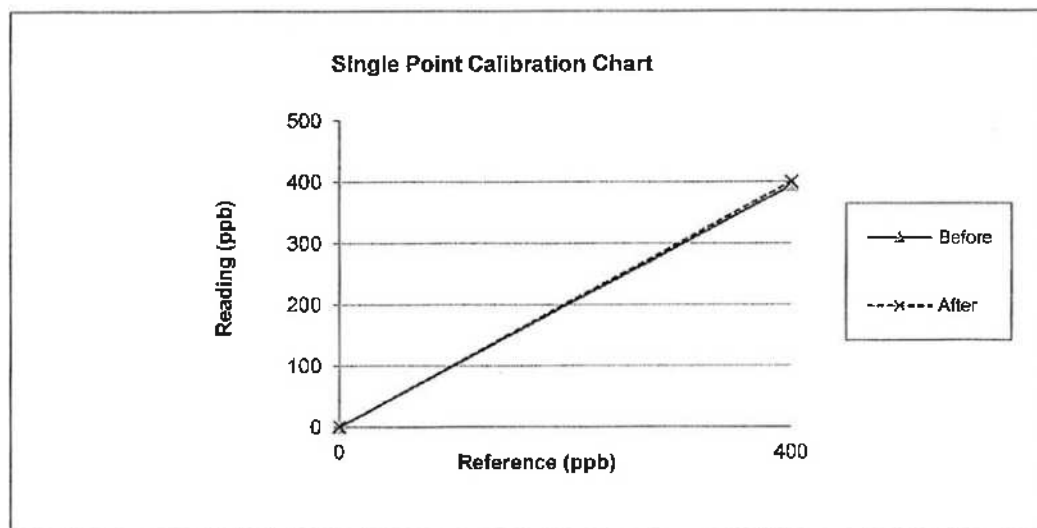
| Calibrator Unit | Standard Gas |
|--|--|
| Dilutor Model: ESA MGC101 S/N: 792 ZERO AIR Generator: ZAG7001 S/N: 644 | NOx Conc: 46.50 PPM NO Conc: 46.50 PPM SO2 Conc: 45.59 PPM CO Conc: 4507 PPM Expire Date: Mar 31,2026 EB0160267 |

Environment: Temperature 26.7 °C

Humidity: 61 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (ppb) | Reading (ppb) | Drift (ppb) | Reference (ppb) | Reading (ppb) | Drift% |
| Before | 0.0 | 0.8 | 0.8 | 400.0 | 395.0 | -0.6 |
| After | 0.0 | 0.4 | 0.4 | 400.0 | 400.7 | 0.1 |



รับรองสำเนาถูกต้อง
 ผู้ตรวจวัดคุณภาพ



neediss

บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.

505 หมู่ 10 ตำบล 7 หมู่ 10 อำเภอ บางพลาย จังหวัด บุรีรัมย์ 33110 505 หมู่ 10 ตำบล 7 หมู่ 10 อำเภอ บางพลาย จังหวัด บุรีรัมย์ 33110 505 หมู่ 10 ตำบล 7 หมู่ 10 อำเภอ บางพลาย จังหวัด บุรีรัมย์ 33110



SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6706001

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

| | |
|---|---|
| Analyzer Type: SO2 Analyzer Model: AF22e | Manufacturer Environnement SA., France S/N: ESOESAF22E2485 |
|---|---|

Calibration System

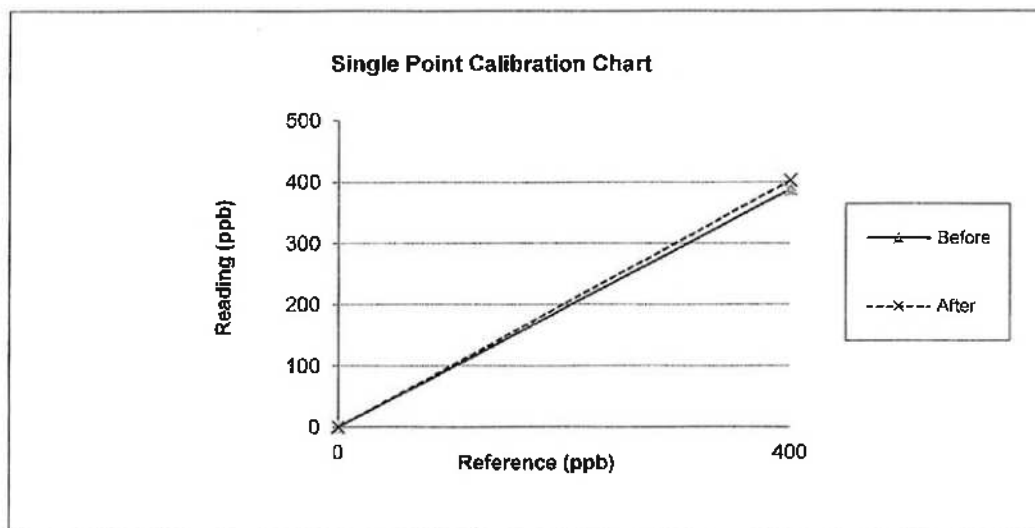
| Calibrator Unit | Standard Gas |
|--|---|
| Difutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NOx Conc 46.50 PPM NO Conc 46.50 PPM SO2 Conc 45.59 PPM CO Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267 |

Environment: Temperature 27.3 °C

Humidity: 63 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (ppb) | Reading (ppb) | Drift (ppb) | Reference (ppb) | Reading (ppb) | Drift% |
| Before | 0.0 | 0.5 | 0.5 | 400.0 | 389.0 | -1.4 |
| After | 0.0 | 0.3 | 0.3 | 400.0 | 403.0 | 0.4 |





SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6706001

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page:2/2

| Analyzer Signal Values | | | | | |
|------------------------|----------|-------|--------------|---------|-------|
| Date | 1-Jun-24 | Time | 13:11:00 | | |
| Power Supplies | | | | | |
| Option | 0.00 | mV | +5 V Sensor | 5 | V |
| +4 V | 4068 | mV | +3.3 V | 3.3 | V |
| +24 V | 24.1 | V | +12 V | 11.9 | V |
| +5 V | 5 | V | I UV lamp | 44.3 | mA |
| +24 V | 1.2 | A | | | |
| Optical Bench | | | | | |
| Dark UV sig. | 0 | mV | Dark PM sig. | 88 | mV |
| UV ref. | 0 | mV | PM ref. | 0 | mV |
| UV sig. | 24.1 | mV | PM sig. | 138.6 | mV |
| Ref.ratio | 0 | | Meas ratio | 0.34 | |
| Mean sig. | 0.7 | | Raw trend | 11 | |
| Raw sig. | 24.4 | ppb | inst.meas. | 22.8 | ppb |
| I UV Lamp | 44.7 | mA | HV PM | 2626.80 | mV |
| Sample | | | | | |
| Internal Temp. | 31.9 | deg.C | Chamber T. | 50 | deg.C |
| Gas Pr. | 970 | hPa | Pump Pr. | 355.5 | hPa |
| Flow | 18.7 | l/h | | | |

Calibrate By : _____

Date:

1-Jun-24

Approve By : _____

Date:

1-Jun-24


neediss
 Neediss Supply Instrument Co.,Ltd





neediss

บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.

515 หมู่ 7 ตำบลบึงบัว อำเภอเมือง จังหวัดบุรีรัมย์ 31000 E-mail: info@neediss.co.th, neediss@neediss.co.th
Tel : 09-024-8004-1, 09-024-8004-2, 09-024-8004-3, 09-024-8004-4, 09-024-8004-5, 09-024-8004-6, 09-024-8004-7, 09-024-8004-8, 09-024-8004-9, 09-024-8004-0



SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6706006

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

| | |
|---|--|
| Analyzer Type: SO2 Analyzer Model: AF22e | Manufacturer: Environnement SA., France S/N: ESOESAF22E2502 |
|---|--|

Calibration System

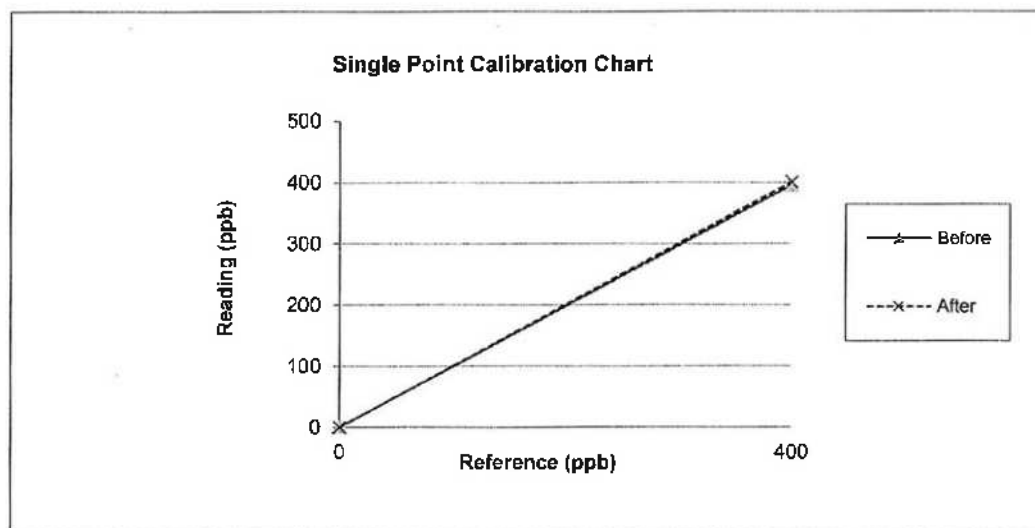
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model: ESA MGC101 S/N: 792 ZERO AIR Generator: ZAG7001 S/N: 644 | NOx Conc: 46.50 PPM NO Conc: 46.50 PPM SO2 Conc: 45.59 PPM CO Conc: 4507 PPM Expire Date: Mar 31, 2026 EB0160267 |

Environment: Temperature 27.4 °C

Humidity: 62 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (ppb) | Reading (ppb) | Drift (ppb) | Reference (ppb) | Reading (ppb) | Drift% |
| Before | 0.0 | 0.7 | 0.7 | 400.0 | 396.0 | -0.5 |
| After | 0.0 | 0.2 | 0.2 | 400.0 | 400.7 | 0.1 |





SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6706006

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page:2/2

| Analyzer Signal Values | | | | | |
|------------------------|----------|-------|--------------|---------|-------|
| Date | 1-Jun-24 | Time | 13:11:00 | | |
| Power Supplies | | | | | |
| Option | 0.00 | mV | +5 V Sensor | 5 | V |
| +4 V | 4068 | mV | +3.3 V | 3.3 | V |
| +24 V | 24.1 | V | +12 V | 11.9 | V |
| +5 V | 5 | V | I UV lamp | 44.3 | mA |
| I+24 V | 1.2 | A | | | |
| Optical Bench | | | | | |
| Dark UV sig. | 0 | mV | Dark PM sig. | 88 | mV |
| UV ref. | 0 | mV | PM ref. | 0 | mV |
| UV sig. | 24.1 | mV | PM sig. | 138.6 | mV |
| Ref.ratio | 0 | | Meas ratio | 0.34 | |
| Mean sig. | 0.7 | | Raw trend | 11 | |
| Raw sig. | 24.4 | ppb | inst.meas. | 22.8 | ppb |
| I UV Lamp | 44.7 | mA | HV PM | 2626.80 | mV |
| Sample | | | | | |
| Internal Temp. | 31.9 | deg.C | Chamber T. | 50 | deg.C |
| Gas Pr. | 970 | hPa | Pump Pr. | 355.5 | hPa |
| Flow | 18.7 | l/h | | | |

Calibrate By :

Date:

1-Jun-24

Approve By :

Date:

1-Jun-24


neediss
 Neediss Supply Instrument Co., Ltd.



**neediss**บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.538 ซอยปิ่นเกล้า 7 ถนนปิ่นเกล้า แขวงปิ่นเกล้า เขตปิ่นเกล้า กรุงเทพฯ 10160 538 Soi Pinyaklad 7 Bangkadee Bangkok
Tel: 02-802-4790-2 Fax: 02-802-3986 E-mail: info@neediss.com

NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6706001

Page:1/1

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

| | |
|---|---|
| Analyzer Type: NO/NO2/NOx Analyzer Model: T200 | Manufacturer API S/N: ENOAIT20003573 |
|---|---|

Calibration System

| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NOx Conc 46.50 PPM NO Conc 46.50 PPM So2 Conc 45.59 PPM Co Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267 |

Environment: Temperature 26.0 °CHumidity: 62 %RH

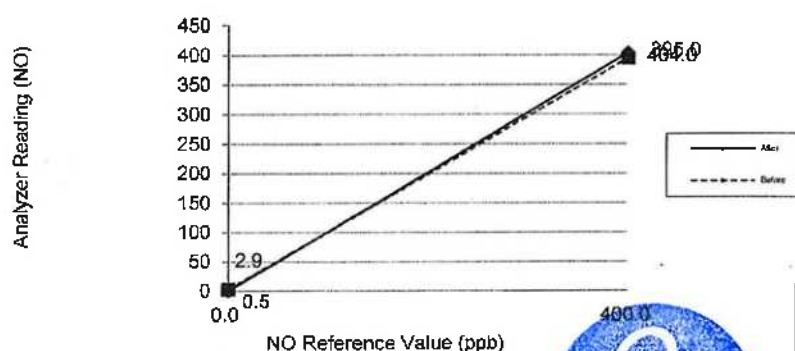
Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 2.4 | 0.0 | 2.4 | 393.5 | 400.0 | -0.8 |
| NO ₂ | 0.5 | 0.0 | 0.5 | 1.5 | 0.0 | 0.2 |
| NOx | 2.9 | 0.0 | 2.9 | 395.0 | 400.0 | -0.6 |

Calibration Check (After adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.4 | 0.0 | 0.4 | 402.0 | 400.0 | 0.2 |
| NO ₂ | 0.1 | 0.0 | 0.1 | 2.0 | 0.0 | 0.2 |
| NOx | 0.5 | 0.0 | 0.5 | 404.0 | 400.0 | 0.5 |

Single Point Calibration Chart





neediss

บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.

575 ซอยเทศบาล 7 แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10110 โทร 02-507-0742-3 โทรสาร 02-507-0743 อีเมล info@neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6706001

Page:1/1

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page:2/2

| Test Function Value | Normal range | Unit | Before | After | Note |
|----------------------|-------------------|-----------|--------|-------|-------|
| Date | 1-Jun-24 | | | | |
| Time | 9:25 | | | | |
| Range | 0.00 - 500.00 PPB | PPB | 500 | 500 | |
| Stability (Zero Gas) | < 0.2 | PPB | 0.5 | 0.2 | |
| Sample Flow | 500+/- 50 | cc/min | 491 | 485 | |
| Ozone Flow | 60-90 | cc/min | 80 | 80 | |
| PMT Detector | 0-5000 | mV | 85.0 | 25.0 | |
| AZERO | -20-150 | mV | 94.1 | 14.5 | |
| HVPS | 400-900 constant | V | 734 | 734 | |
| DCPS | 2500 +/- 200 | mV | - | - | |
| RCELL TEMP | 50+/- 1 | Dreagee C | 50 | 50 | |
| BOX TEMP | 20-35 | Dreagee C | 34.7 | 33.6 | |
| PMT TEMP | 7 +/-1 | Dreagee C | 7.0 | 7.0 | |
| IZS TEMP | 50+/- 4 | Dreagee C | - | - | |
| MOLY Temp | 315 +/- 5 | Dreagee C | 314.0 | 314.0 | |
| RCEL PRES | 4-10 constant | IN-Hg-A | 5.0 | 5.0 | |
| SAMP PRES | 20-30 constant | IN-Hg-A | 28.8 | 27.9 | |
| NO Slope | 1 +/- 0.3 | | 1.135 | 1.197 | |
| Nox Slope | 1 +/- 0.3 | | 1.260 | 1.114 | |
| NO Offset | -10 to + 150 | mV | 0.8 | -3.6 | |
| NOx Offset | -10 to + 150 | mV | -2.6 | 6.1 | |
| Span and Cal Values | | | | | |
| Zero Value | NO | 0 | ppb | 2.4 | 0.4 |
| | NOx | 0 | ppb | 2.9 | 0.5 |
| Span Value | NO | 400 | ppb | 393.5 | 402.0 |
| | NOx | 400 | ppb | 395.0 | 404.0 |

Calibrate By : _____

Approve By : _____

Date:

1-Jun-24

Date:

1-Jun-24

neediss

Neediss Supply Instrument Co.,Ltd.



This report shall not be reproduced except in full without the written approval of Neediss Supply Instrument Co., Ltd.

รับรองสำเนาถูกต้อง
EnviLab Co.,Ltd. : ผู้จัดการฝ่ายควบคุมคุณภาพ



neediss

บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.

5/5 หมู่ 7 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
5/5 หมู่ 7 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6706002

Page:1/1

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

| | |
|--|---|
| Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: 200A | Manufacturer API S/N: ENOA1200E01170 |
|--|---|

Calibration System

| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NO _x Conc 46.50 PPM NO Conc 46.50 PPM So ₂ Conc 45.59 PPM Co Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267 |

Environment: Temperature 27.8 °C

Humidity: 60 %RH

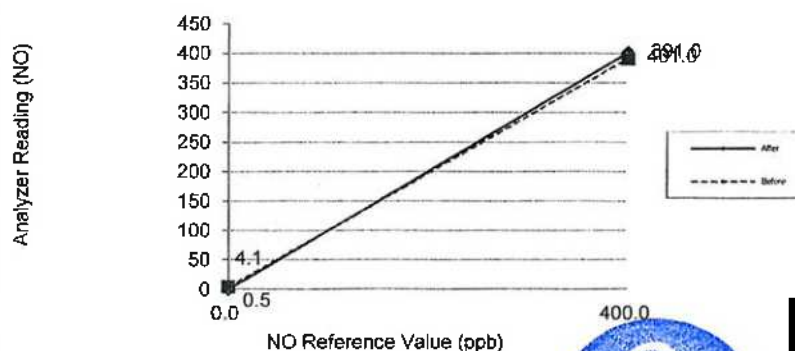
Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 3.5 | 0.0 | 3.5 | 388.0 | 400.0 | -1.5 |
| NO ₂ | 0.6 | 0.0 | 0.6 | 3.0 | 0.0 | 0.4 |
| NO _x | 4.1 | 0.0 | 4.1 | 391.0 | 400.0 | -1.1 |

Calibration Check (After adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.5 | 0.0 | 0.5 | 400.0 | 400.0 | 0.0 |
| NO ₂ | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.1 |
| NO _x | 0.5 | 0.0 | 0.5 | 401.0 | 400.0 | 0.1 |

Single Point Calibration Chart





NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6706002

Page: 1/1

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page: 2/2

| Test Function Value | Normal range | Unit | Before | After | Note |
|----------------------|-------------------|-----------|--------|-------|-------|
| Date | 1-Jun-24 | | | | |
| Time | 10:10 | | | | |
| Range | 0.00 - 500.00 PPB | PPB | 500 | 500 | |
| Stability (Zero Gas) | < 0.2 | PPB | 0.4 | 0.2 | |
| Sample Flow | 500 +/- 50 | cc/min | 482 | 494 | |
| Ozone Flow | 80-90 | cc/min | 74 | 77 | |
| PMT Detector | 0-5000 | mV | 51 | 26 | |
| AZERO | -20-150 | mV | 53.3 | 33.3 | |
| HVPS | 400-900 constant | V | 821 | 821 | |
| DCPS | 2500 +/- 200 | mV | 2556 | 2556 | |
| RCELL TEMP | 50 +/- 1 | Dreegee C | 50 | 50 | |
| BOX TEMP | 20-35 | Dreegee C | 30.2 | 32.8 | |
| PMT TEMP | 7 +/- 1 | Dreegee C | 7.5 | 7.5 | |
| IS TEMP | 50 +/- 4 | Dreegee C | - | - | |
| MOLY Temp | 315 +/- 5 | Dreegee C | 315.0 | 314.5 | |
| RCEL PRES | 4-10 constant | IN-Hg-A | 8.8 | 8.8 | |
| SAMP PRES | 20-30 constant | IN-Hg-A | 30.2 | 31.8 | |
| NO Slope | 1 +/- 0.3 | | 0.820 | 0.822 | |
| Nox Slope | 1 +/- 0.3 | | 0.854 | 0.858 | |
| NO Offset | -10 to + 150 | mV | 17.8 | 17.8 | |
| NOx Offset | -10 to + 150 | mV | 5.0 | 5.0 | |
| Span and Cal Values | | | | | |
| Zero Value | NO | 0 | ppb | 3.5 | 0.5 |
| | NOx | 0 | ppb | 4.1 | 0.5 |
| Span Value | NO | 400 | ppb | 388.0 | 400.0 |
| | NOx | 400 | ppb | 391.0 | 401.0 |

Calibrate By : _____

Approve By : _____

Date:

1-Jun-24

Date:

1-Jun-24



Neediss Supply Instrument Co., Ltd





neediss

บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.

125 หมู่ 10 ตำบล 7 ต.บ้านใหม่ อำเภอเมือง จังหวัด เชียงใหม่ 50100 ประเทศไทย
Tel: 053-2012422 Fax: 053-2012423 E-mail: neediss@neediss.co.th



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6706003

Page:1/1

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

| | |
|--|---|
| Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: T200 | Manufacturer API S/N: ENOAIT20002470 |
|--|---|

Calibration System

| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NO Conc 44.68 PPM SO ₂ Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 27.9 °C

Humidity: 60 %RH

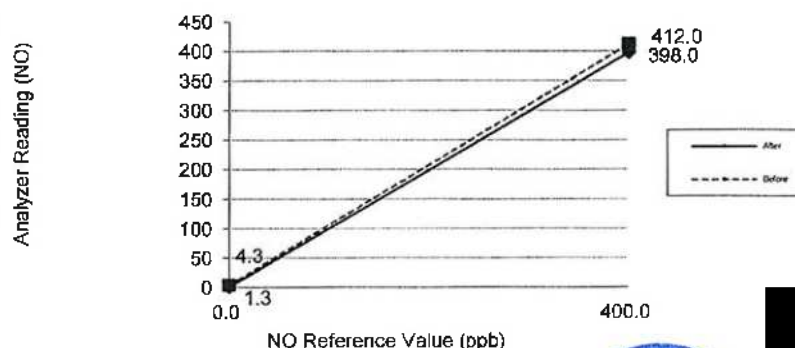
Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 3.2 | 0.0 | 3.2 | 410.0 | 400.0 | 1.2 |
| NO ₂ | 1.1 | 0.0 | 1.1 | 2.0 | 0.0 | 0.2 |
| NO _x | 4.3 | 0.0 | 4.3 | 412.0 | 400.0 | 1.5 |

Calibration Check (After adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.7 | 0.0 | 0.7 | 392.0 | 400.0 | -1.0 |
| NO ₂ | 0.6 | 0.0 | 0.6 | 6.0 | 0.0 | 0.8 |
| NO _x | 1.3 | 0.0 | 1.3 | 398.0 | 400.0 | -0.3 |

Single Point Calibration Chart



Page: 2/2

This report shall not be reproduced except in full without the written approval of Neediss Supply Instrument Co., Ltd.

Neediss Co., Ltd.

รับรองสำเนาถูกต้อง

ผู้ตรวจการฝ่ายควบคุมคุณภาพ



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6706003

Page:1/1

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

| Test Function Value | Normal range | Unit | Before | After | Note |
|----------------------------|-------------------|-----------|--------|-------|-------|
| Date | 1-Jun-24 | | | | |
| Time | 10:10 | | | | |
| Range | 0.00 - 500.00 PPB | PPB | 500 | 500 | |
| Stability (Zero Gas) | < 0.2 | PPB | 0.5 | 0.2 | |
| Sample Flow | 500+/- 50 | cc/min | 511 | 532 | |
| Ozone Flow | 60-90 | cc/min | 80 | 80 | |
| PMT Detector | 0-5000 | mV | 27.4 | 16.4 | |
| AZERO | -20-150 | mV | 54.2 | 54.2 | |
| HVPS | 400-900 constant | V | 819 | 819 | |
| DCPS | 2500 +/- 200 | mV | - | - | |
| RCELL TEMP | 50+/- 1 | Dreegee C | 50 | 50 | |
| BOX TEMP | 20-35 | Dreegee C | 33.7 | 32.9 | |
| PMT TEMP | 7 +/-1 | Dreegee C | 7.1 | 7.1 | |
| IZS TEMP | 50+/- 4 | Dreegee C | - | - | |
| MOLY Temp | 315 +/- 5 | Dreegee C | 314.4 | 315.0 | |
| RCEL PRES | 4-10 constant | IN-Hg-A | 10 | 10 | |
| SAMP PRES | 20-30 constant | IN-Hg-A | 29.0 | 29.4 | |
| NO Slope | 1 +/- 0.3 | | 0.820 | 0.801 | |
| Nox Slope | 1 +/- 0.3 | | 0.848 | 0.813 | |
| NO Offset | -10 to + 150 | mV | 10.2 | 15.3 | |
| NOx Offset | -10 to + 150 | mV | -2.0 | -3.4 | |
| Span and Cal Values | | | | | |
| Zero Value | NO | 0 | ppb | 3.2 | 0.7 |
| | NOx | 0 | ppb | 4.3 | 1.3 |
| Span Value | NO | 400 | ppb | 410.0 | 392.0 |
| | NOx | 400 | ppb | 412.0 | 398.0 |

Calibrate By : _____

Date:

1-Jun-24

Approve By : _____

Date:

1-Jun-24


neediss
 Neediss Supply Instrument Co.,Ltd



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6706004

Page:1/1

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

| | |
|---|---|
| Analyzer Type: NO/NO2/NOx Analyzer Model: 200A | Manufacturer API S/N: ENOAI200A02243 |
|---|---|

Calibration System

| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | Nox Conc 46.50 PPM NO Conc 46.50 PPM SO2 Conc 45.59 PPM CO Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267 |

Environment: Temperature 27.9 °C

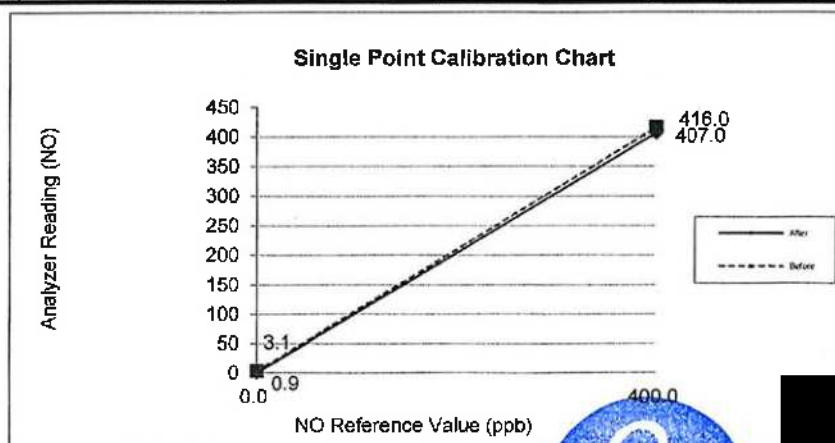
Humidity: 59 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 2.5 | 0.0 | 2.5 | 413.0 | 400.0 | 1.6 |
| NO ₂ | 0.6 | 0.0 | 0.6 | 3.0 | 0.0 | 0.4 |
| NOx | 3.1 | 0.0 | 3.1 | 416.0 | 400.0 | 2.0 |

Calibration Check (After adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.7 | 0.0 | 0.7 | 403.1 | 400.0 | 0.4 |
| NO ₂ | 0.2 | 0.0 | 0.2 | 3.9 | 0.0 | 0.5 |
| NOx | 0.9 | 0.0 | 0.9 | 407.0 | 400.0 | 0.9 |



NOx Analyzer Verification Test Report

Page:1/1

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page:2/2

| Test Function Value | Normalinal range | Unit | Before | After | Note |
|----------------------------|-------------------|-----------|--------|-------|-------|
| Date | 1-Jun-24 | | | | |
| Time | 10:10 | | | | |
| Range | 0.00 - 500.00 PPB | PPB | 500 | 500 | |
| Stability (Zero Gas) | < 0.2 | PPB | 0.4 | 0.2 | |
| Sample Flow | 500+/- 50 | cc/min | 482 | 494 | |
| Ozone Flow | 60-90 | cc/min | 74 | 77 | |
| PMT Detector | 0-5000 | mV | 51 | 26 | |
| AZERO | -20-150 | mV | 53.3 | 33.3 | |
| HVPS | 400-900 constant | V | 821 | 821 | |
| DCPS | 2500 +/- 200 | mV | 2556 | 2556 | |
| RCCELL TEMP | 50+/- 1 | Dreagee C | 50 | 50 | |
| BOX TEMP | 20-35 | Dreagee C | 30.2 | 32.8 | |
| PMT TEMP | 7 +/-1 | Dreagee C | 7.5 | 7.5 | |
| IZS TEMP | 50+/- 4 | Dreagee C | - | - | |
| MOLY Temp | 315 +/- 5 | Dreagee C | 315.0 | 314.5 | |
| RCEL PRES | 4-10 contant | IN-Hg-A | 8.8 | 8.8 | |
| SAMP PRES | 20-30 contant | IN-Hg-A | 30.2 | 31.8 | |
| NO Slope | 1 +/- 0.3 | | 0.820 | 0.822 | |
| Nox Slope | 1 +/- 0.3 | | 0.854 | 0.858 | |
| NO Offset | -10 to + 150 | mV | 17.8 | 17.8 | |
| NOx Offset | -10 to + 150 | mV | 5.0 | 5.0 | |
| Span and Cal Values | | | | | |
| Zero Value | NO | 0 | ppb | 2.5 | 0.7 |
| | NOx | 0 | ppb | 3.1 | 0.9 |
| Span Value | NO | 400 | ppb | 413.0 | 403.1 |
| | NOx | 400 | ppb | 416.0 | 407.0 |

Calibrate By :

Date:

1-Jun-24

Approve By :

Date:

1-Jun-24



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6706005

Page:1/1

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

| | |
|---|---|
| Analyzer Type: NO/NO2/NOx Analyzer Model: 200A | Manufacturer API S/N: ENOAI200A01679 |
|---|---|

Calibration System

| Calibrator Unit | Standard Gas |
|--|--|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NOx Conc 46.50 PPM NO Conc 46.50 PPM So2 Conc 45.59 PPM Co Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267 |

Environment: Temperature 27.9 °C

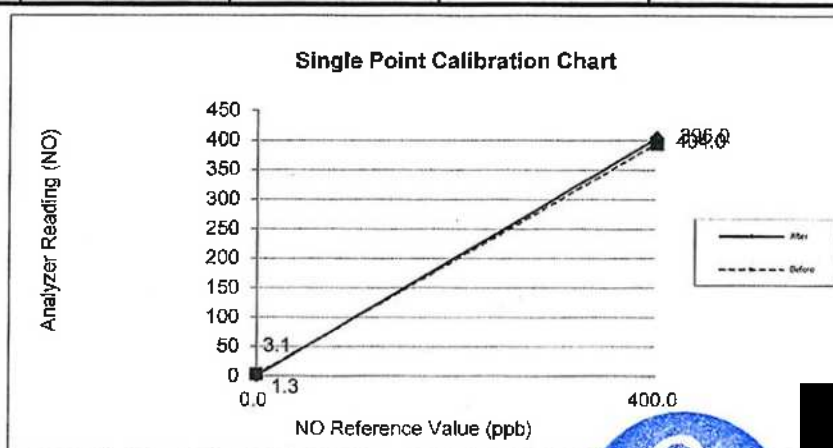
Humidity: 58 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 2.3 | 0.0 | 2.3 | 391.0 | 400.0 | -1.1 |
| NO ₂ | 0.8 | 0.0 | 0.8 | 4.0 | 0.0 | 0.5 |
| NOx | 3.1 | 0.0 | 3.1 | 395.0 | 400.0 | -0.6 |

Calibration Check (After adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.9 | 0.0 | 0.9 | 403.1 | 400.0 | 0.4 |
| NO ₂ | 0.4 | 0.0 | 0.4 | 0.9 | 0.0 | 0.1 |
| NOx | 1.3 | 0.0 | 1.3 | 404.0 | 400.0 | 0.5 |





neediss

บริษัท เน็ดิส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.

50/5 หมู่ 7 ต.บึงหวด อ.บึงหวด จ.นครราชสีมา 30130
โทร : 043-833441-45 โทรสาร : 043-833441 E-mail : neediss@neediss.co.th
www.neediss.co.th



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6706005

Page:1/1

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page:2/2

| Test Function Value | Normal range | Unit | Before | After | Note |
|----------------------------|-------------------|-----------|--------|-------|-------|
| Date | 1-Jun-24 | | | | |
| Time | 10:10 | | | | |
| Range | 0.00 - 500.00 PPB | PPB | 500 | 500 | |
| Stability (Zero Gas) | < 0.2 | PPB | 0.4 | 0.2 | |
| Sample Flow | 500+/- 50 | cc/min | 482 | 494 | |
| Ozone Flow | 60-90 | cc/min | 74 | 77 | |
| PMT Detector | 0-5000 | mV | 51 | 26 | |
| AZERO | -20-150 | mV | 53.3 | 33.3 | |
| HVPS | 400-900 constant | V | 821 | 821 | |
| DCPS | 2500 +/- 200 | mV | 2556 | 2556 | |
| RCELL TEMP | 50+/- 1 | Dreegee C | 50 | 50 | |
| BOX TEMP | 20-35 | Dreegee C | 30.2 | 32.8 | |
| PMT TEMP | 7 +/-1 | Dreegee C | 7.5 | 7.5 | |
| IZS TEMP | 50+/- 4 | Dreegee C | - | - | |
| MOLY Temp | 315 +/- 5 | Dreegee C | 315.0 | 314.5 | |
| RCEL PRES | 4-10 contant | IN-Hg-A | 8.8 | 8.8 | |
| SAMP PRES | 20-30 contant | IN-Hg-A | 30.2 | 31.8 | |
| NO Slope | 1 +/- 0.3 | | 0.820 | 0.822 | |
| Nox Slope | 1 +/- 0.3 | | 0.854 | 0.858 | |
| NO Offset | -10 to + 150 | mV | 17.8 | 17.8 | |
| NOx Offset | -10 to + 150 | mV | 5.0 | 5.0 | |
| Span and Cal Values | | | | | |
| Zero Value | NO | 0 | ppb | 2.3 | 0.9 |
| | NOx | 0 | ppb | 3.1 | 1.3 |
| Span Value | NO | 400 | ppb | 391.0 | 403.1 |
| | NOx | 400 | ppb | 395.0 | 404.0 |

Calibrate By :

Date:

1-Jun-24

Approve By :

Date:

1-Jun-24

neediss
Neediss Supply Instrument Co.,Ltd





neediss

บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.

100 หมู่ 10 ตำบลบ้านใหม่ อำเภอรามหลวง จังหวัดสุพรรณบุรี 18110
100 Moo 10 Tambon Ban Mai, Amphoe Ramthong, Suphanburi 18110

TEL: 08-1000-20000 FAX: 08-1000-20000 E-MAIL: info@neediss.com



CO Analyzer Verification Test Report

Calibration Report No.: AP-C6706008

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

| | |
|---|---|
| Analyzer Type: CO Analyzer Model: 300E | Manufacturer API S/N: ECOAI300E00449 |
|---|---|

Calibration System

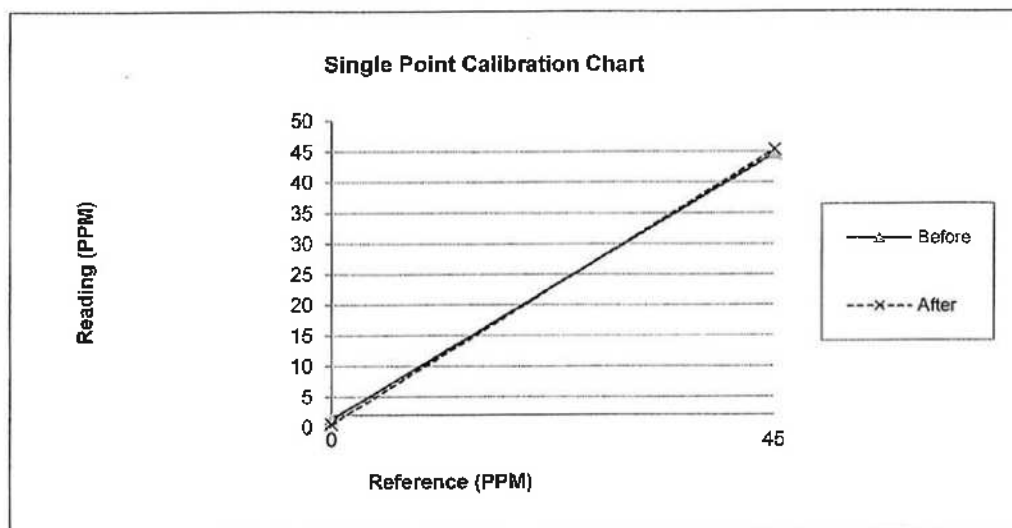
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NOx Conc 46.50 PPM NO Conc 46.50 PPM So2 Conc 45.59 PPM Co Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267 |

Environment: Temperature 27.0 °C

Humidity: 53 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPM) | Reading (PPM) | Drift (PPM) | Reference (PPM) | Reading (PPM) | Drift% |
| Before | 0.0 | 1.30 | 1.3 | 45.0 | 44.7 | -0.3 |
| After | 0.0 | 0.50 | 0.5 | 45.0 | 45.3 | 0.3 |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



neediss

บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.

225 หมู่ 10 ตำบล 7 อำเภอเมือง จังหวัดเชียงใหม่ 50000
111 หมู่ 10 ตำบล 7 อำเภอเมือง จังหวัดเชียงใหม่ 50000



CO Analyzer Verification Test Report

Calibration Report No.: AP-C6706008

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page:2/2

| Detail | Range | Unit | Before | After | Note |
|-------------------|------------------|---------|--------|--------|---------------|
| Date | 1-Jun-24 | | | | |
| Time | 11:00 | | | | |
| Range | 0.1-1000 PPM | PPM | 50 | 50 | |
| Stability | (0.1-2PPB) | ppb | 0.73 | 1.11 | |
| CO Measure | 2500 - 4800 MV. | mV | 2913.3 | 2923.5 | |
| CO Reference | 2500 - 4800 MV. | mV | 2444.3 | 2421.4 | |
| MR Ratio | 1.2 +/- 0.5 | | 1.18 | 1.21 | |
| Sample Pressure | 26 - 30 in-Hg-A | in-Hg-A | 29.1 | 29 | |
| Sample Flow | 720 - 880 cc/min | cc/min | 890 | 886 | |
| Sample Temp | 44 - 52 deg.C | deg.C | 50.3 | 50.4 | |
| Bench Temp | 47 - 49 deg.C | deg.C | 48 | 48 | |
| Wheel Temp | 66 - 70 deg.C | deg.C | 68.3 | 68.4 | |
| Box Temp | 27 - 50 deg.C | deg.C | 35.2 | 35.1 | |
| PHT drive | 250 - 4750 mv. | mV | 3323.4 | 3353.6 | |
| Slope | 0.800 - 1.200 | | 1.051 | 1.112 | |
| Offset | 0.05 +/- 0.2 | | 0.088 | 0.088 | |
| Gas Test Response | | | | | |
| Zero Gas | 0 | PPM | 1.3 | 0.5 | |
| Span Gas | 45 | PPM | 44.7 | 45.3 | ± 5% of Range |

Calibrate By :

Approve By :

Date:

1-Jun-24

Date:

1-Jun-24

neediss

Neediss Supply Instrument Co.,Ltd



This report shall not be reproduced except in full without the written approval of Neediss Supply Instrument Co.,Ltd.

EnviLab Co.,Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ



CO Analyzer Verification Test Report

Calibration Report No.: ES-C6706002

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

| | |
|--|---|
| Analyzer Type: CO Analyzer Model: CO12E | Manufacturer: Environnement SA, France S/N: ECOESACO12E201 |
|--|---|

Calibration System

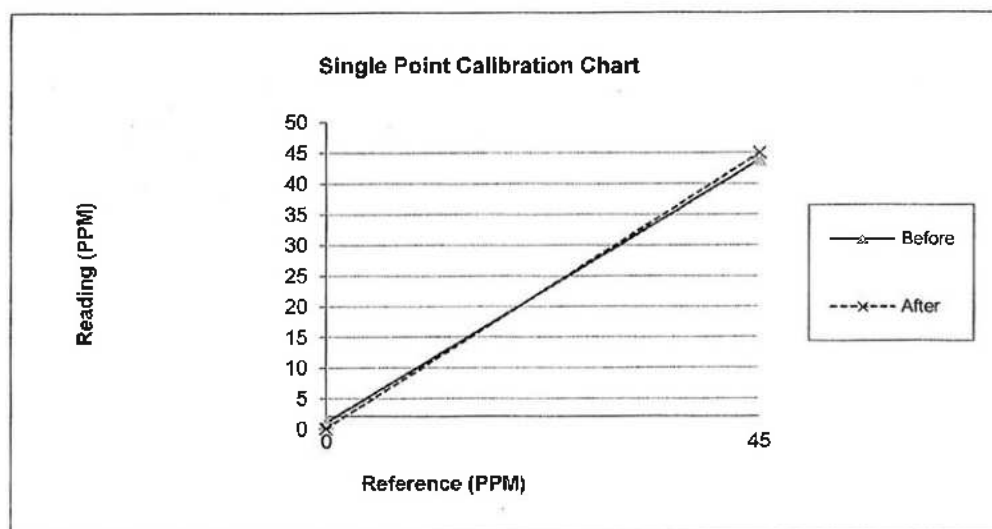
| Calibrator Unit | Standard Gas |
|----------------------------|------------------------------------|
| Dilutor Model ESA MGC101 | NO Conc 44.68 PPM |
| S/N: 792 | SO2 Conc 45.34 PPM |
| ZERO AIR Generator ZAG7001 | CO Conc 4500 PPM |
| S/N: 644 | Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 21.6 °C

Humidity: 56 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPM) | Reading (PPM) | Drift (PPM) | Reference (PPM) | Reading (PPM) | Drift% |
| Before | 0.0 | 1.050 | 1.1 | 45.0 | 43.90 | -1.2 |
| After | 0.0 | 0.098 | 0.1 | 45.0 | 44.98 | 0.0 |



ผู้รับรองสำเนาถูกต้อง

This report shall not be reproduced except in full without the written approval of Nicolas Supply Instrument Co. Ltd.

Supplier of Needles to
Mitsubishi Co. Ltd.

พิกุล Instrument Co. Ltd
ผู้จัดการฝ่ายควบคุมคุณภาพ



CO Analyzer Verification Test Report

Calibration Report No.: ES-C6706002

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page:2/2

| Analyzer Signal Values | | | | | |
|------------------------|----------|-------|----------------|-------|-------|
| Date | 1-Jun-24 | Time | 10:09:00 | | |
| Power Supplies | | | | | |
| Option | 0.0 | mV | +5 V Sensor | 5 | V |
| +3.3 V | 3.3 | V | +24 V | 24.2 | V |
| +12 V | 11.8 | V | +5 V | 5.1 | V |
| +24 V | 1.1 | mV | | | |
| Optical Bench | | | | | |
| IR current ratio | 884.7 | mA | Pbse current | 618.2 | mV |
| Optical T. | 46.0 | deg.C | Pbse T. | -24.2 | deg.C |
| Measure sig. | 506.4 | mV | Refer Sig. | 456.4 | mV |
| Min sig. | 945.0 | mV | Max Sig. | 2840 | mV |
| Sample | | | | | |
| inst. Ratio | 1.109 | | Ratio | 1.105 | |
| Ref. ratio | 1.109 | | Internal Temp. | 28.9 | deg.C |
| Source Temp. | 46.0 | deg.C | Gas Pressure | 997 | hPa |
| Up Pressure | 947.0 | hPa | Flow | 59 | l/h |

Calibrate By :

Date:

1-Jun-24

 **neediss**

Neediss Supply Instrument
Approve By :

Date:

1-Jun-24





CO Analyzer Verification Test Report

Calibration Report No.: ES-C6706006

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

| | |
|--|---|
| Analyzer Type: CO Analyzer Model: CO12E | Manufacturer: Environnement SA, France S/N: ECOESACO12E205 |
|--|---|

Calibration System

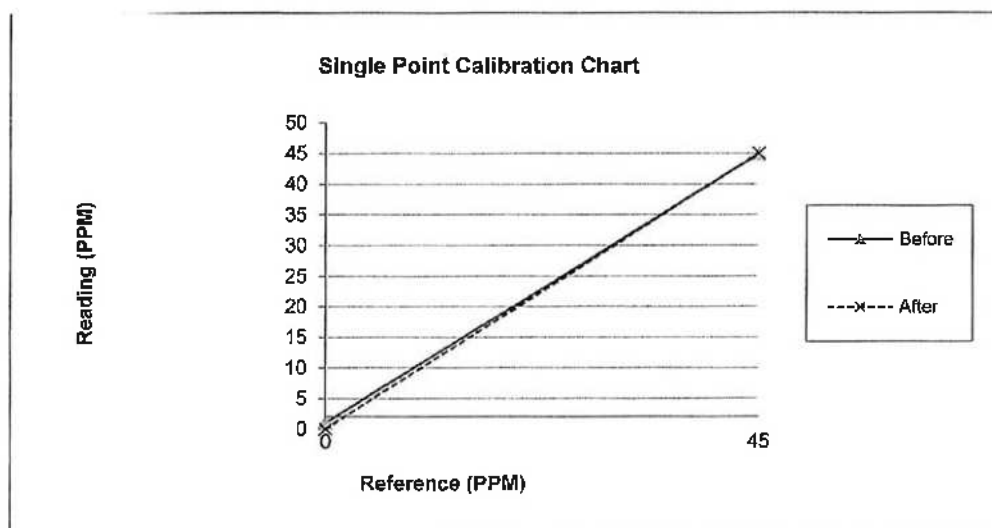
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model: ESA MGC101 S/N: 792 ZERO AIR Generator: ZAG7001 S/N: 644 | NOx Conc: 46.50 PPM NO Conc: 46.50 PPM So2 Conc: 45.59 PPM Co Conc: 4507 PPM Expire Date: Mar 31, 2026 EB0160267 |

Environment: Temperature 26.2 °C

Humidity: 62 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPM) | Reading (PPM) | Drift (PPM) | Reference (PPM) | Reading (PPM) | Drift% |
| Before | 0.0 | 1.000 | 1.0 | 45.0 | 44.95 | -0.1 |
| After | 0.0 | 0.009 | 0.0 | 45.0 | 45.07 | 0.1 |





CO Analyzer Verification Test Report

Calibration Report No.: ES-C6706006

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page:2/2

| Analyzer Signal Values | | | | | |
|------------------------|----------|-------|----------------|-------|-------|
| Date | 1-Jun-24 | Time | 10:09:00 | | |
| Power Supplies | | | | | |
| Option | 0.0 | mV | +5 V Sensor | 5 | V |
| +3.3 V | 3.3 | V | +24 V | 24.2 | V |
| +12 V | 11.8 | V | +5 V | 5.1 | V |
| +24 V | 1.1 | mV | | | |
| Optical Bench | | | | | |
| IR current ratio | 884.7 | mA | Pbse current | 618.2 | mV |
| Optical T. | 46.0 | deg.C | Pbse T. | -24.2 | deg.C |
| Measure sig. | 506.4 | mV | Refer Sig. | 456.4 | mV |
| Min sig. | 945.0 | mV | Max Sig. | 2840 | mV |
| Sample | | | | | |
| inst. Ratio | 1.109 | | Ratio | 1.105 | |
| Ref. ratio | 1.109 | | Internal Temp. | 28.9 | deg.C |
| Source Temp. | 46.0 | deg.C | Gas Pressure | 997 | hPa |
| Up Pressure | 947.0 | hPa | Flow | 59 | l/h |

Calibrate By : _____

Date:

1-Jun-24

Approve By : _____

Date:

1-Jun-24


neediss
 Neediss Supply Instrument Co.,Ltd.





CO Analyzer Verification Test Report

Calibration Report No.: TD-C6706009

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

| | |
|----------------------------|---------------------|
| Analyzer Type: CO Analyzer | Manufacturer API |
| Model: T300 | S/N: ECOAIT30000099 |

Calibration System

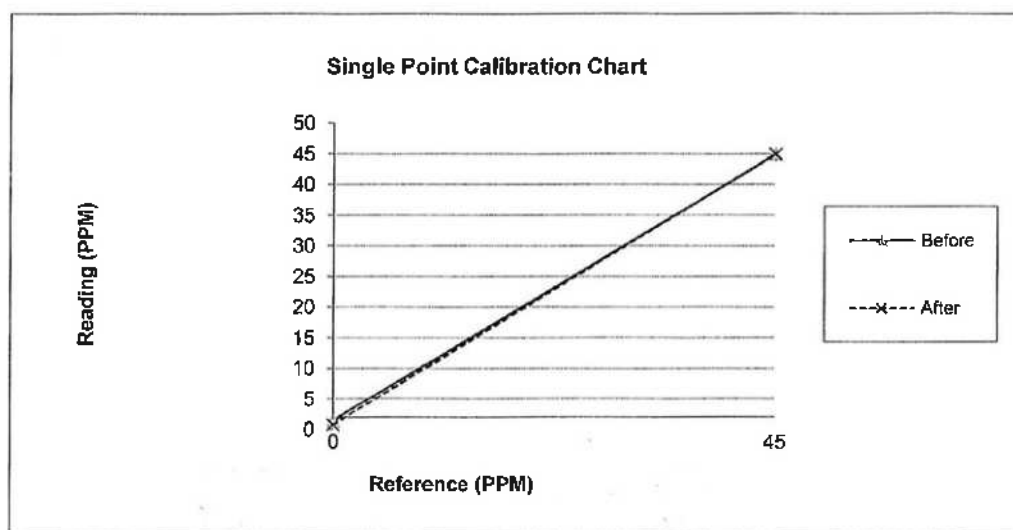
| Calibrator Unit | Standard Gas |
|----------------------------|------------------------------------|
| Dilutor Model ESA MGC101 | NOx Conc 46.50 PPM |
| S/N: 792 | NO Conc 46.50 PPM |
| ZERO AIR Generator ZAG7001 | So2 Conc 45.59 PPM |
| S/N: 644 | Co Conc 4507 PPM |
| | Expire Date: Mar 31,2026 EB0160267 |

Environment: Temperature 27.0 °C

Humidity: 52 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPM) | Reading (PPM) | Drift (PPM) | Reference (PPM) | Reading (PPM) | Drift% |
| Before | 0.0 | 1.5 | 1.5 | 45.0 | 44.9 | -0.1 |
| After | 0.0 | 0.8 | 0.8 | 45.0 | 45.0 | 0.0 |



**neediss**บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.5/5 หมู่ 7 ตำบล คลองเตย อำเภอ บางบาล จังหวัด สุพรรณบุรี 32110
Tel. 034324144-45 Fax. 034324145 E-mail: info@neediss.com**CO Analyzer Verification Test Report**

Calibration Report No.: TD-C6706009

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page:2/2

| Detail | Range | Unit | Before | After | Note |
|--------------------------|------------------|---------|--------|--------|---------------|
| Date | 1-Jun-24 | | | | |
| Time | 14:57 | | | | |
| Range | 0.1-1000 PPM | PPM | 50 | 50 | |
| Stability | (0.1-2PPB) | ppb | 0.22 | 0 | |
| CO Measure | 2500 - 4800 MV. | mV | 3793.2 | 3836.5 | |
| CO Reference | 2500 - 4800 MV. | mV | 3143.6 | 3179.5 | |
| MR Ratio | 1.2 +/- 0.5 | | 1.215 | 1.215 | |
| Sample Pressure | 26 - 30 in-Hg-A | in-Hg-A | 28.6 | 28.6 | |
| Sample Flow | 720 - 880 cc/min | cc/min | 859 | 859 | |
| Sample Temp | 44 - 52 deg.C | deg.C | 47.8 | 46.7 | |
| Bench Temp | 47 - 49 deg.C | deg.C | 48 | 48 | |
| Wheel Temp | 66 - 70 deg.C | deg.C | 68 | 68 | |
| Box Temp | 27 - 50 deg.C | deg.C | 32 | 34.9 | |
| PHT drive | 250 - 4750 mv. | mV | 3015 | 3018.6 | |
| Slope | 0.800 - 1.200 | | 0.867 | 0.875 | |
| Offset | 0.05 +/- 0.2 | | 0.006 | 0.005 | |
| Gas Test Response | | | | | |
| Zero Gas | 0 | PPM | 1.5 | 0.8 | |
| Span Gas | 45 | PPM | 44.9 | 45.0 | ± 5% of Range |

Calibrate By : _____

Approve By : _____

Date:

1-Jun-24

Date:

1-Jun-24

neediss

Neediss Supply Instrument Co.,Ltd.



EnviLab Co.,Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ



CO Analyzer Verification Test Report

Calibration Report No.: TD-C6706010

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

| | |
|---|---|
| Analyzer Type: CO Analyzer Model: T300 | Manufacturer API S/N: ECOAIT30000098 |
|---|---|

Calibration System

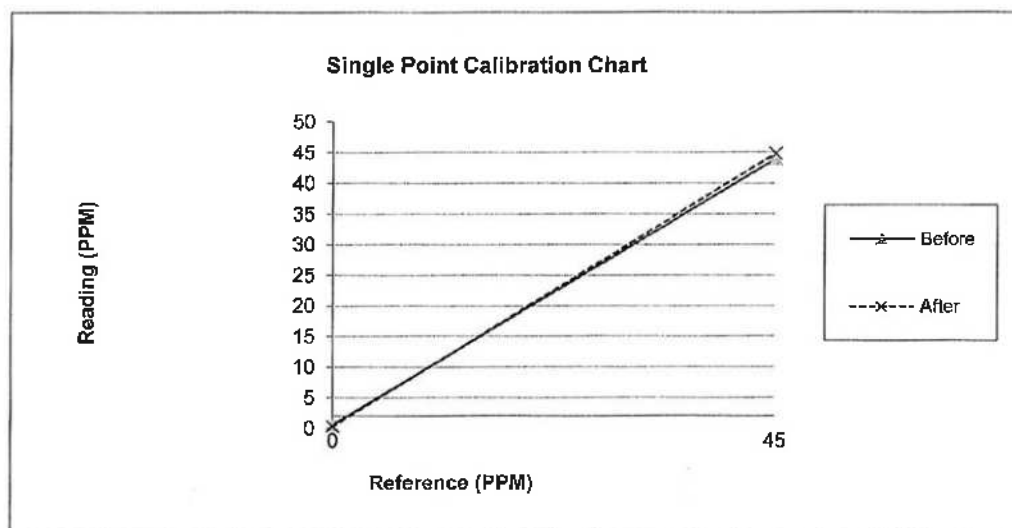
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGA101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NOx Conc 46.50 PPM NO Conc 46.50 PPM So2 Conc 45.59 PPM Co Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267 |

Environment: Temperature 27.1 °C

Humidity: 52 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPM) | Reading (PPM) | Drift (PPM) | Reference (PPM) | Reading (PPM) | Drift% |
| Before | 0.0 | 0.6 | 0.6 | 45.0 | 44.0 | -1.1 |
| After | 0.0 | 0.3 | 0.3 | 45.0 | 44.9 | -0.1 |





CO Analyzer Verification Test Report

Calibration Report No.: TD-C6706010

Calibrated Date: 1-Jun-24

☒ PM ☐ Onsite

Page:2/2

| Detail | Range | Unit | Before | After | Note |
|-------------------|------------------|---------|--------|--------|---------------|
| Date | 1-Jun-24 | | | | |
| Time | 10:51 | | | | |
| Range | 0.1-1000 PPM | PPM | 50 | 50 | |
| Stability | (0.1-2PPB) | ppb | 0.04 | 0.2 | |
| CO Measure | 2500 - 4800 MV. | mV | 4465.6 | 4431.3 | |
| CO Reference | 2500 - 4800 MV. | mV | 3768.5 | 3730.2 | |
| MR Ratio | 1.2 +/- 0.5 | | 1.19 | 1.20 | |
| Sample Pressure | 26 - 30 in-Hg-A | in-Hg-A | 28.7 | 28.6 | |
| Sample Flow | 720 - 880 cc/min | cc/min | 904 | 898 | |
| Sample Temp | 44 - 52 deg.C | deg.C | 48.5 | 43.3 | |
| Bench Temp | 47 - 49 deg.C | deg.C | 48 | 48 | |
| Wheel Temp | 66 - 70 deg.C | deg.C | 68 | 68 | |
| Box Temp | 27 - 50 deg.C | deg.C | 33.3 | 34.8 | |
| PHT drive | 250 - 4750 mv. | mV | 2912.3 | 2913.5 | |
| Slope | 0.800 - 1.200 | | 1.197 | 1.138 | |
| Offset | 0.05 +/- 0.2 | | -0.015 | -0.016 | |
| Gas Test Response | | | | | |
| Zero Gas | 0 | PPM | 0.6 | 0.3 | |
| Span Gas | 45 | PPM | 44.0 | 44.9 | ± 5% of Range |

Calibrate By : _____

Approve By : _____

Date:

1-Jun-24

Date:

1-Jun-24

 **neediss**
Neediss Supply Instrument Co., Ltd.





Certificate of Calibration

Calibration Certification Information

Cal. Date: February 9, 2024 Rootsmeter S/N: 438320 Ta: 295 °K
 Operator: Jim Tisch Pa: 749.0 mm Hg
 Calibration Model #: TE-5025A Calibrator S/N: 5411

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.3950 | 3.2 | 2.00 |
| 2 | 3 | 4 | 1 | 0.9840 | 6.4 | 4.00 |
| 3 | 5 | 6 | 1 | 0.8790 | 7.9 | 5.00 |
| 4 | 7 | 8 | 1 | 0.8430 | 8.8 | 5.50 |
| 5 | 9 | 10 | 1 | 0.6940 | 12.7 | 8.00 |

Data Tabulation

| Vstd (m3) | Qstd (x-axis) | $\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis) | Va | Qa (x-axis) | $\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis) |
|-----------|---------------|--|--------|-------------|---|
| 0.9914 | 0.7106 | 1.4111 | 0.9957 | 0.7138 | 0.8875 |
| 0.9871 | 1.0032 | 1.9956 | 0.9915 | 1.0076 | 1.2551 |
| 0.9851 | 1.1207 | 2.2312 | 0.9895 | 1.1257 | 1.4033 |
| 0.9839 | 1.1672 | 2.3401 | 0.9883 | 1.1723 | 1.4718 |
| 0.9787 | 1.4103 | 2.8222 | 0.9830 | 1.4165 | 1.7750 |
| QSTD | m= | 2.02024 | QA | m= | 1.26504 |
| | b= | -0.02667 | | b= | -0.01677 |
| | r= | 0.99993 | | r= | 0.99993 |

Calculations

| | | | |
|--|---|-----|--|
| Vstd= | $\Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)$ | Va= | $\Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$ |
| Qstd= | Vstd/ΔTime | Qa= | Va/ΔTime |
| For subsequent flow rate calculations: | | | |
| Qstd= | $1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$ | Qa= | $1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$ |

Standard Conditions

| | |
|-------|---------------------------------------|
| Tstd: | 298.15 °K |
| Pstd: | 760 mm Hg |
| Key | |
| ΔH: | calibrator manometer reading (in H2O) |
| ΔP: | rootsmeter manometer reading (mm Hg) |
| Ta: | actual absolute temperature (°K) |
| Pa: | actual barometric pressure (mm Hg) |
| b: | intercept |
| m: | slope |

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30



CAL

Calibratech Co.,Ltd.

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

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



Certificate of Calibration

Certificate No. : 67-410025-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.
540, 540/1 Soi Bangkhac 7, Bangkhac, Bangkok 10160

Equipment : Digital Thermo-Hygrometer

Manufacturer : Jedto

Model : HTC-1

Range Temperature : N/A °C

Resolution : 0.1 °C

Range Humidity : N/A %R.H.

Resolution : 1 %R.H.

Serial No. : PONPE5852094

ID No. : ELABTMHTC10003

Environment : Ambient Temperature : $(23 \pm 2) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$

Date of Received : 20 February 2024

Date of Calibration : 22 February 2024

Date of Issue : 22 February 2024

Calibrated by : Chortip Samchusri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4013 by compared with standard probe sensor humidity/temperature into humidity/temperature chamber.

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

Digital Indicator with Standard Probe Temp&Hum

| ID No. | Cert. No. | Due Date | Traceability |
|-----------------|---------------|-------------|---|
| 400034 & 400035 | SG-H-00020/67 | 05 Jul 2024 | Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268 |

Approved by :

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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



CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 67-410025-1

Page : 2 of 2

UUC Condition As-Received : Good

Result of Calibration : Without Adjustment

Function : Temperature measurement

Reference Humidity @ 50 %R.H.

| Standard Temperature (°C) | UUC Reading (°C) | Correction (°C) | Uncertainty (± °C) |
|--------------------------------|-----------------------|----------------------|-------------------------|
| 24.98 | 25.0 | 0.0 | 0.46 |

Result of Calibration : Without Adjustment

Function : Humidity measurement

Reference Temperature @ 25 °C

| Standard Humidity (%R.H.) | UUC Reading (%R.H.) | Correction (%R.H.) | Uncertainty (± %R.H.) |
|--------------------------------|--------------------------|-------------------------|----------------------------|
| 50.03 | 50 | 0 | 2.2 |

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%

- o0o -

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

| | | | |
|--------------------------------------|---------------------------|---------------------|-----------------|
| Customer: | BANGKOK INDUSTRIAL | | |
| | GAS CO LTD | | |
| Part Number: | E04NI99E15A00V3 | Reference Number: | 160-402685487-1 |
| Cylinder Number: | EB0160267 | Cylinder Volume: | 144.0 CF |
| Laboratory: | 124 - Plumsteadville - PA | Cylinder Pressure: | 2015 PSIG |
| PGVP Number: | A12023 | Valve Outlet: | 660 |
| Gas Code: | CO,NO,NOX,SO2,BALN | Certification Date: | Mar 31, 2023 |
| Expiration Date: Mar 31, 2026 | | | |

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

| ANALYTICAL RESULTS | | | | | |
|--------------------|-------------------------|----------------------|-----------------|----------------------------|------------------------|
| Component | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates |
| NOX | 45.00 PPM | 46.50 PPM | G1 | +/- 1.4% NIST Traceable | 03/24/2023, 03/31/2023 |
| NITRIC OXIDE | 45.00 PPM | 46.50 PPM | G1 | +/- 1.4% NIST Traceable | 03/24/2023, 03/31/2023 |
| SULFUR DIOXIDE | 45.00 PPM | 45.59 PPM | G1 | +/- 1.0% NIST Traceable | 03/24/2023, 03/31/2023 |
| CARBON MONOXIDE | 4500 PPM | 4507 PPM | G1 | +/- 1.4% NIST Traceable | 03/24/2023 |
| NITROGEN | Balance | | | | |

| CALIBRATION STANDARDS | | | | | |
|-----------------------|--------------|-------------|-------------------------------------|-------------|-----------------|
| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
| NTRM | 210607-22 | CC708067 | 48.41 PPM NITRIC OXIDE/NITROGEN | +/- 1.2% | Sep 21, 2025 |
| PRM | 12395 | D887660 | 9.91 PPM NITROGEN DIOXIDE/AIR | +/- 2.0% | Feb 22, 2022 |
| GMIS | 124206889104 | CC322509 | 4.326 PPM NITROGEN DIOXIDE/AIR | +/- 2.0% | Feb 21, 2025 |
| NTRM | 160610-01 | CC473196 | 49.02 PPM SULFUR DIOXIDE/NITROGEN | +/- 0.8% | Mar 22, 2028 |
| GMIS | 07212022B109 | EB0141209 | 50.08 PPM SULFUR DIOXIDE/NITROGEN | +/- 1.0% | Dec 21, 2026 |
| CO | 220608 | CC744768 | 2501.8 PPM CARBON MONOXIDE/NITROGEN | +/- 0.5% | Sep 30, 2028 |

The SRM, NTRM, PRM, or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

| ANALYTICAL EQUIPMENT | | |
|----------------------------------|----------------------|-----------------------------|
| Instrument/Make/Model | Analytical Principle | Last Multipoint Calibration |
| SIEMENS ULTRAMAT 6 N1KD579 | NDIR | Mar 07, 2023 |
| Nicolet iS50 FTIR AUP2010245 NO | FTIR | Mar 09, 2023 |
| Nicolet iS50 FTIR AUP2010245 NO2 | FTIR | Mar 23, 2023 |
| Nicolet iS50 FTIR AUP2010245 SO2 | FTIR | Mar 16, 2023 |

Triad Data Available Upon Request

NOTES:Gross Weight: 27.8 Kg
Net Weight: 4.8 Kg
PO# 5223001123



[Redacted Signature]
Approved for Release



[Redacted Signature]
รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Agilent CrossLab Start Up Services

Agilent 5100 5110 ICP-OES Preventive Maintenance



Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your systems operating at their peak performance.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.



รับรองสาขาเหนือถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for regular maintenance and are encouraged to observe the service representative.
- Any parts not included in the Parts Lists section of this document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.
- For customers using HF applications, the instrument should be returned to its standard sample introduction system.

✓

Important Customer Web Links

- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- To access the **Agilent Resource Center** web page, visit <https://www.agilent.com/en-us/agilentresources>. The following information topics are available:
 - Sample Prep and Containment
 - Chemical Standards
 - Analysis
 - Service and Support
 - Application Workflows
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>
- Videos about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>
- Need to place a service call?** Flexible Repair Options | Agilent



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Service Engineer's Responsibilities

- Contact the customer and ensure that all **necessary** supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the **relevant** information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "**Service not applicable**" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in the most logical order relevant to the individual system service in the order of the tasks listed.
- Complete the **Service Review** section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Verification section including the customer's and your signature.**

Instrument Maintenance

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

| | |
|-------------------------------------|--------------------------------------|
| Instrument System Name and ID | ICP 5110 VDV / MY17490002 |
| Instrument System Site and Location | ENV/LAB Company Limited / Laboratory |

| List System Component | Product Numbers | List the Serial Numbers of each Component |
|-----------------------|-----------------|---|
| 1. G8015A | | MY17490002 |
| 2. G8481A | | 1709-05327 |
| 3. G8410A | | AU17393769 |
| 4. | | |
| 5. | | |
| 6. | | |
| 7. | | |
| 8. | | |
| 9. | | |

| ICP-OES Configuration Table | | Circle the type or write in the type if other |
|-----------------------------|----------------------|---|
| Rebubler Type | SeaSpray | OneNeb Conical Other |
| Spray Chamber | Cyclonic Single Pass | Cyclonic Double Pass Other |
| Torch | Radial | Dual View Other |
| Torch Type | One Piece | Semi Demountable Fully Demountable Other |
| Injector Diameter | 2.4mm | 1.8mm 1.4mm 0.8mm Other |
| Injector Material | Quartz | Ceramic Other |

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components and implementation of Service Notes
- ☒ Check for required firmware/software updates and verify with customers if they would like them installed.
- ☒ For HF application systems, if standard sample introduction system was not installed, ask the customer to install it.
- ☒ Ask the customer to remove any samples from the ICP-OES sample introduction area, auto sampler or around the ICP-OES.



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Preventive Maintenance Procedures

Record Pre-PM Instrument performance

- ☒ Run Instrument Performance test.
- ☒ Record results in Instrument Performance Test Results Table – Pre-PM.

Clean and inspect ICP-OES system

- ☒ Look for any obvious external damage or problems.
- ☒ Inspect water cooling hoses, gas lines and power cord for excessive wear or damage.
- ☒ Perform a general internal inspection of the system for excessive dust accumulation, clean if necessary.
- ☒ Inspect sample introduction components and record any required maintenance in the Service Engineer Comments and notify the customer as the required actions required.
- ☒ Record the instrument operating conditions in the ICP-OES Status Results Table.
- ☒ Replace the polychromator purge filter.
- ☒ Replace the radial pre-optics window
- ☒ Replace the axial pre-optics window for SVDV and VDV instruments.
- ☒ Check exhaust flow for the correct positive extraction at the exhaust duct to insure they meet minimum specifications.
- ☒ Replace air inlet dust filter.
- ☐ Replace high capacity air inlet dust filter element if installed.
- ☒ Remove and clean instrument water inlet filter.

Agilent Water Recirculator

- ☐ **Service not applicable**
- ☒ Drain cooling fluid and remove any particles from the chiller reservoir
- ☒ Remove, clean and reinstall water inlet metal mesh filter if present.
- ☒ Re fill with Agilent Cool Clear cooling fluid.
- ☒ Clean the cooling system Air filter and the condenser.

SPS 3 Auto Sampler

- ☒ **Service not applicable**
- ☐ Power cycle the autosampler and verify successful initialization.
- ☐ Inspect X and Z axis belts for wear. Replace is necessary.
- ☐ Clean X and Z axis slide shafts.
- ☐ Using customer's racks and the Agilent software move the sample probe to the 4 outermost corners and rinse port, ensure that the probe is approximately centered in the vial.

SPS 4 Auto sampler

- ☐ **Service not applicable**
- ☒ Clean the spill tray, rack location mat, end frames and chassis with a damp soft cloth and diluted mild detergent
- ☒ Clean the auto sampler cover panels, if cover kit is installed, with domestic window cleaner.
- ☒ Check the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ☒ Check the X-axis, Theta-axis and Z-axis FFC cables for cracks, incorrect positioning, damaged edges or damaged connectors.
- ☒ Pump Tubing Replacement. Replace peristaltic pump tubing. Replace all tubing that goes from the rinse station to the pump and from the pump to the waste/rinse bottles
- ☒ Test using customer's tray and move the sample probe to the sample vial 1, wash vial and rinse port and ensure that the probe is centered in the vial. If not use calibration wizard and calibrate the position.

AVS 4, 6, 7 Advanced Valve System

- ☒ **Service not applicable**
- ☐ Replace valve rotor seal
- ☐ Check fittings for signs of leaks
- ☐ Check tubing including autosampler tubing for kinks or excessive wear
- ☐ Check high flow pump for signs of leaks

ICP-OES adjustment

- ☒ Check position of Zn peak, adjust if required.
- ☒ Check Argon Ratio, adjust to specified value if required.
- ☒ Perform Detector Calibration.
- ☒ Perform Instrument Calibration.

Record Post-PM instrument performance

- ☒ Run Instrument Performance test.
- ☒ Record results in Instrument Performance Test Results Table - Post PM.
- ☒ For systems using ICP Expert version 7.3 and above, run the following Instrument tests

- ☒ Subsystem Communications Test
- ☒ Air Flow
- ☒ Water Flow
- ☒ Gas Flows
- ☒ RF Generator
- ☒ Camera Test
- ☒ Optics Test
- ☒ Nebulizer Test

- ☒ Record the result in the Instrument Test Results Table



รบรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Restore Instrument

- ☒ For HF applications, ask the customer to reinstall their sample introduction system.
- ☒ Leave system in an idle state: on and purging.
- ☒ Guidance: If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box. Systems in a compliant environment may need additional documentation.
- ☒ Complete the Signature Page with both Service Engineer and Customer signatures.



Test Results

Instrument Performance Test Results Table

Note: These measurements do not form part of any specification and are for reference only.

| | Pre PM Sensitivity Check | | Post PM Sensitivity Check | |
|--------------------|--------------------------|---------|---------------------------|---------|
| | Radial | Axial * | Radial | Axial* |
| Zn 213.857 nm SRBR | 1597.1 | 3382.8 | 3780.2 | 7240.8 |
| Mn 257.610 nm SRBR | 5945.3 | 16145.3 | 11049.1 | 24678.4 |
| Al 396.152 nm SBR | 7.0 | 16.3 | 6.8 | 17.0 |
| K 766.491 nm SBR | 5.2 | 67.3 | 3.5 | 56.3 |

* Axial result is not applicable for G8016AA, G8012AA Radial View instruments.

Instrument Test Results Table

Note: The Instrument Test results are for systems using ICP Expert version 7.3 and above only.

| Instrument Test | Result |
|-------------------------------|--------|
| Subsystem Communications Test | Pass |
| Air Flow | Pass |
| Water Flow | Pass |
| Gas Flows | Pass |
| RF Generator | Pass |
| Camera Test | Pass |
| Optics Test | Pass |
| Nebulizer test | Pass |

ICP-OES Status Results Table

Note: These measurements do not form part of any specification and are for reference only.

| Measurement | Standby Mode | | Plasma On | |
|------------------------------|----------------|-------|-----------|-------|
| Mains Voltage | 219 | VAC | 217 | VAC |
| Mains Current | 0.082 | A | 0.086 | A |
| Instrument Temperature | 23.5 | °C | 24.5 | °C |
| RF Air Flow (sensor speed) | 13.0 | L/min | 19.0 | L/min |
| Plasma Exhaust Temperature | No measurement | | 56.4 | °C |
| Water Flow Oscillator | No measurement | | 1.51 | L/min |
| Water Flow Detector | 1.09 | L/min | 1.06 | L/min |
| Water Inlet Temperature | 16.9 | °C | 16.7 | °C |
| Polychromator Temperature | 35.0 | °C | 35.0 | °C |
| CCD Temperature | -39.6 | °C | -39.6 | °C |
| Thermal Stabilizer | 35.0 | °C | 35.0 | °C |
| Argon Supply Pressure | 619 | kPa | 560 | kPa |
| Purge Gas Supply Pressure*1 | 616 | kPa | 597 | kPa |
| Option Gas Supply Pressure*1 | N/A | kPa | N/A | kPa |
| Nebulizer Flow | No measurement | | 0.7 | L/min |
| Nebulizer Back Pressure | No measurement | | 283 | kPa |
| Plasma Gas Flow | No measurement | | 11.98 | L/min |
| Auxiliary Gas Flow | No measurement | | 1.00 | L/min |
| RF Power | No measurement | | 1195.1 | W |
| RF Supply Current | No measurement | | B.190 | A |
| RF Supply Voltage | No measurement | | 194.557 | V |

*1 If option installed

Signature Page

| Part Description | Part Number | Product or Model# where used | Quantity consumed |
|--|--------------|-------------------------------|-------------------|
| Axial Pre-Optic Window | GB8010-68014 | GB010A, GB011A, GB014A/GB015A | 1 |
| Radial Pre-Optic Window | GB8010-68015 | All | 1 |
| Agilent Cool Clear Coolant Fluid | 5799-00037 | Agilent Water Recirculator | |
| Purge Gas Filter | GB8010-60136 | All | 1 |
| Air Inlet Filter | GB8000-68002 | All | 1 |
| High Capacity Air Filter | GB8010-60189 | Optional | |
| Rotor seal for 6-7 port valve for AVS6/7 | GB4944-60002 | GB4944A/GB455 | |
| Rotor seal for 4 port valve for AVS4 | GB4933-60002 | GB4933A | |
| Rinse solution to rinse station 2.5mm id x 1m | GB410-80123 | SPS 4 | |
| Barb connector 2.5mm-1.5mm ID | GB410-80124 | SPS 4 | |
| PVC waste tubing, 8mm od x 5mm id, 2m | GB410-80122 | SPS 4 | |
| Additional Parts may be required from engineer's stock: | | | |
| X axis drive belt | 5410047500 | SPS 3 | |
| Z axis drive belt | 5410047400 | SPS 3 | |
| Peristaltic pump tubing, PVC SolvaFlex, 3/16" ID | 3710049000 | SPS 4 | |

Service Verification

(Purchased by customer, not included as part of PM)

☒ Section Not Applicable.

| Part Description | Part Number | Product or Model# where used | Quantity consumed |
|------------------|-------------|------------------------------|-------------------|
|------------------|-------------|------------------------------|-------------------|

บรรณสารเพื่อถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

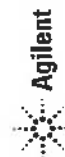
Agilent CrossLab Start Up Services Agilent 7890 Gas Chromatograph Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the preventive maintenance activities.



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Important Customer Web Links

- For more information about **Agilent Technologies services**, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/aesvise-repair>
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful **Agilent Resource Center** web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>.
- Need technical support, FAQs, supplies? – visit our **Support Home page** <http://www.agilent.com/search/support>.
- Videos about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>.
- **7890B Manuals** are also available on Agilent.com:
 - **Safety** https://www.agilent.com/cs/library/usermanuals/public/7890B_Safety.pdf
 - **Installation and First Startup** https://www.agilent.com/cs/library/usermanuals/Public/7890B_Installation.pdf
 - **Operation Manual** https://www.agilent.com/cs/library/usermanuals/Public/7890B_Operation.pdf
 - **Maintaining Your GC** https://www.agilent.com/cs/library/usermanuals/public/33430-90052%207890B_Maintaining%20Guide.pdf

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service.
- Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the Instrument control software.



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

System Information

- ☐ Check this box if an Instrument configuration report is attached instead of completing the table below.

| | |
|-------------------------------------|------------------------------------|
| Instrument System Name and ID | 7890B GC System / ELAB GC 7890B001 |
| Instrument System Site and Location | ENVTLAB CO., LTD. |

| List System Component Product Numbers | List the Serial Numbers of each Component |
|---------------------------------------|---|
| 1. 631A0b | CN16403099 |
| 2. 64513A | CN15150212 |
| 3. 64514A | CN16140018 |
| 4. N/A | N/A |
| 5. N/A | N/A |
| 6. N/A | N/A |
| 7. N/A | N/A |
| 8. N/A | N/A |
| 9. N/A | N/A |
| 10. N/A | N/A |

Preparation

- ✓ Discuss any specific issues with the customer before starting.
- ✓ Review the Instrument logbook for recorded problems and comments.
- ✓ Save Instrument control settings before starting the procedure.
- ✓ Perform a general inspection of the system for cleanliness.
- ✓ Check for proper installation of parts, assemblies, sensors etc.
- ✓ Check system for required installation of components, settings as defined by current Service Notes.
- ✓ Check for required firmware updates and verify with customers if they would like them installed.
- ✓ Before starting the following procedures, record the Detector Signal Output(s) in the results table. If the GC is turned OFF or in a service mode, comparing the detector outputs before and after the service is not possible.

Preventive Maintenance Procedure

Clean and inspect GC

- ☒ Unplug power cord from the power source.
- ☒ Open GC covers and vacuum/remove any dust/debris. Pay particular attention to cooling fans.
- ☒ Inspect internal connectors for proper contact and placement.
- ☒ Reconnect Power to the GC. Power the GC on and verify the power on self-test passed.
- ☒ Verify oven motor spins freely and turns on with the oven door closed, off when the door is opened.
- ☒ Verify operation of all other fans - the Inlet and EPC cooling fans.
- ☒ Verify oven intake/outlet flap assembly is operating smoothly while heating and cooling the oven

Inlet and detector consumable replacement

- ☒ For the Inlets installed, perform Inlet maintenance as defined in the 7890 manual - "Maintaining Your GC" - for the Inlet(s) installed.
- ☒ Replace the split vent trap cartridge filter on units with these Inlets: Splitless Capillary (SSL), Multi-Mode Inlet (MMI), Programmed Temperature Vaporizer (PTV), Volatiles Interface (VI).
- ☒ If the Inlet system is used in Split Mode with viscous samples, inspect and clean the split vent tube on the Inlet and flush or replace the tubing between the Inlet and the split vent trap.
- ☒ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the Ignitor shows any buildup of sample or corrosion, replace the Ignitor. Examine the FID collector and castle assemblies for contamination - clean as necessary.

Zero Sensors and Leak test

- ☒ Zero all pressure sensors per the procedure in the 7890 "Advanced User Guide".
- ☒ Perform Inlet pressure decay test(s) as defined in the 7890 "Troubleshooting Manual".
- ☒ If the PM is done in preparation for an Operational Qualification, then the pressure decay test defined within that protocol can be used for the PM.
- ☒ Record if test passed or failed in the results table.



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

ALS Maintenance

- ☐ Section NOT applicable
- ☒ Check all cabling and configuration settings between GC, tray, and injectors.
- ☒ Vacuum or remove any dust, especially around fans.
- ☒ Check operation of all fans.
- ☒ Check syringe for smooth plunger operation.
- ☒ Check for smooth operation of the needle support - clean if necessary

Restore Instrument

- ☒ Restore the normal operating conditions or customer method using the Browser Interface or Data System.
- ☒ Purge the system with carrier flow for 15 minutes
- ☒ Bake out the system, then restore the normal operating conditions
- ☒ After equilibration, check and record the post PM detector signal output values. Results should be similar or lower than the detector outputs recorded prior to PM.
- ☒ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

Note: If the PM Service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Signature Page Service Review

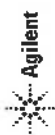
- ☐ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review with the customer this service, parts replaced, and test results obtained.
- ☐ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or, if necessary, in the customer's IO records.
- ☐ Supply the customer with a copy of the Smart Alerts flyer.
- ☐ Describe Smart Alerts to the customer.
- ☐ Install Smart Alerts if requested.

7890 GC Test Results Table

| Detector/Signal Outputs | Before PM Service | After PM Service |
|---------------------------------|----------------------------|--------------------------|
| Front detector output | 14 | 14 |
| Back detector output | N/A | N/A |
| AUX detector output | N/A | N/A |
| Pressure decay test | Expected test result: Pass | Actual test result: Pass |
| Front inlet pressure decay test | Pass | N/A |
| Back inlet pressure decay test | Pass | N/A |



บริษัท เอ็นวิลแลบ จำกัด
ผู้จัดการฝ่ายควบคุมคุณภาพ



7890 Parts List Table

The following kits are recommended for capillary and purged packed Inlets. If this is a general PM and the customer has a preferred set of consumables, you may use the customer's consumables.

| Part description | Part number | Product or model # where used | Quantity consumed |
|--|-------------|-------------------------------|-------------------|
| SSL Capillary Inlet PM kit, Splitless | 5188-6497 | 7890A/B | 1 |
| SSL Capillary Inlet PM kit, split | 5188-6496 | 7890A/B | 1 |
| SSL Capillary Ultra Inert Inlet Gold Seal with Washer | 5190-6144 | 7890A/B | N/A |
| SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool | 5190-2293 | 7890A/B | N/A |
| SSL Capillary Ultra Inert Inlet Low Pressure Drop Split Liner - with Glass Wool | 5190-2295 | 7890A/B | N/A |
| PP Inlet PM kit | 5188-6498 | 7890A/B | N/A |
| Split vent trap PM kit, single cartridge (for MM1, PTV & VI) | 5188-6495 | 7890A/B | N/A |
| MM1 Cleaning Kit | 63510-60820 | 7890A/B | N/A |
| PTV Septumless Head Rebuild Kit | 5182-9747 | 7890A/B | N/A |
| PTV Septumless Head Teflon Guide | 5182-9748 | 7890A/B | N/A |
| Ignitor (glow plug) assembly with O-ring | 19231-60680 | 7890A/B | 1 |
| FID Collector Rebuild/Cleaning Kit | G1531-67000 | 7890A/B | N/A |
| Standard .011-inch FID Jet for capillary FID base | G1531-80560 | 7890A/B | N/A |
| High Temperature .018-inch FID Jet for capillary FID base | G1531-80620 | 7890A/B | N/A |
| Standard .018-inch FID Jet for packed column with packed FID base | 1871D-20119 | 7890A/B | N/A |
| Standard .011-inch FID Jet for capillary column with packed/adeptable FID base | 19244-80560 | 7890A/B | N/A |
| High Temperature .018-inch FID Jet for capillary column with packed/adeptable FID base | 19244-80620 | 7890A/B | N/A |
| NPD Jet, universal fit, .011-inch ID | G1534-80580 | 7890A/B | N/A |
| NPD Jet, universal fit, .011-inch ID Extended tip | G1534-80590 | 7890A/B | N/A |
| SSL Capillary Ultra Inert Inlet Gold Seal with Washer | 5190-6144 | 7890A/B | N/A |
| SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool | 5190-2293 | 7890A/B | N/A |
| **FID Collector Replacement Kit, if needed | G1531-67001 | 7890A/B | N/A |



Service Engineer Comments

If there are any specific points you wish to note as part of performing the service or other items of interest for the customer, please write include them in this box.

Service Completion

Service request number 44166 759722222 Date service completed 04 Jun 2024
Agilent signature [Signature] Customer signature [Signature]
Total number of pages in this document 1



รับรองสารเพื่อสุขภาพ
ผู้จัดการฝ่ายควบคุมคุณภาพ



THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 6 April, 2024

Certification No. 171/24

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : NovaLynx

Type : Data Logger 110-WS-25DL-D

Serial No. : EWSNV110WS2501

Customer : ENVILAB Co.,Ltd.
540, 540/1 Soi Bangkhae 7, Bangkhae, Bangkhae,
Bangkok 10160,Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1008.9 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aloft Plotting Board

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO 1425

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

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

: Thermoschneider No.9188 : testo, testo 645 Serial No. 02848057

STANDARD BAROMETER : Digital Type PTB220 No. V1220015

Calibrated by :

Mechanical Engineer

(Authorised Signatory)

for the Chief

Sub-Standard



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Sensor model

EWSNV110WS2501

Certification No. 171/24

6 April, 2024

Page : 2 of 6

| Standard Ultrasonic Anemometer m/sec | HOOK GAGE NO. 1425 | | | TESTED ANEMOMETER | |
|--|--------------------|------------|----------|-------------------|------------|
| | Pressure | Vacumm | Velocity | Velocity | Correction |
| | inches H2O | inches H2O | m/sec | m/sec | m/sec |
| 1.00 | - | - | - | 0.3 | 0.70 |
| 3.02 | - | - | - | 2.4 | 0.62 |
| 5.00 | - | - | - | 4.9 | 0.10 |
| 7.04 | - | - | - | 6.9 | 0.14 |
| 9.02 | - | - | - | 8.8 | 0.22 |
| 11.01 | - | - | - | 10.8 | 0.21 |
| 13.01 | - | - | - | 12.8 | 0.21 |
| 15.01 | - | - | - | 14.8 | 0.21 |
| 17.02 | - | - | - | 17.1 | -0.08 |
| 20.02 | - | - | - | 19.9 | 0.12 |

| Wind Aloft Plotting Board. | |
|--|-----------------------|
| US.DEPARTMENT OF COMMERCE WEATHER BUREAU | |
| WIND DIRETION | TESTED WIND DIRECTION |
| 0 | 0 |
| 90 | 92 |
| 180 | 181 |
| 270 | 269 |

Calibrated

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Sensor model

EWSNV110WS2501

Certification No. 171/24

6 April, 2024

Page : 3 of 6

| Standard Barometer | Tested Barometer | Correction |
|--------------------|------------------|------------|
| Pressure | Pressure | |
| 1009.59 | 1009.46 | 0.13 |
| 1009.45 | 1009.56 | -0.11 |
| 1010.10 | 1010.09 | 0.01 |
| 1010.94 | 1010.83 | 0.11 |
| 1011.46 | 1011.49 | -0.03 |
| 1011.84 | 1011.96 | -0.12 |
| 1012.06 | 1012.23 | -0.17 |
| 1013.04 | 1013.05 | -0.01 |
| 1013.18 | 1013.29 | -0.11 |
| 1012.89 | 1012.79 | 0.10 |
| 1013.20 | 1013.32 | -0.12 |
| 1013.44 | 1013.49 | -0.05 |
| 1013.81 | 1013.76 | 0.05 |
| 1014.19 | 1014.23 | -0.04 |
| 1015.96 | 1016.09 | -0.13 |
| 1016.23 | 1016.31 | -0.08 |
| 1015.64 | 1015.63 | 0.01 |
| 1015.23 | 1015.19 | 0.04 |
| 1012.87 | 1012.72 | 0.15 |
| 1013.63 | 1013.62 | 0.01 |

Average

Calibration

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau



Envislab Co., Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Sensor model

EWSNV110WS2501

Certification No. 171/24

6 April, 2024

Page : 4 of 6

| Standard Temp. °C | Temperature Sensor Reading | |
|-------------------------|----------------------------|------------------|
| | Reading °C | Correction °C |
| 45.6 | 45.9 | -0.3 |
| 30.1 | 30.3 | -0.2 |
| 15.4 | 15.6 | -0.2 |

Calibration



Mechanical Engineer



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

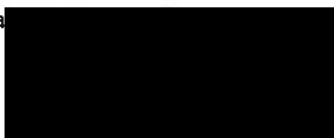
Sensor model EWSNV110WS2501 Certification No. 171/24

6 April, 2024

Page : 5 of 6

| Standard Humidity % R.H. | Relative Humidity Sensor Reading | |
|--------------------------------|----------------------------------|----------------------|
| | Reading % R.H. | Correction % R.H. |
| 85.2 | 90.2 | -5.0 |
| 62.4 | 66.8 | -4.4 |
| 41.5 | 44.2 | -2.7 |

Calibra



Mechanical Engineer



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Date of Issue 6 April, 2024

Certification No. 171/24

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING BUCKET Product No. #7852 Mfg. Code. EWSNV110WS2501 ทำการสอบเทียบกับแก้ววัดฝน แบบแก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm./TIP)



ลงชื่อ



วิศวกรชำนาญการ



รับรองและดูแล
ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Needless Supply Instrument

Verification Test Report

Report No.:

SO2400122-E001 -SLM 01

☐ PM ☒ Onsite UTM : 47P N323669 E 648546

Calibrated Date: 12 June 2024

Site : ริมรั้วติดลานจอดรถ

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 2205

Environment: Temperature 34 °C Humidity 66 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 10 Apr 2024

Result of Test

| Reference Standard (dB) | Instrument reading (dB) | Error (dB) | Adjust (dB) |
|----------------------------|----------------------------|---------------|----------------|
| 93.72 | 94.10 | 0.38 | 93.72 |

Calibrated By:

Date:

12 June 2024

Approve By:

Date:

12 June 2024

This report shall not be reproduced except in full, without the written approval of Envilab Co., Ltd.





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0391

MTC No. EEL. BP. 30/0467

CALIBRATION CERTIFICATE

Submitted by : Envilab Co.,Ltd.

Address : 540, 540/1 Soi Bangkhae 7, Bangkhae, Bangkhae, Bangkok 10160.

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 Level Calibrator

Manufacturer : Bruel & Kjaer

Model : 4230

Serial No. : 1351075

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/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 : 9 Apr. 2024

Date of Calibration : 10 Apr. 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.5

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

Office/Laboratory
668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office
196 Phahonyothin Road Ladang, Chatuchak,
Bangkok 109
Tel. (66) 0 2
(66) 08



รับ
ผู้จัดการฝ่ายควบคุมคุณภาพ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0391

MTC No. EEL. BP. 30/0467

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 μ Pa at 1000 Hz

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

1. Sound Pressure Level

| Standard Microphone Type | Measured Sound Pressure Level (dB) | Deviated value (dB) | Uncertainty (dB) | Tolerance limit IEC60942:2003 Class 1 |
|-----------------------------|---------------------------------------|------------------------|---------------------|--|
| 1/2 inch Bruel&Kjaer 4180 | 93.72 | -0.28 | ± 0.10 | ± 0.40 dB |

2. Frequency

| Standard Microphone Type | Measured Frequency (Hz) | Deviated value (Hz) | Uncertainty (Hz) | Tolerance limit IEC60942:2003 Class 1 |
|-----------------------------|----------------------------|------------------------|---------------------|--|
| 1/2 inch Bruel&Kjaer 4180 | 994.9 | -5.1 | ± 1.5 | $\pm 1.0\%$ |

3. Total Distortion

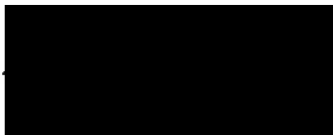
| Standard Microphone Type | Measured Total Distortion (%) | Uncertainty (%) | Tolerance limit IEC60942:2003 Class 1 |
|-----------------------------|----------------------------------|--------------------|--|
| 1/2 inch Bruel&Kjaer 4180 | 1.25 | ± 0.50 | $\pm 3.0\%$ |

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :



Approved by :



Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 10 Apr. 2024

Date of Issue : 11 Apr. 2024

Ref : 2011267040901374001

End of Certificate

2 / 2

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

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

FM.BL.MTC.002 Rev.5

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

Office/Laboratory
668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office

196 Pha
Bangkok
Tel. (66)



EnviLab Co., Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ



Certificate of Calibration

Certificate Number : SPR23070059-4

Page : 1 of 3

Customer : Envilab Co., Ltd.

540, 540/1 Soi Bangkhae 7, Bangkhae, Bangkhae Bangkok 10160

Equipment Name : Sound Level Meter

Manufacturer : Pulsar

Model : 44

Serial Number : PN2205

ID. Number : NSMPUMD44N2205

Environmental Conditions

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

Received Date : 05 Jul 2023

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

Calibration Date : 06 Jul 2023

Location of Calibration : In-Lab

Recommend Due Date : 06 Jul 2024

Calibration Procedure : SP-CPE-04-01

Date of Issue : 07 Jul 2023

Method of Calibration

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

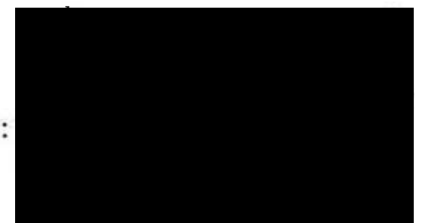
The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Calibration Officer

Approved by :



Authorized Signatory



วันที่ 06 Jul 2023 ผู้จัดทำ
ผู้จัดการฝ่ายควบคุมคุณภาพ



Calibration Report

Certificate Number : SPR23070059-4

Page : 2 of 3

Reference Standards

| Equipment Name | Model | Serial No. | Certificate No. | Due. Date |
|------------------------|--------|------------|------------------|-------------|
| Sound Level Calibrator | ST-120 | 211203773 | EEL.BP. 114/0166 | 17 Jan 2024 |

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR23070059-4

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.1 | 94.1 | 0.1 | 0.1 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.2 | 94.2 | 0.2 | 0.2 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.2 | 94.2 | 0.2 | 0.2 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Note:

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

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

M-04-15 REV.C



บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Needs Supply Instrument

Verification Test Report

Report No.:

SO2400122-E001 -PU 01

Calibrated Date: 13-Jun-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-5

Serial or ID No. 5447

Environment: Temperature 25 °C Humidity 65 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 05 May 2024

| Result of Test | | | |
|----------------------------|----------|---------------------|---------------------|
| Reference Flow (ml/min) | Test No. | Reading (ml/min) | Average (ml/min) |
| 2000 | 1 | 2000.4 | 2000.4 |
| | 2 | 2000.8 | |
| | 3 | 2000.3 | |
| | 4 | 2001.1 | |
| | 5 | 1999.5 | |

Calibrated By:

Date: 13-Jun-24

Approve By:

Date: 13-Jun-24





บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evitesting.com



Envilab & Needles Supply Instruments

This report shall not be reproduced except in full, without the written approval of Envilab Co., Ltd.

Verification Test Report

Report No.:

SO2400122-E001 -PU 02

Calibrated Date: 13-Jun-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-5

Serial or ID No. 5446

Environment: Temperature 25 °C Humidity 65 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 05 May 2024

| Result of Test | | | |
|----------------------------|----------|---------------------|---------------------|
| Reference Flow (ml/min) | Test No. | Reading (ml/min) | Average (ml/min) |
| 1700 | 1 | 1700.5 | 1700.5 |
| | 2 | 1700.6 | |
| | 3 | 1699.8 | |
| | 4 | 1701.2 | |
| | 5 | 1700.2 | |

Calibrated By:

Date: 13-Jun-24

Approve By:





บริษัท เอ็นไวเล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkhoe Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Needles Supply Instrument

Verification Test Report

Report No.:

SO2400122-E001 -PU 03

Calibrated Date: 13-Jun-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-5

Serial or ID No. 5445

Environment: Temperature 25 °C Humidity 65 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 05 May 2024

| Result of Test | | | |
|----------------------------|----------|---------------------|---------------------|
| Reference Flow (ml/min) | Test No. | Reading (ml/min) | Average (ml/min) |
| 2000 | 1 | 2000.4 | 2000.3 |
| | 2 | 2000.3 | |
| | 3 | 2001.2 | |
| | 4 | 2000.2 | |
| | 5 | 1999.6 | |

Calibrated By:

Date: 13-Jun-24

Approve By:

Date: 13-Jun-24



ประกาศใช้ 01/02/2566

www.evltesting.com

Environmental responsibility with accuracy in testing



Envilab Co.,Ltd.

ปรับปรุงมาตรฐาน
ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Needless Supply Instrument

This report shall not be reproduced except in full, without the written approval of Envilab Co., Ltd.

Verification Test Report

Report No.:

SO2400122-E001 -PU 04

Calibrated Date: 13-Jun-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-5

Serial or ID No. 5449

Environment: Temperature 25 °C Humidity 65 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 05 May 2024

| Result of Test | | | |
|----------------------------|----------|---------------------|---------------------|
| Reference Flow (ml/min) | Test No. | Reading (ml/min) | Average (ml/min) |
| 1700 | 1 | 1700.3 | 1700.3 |
| | 2 | 1700.5 | |
| | 3 | 1701.2 | |
| | 4 | 1699.9 | |
| | 5 | 1699.5 | |

Calibrated By:

Date: 13-Jun-24

Approve By:





บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Needles Supply Instrument

Verification Test Report

Report No.:

SO2400122-E001 -SLM 01

☒ PM ☐ Onsite UTM : 47P 1514458 N 654247 E

Calibrated Date: 13 June 2024

Site : บริษัท เอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 1879

Environment: Temperature 25 °C Humidity 65 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 10 Apr 2024

Result of Test

| Reference Standard (dB) | Instrument reading (dB) | Error (dB) | Adjust (dB) |
|----------------------------|----------------------------|---------------|----------------|
| 93.72 | 93.67 | -0.05 | 93.72 |

Calibrated By:

Date: 13 June 2024

Approve By:

Date: 13 June 2024

This report shall not be reproduced except in full, without the written approval of Envilab Co., Ltd.





บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Needits Supply Instrument

Verification Test Report

Report No.:

SO2400122-E001 -SLM 01

☒ PM ☐ Onsite UTM : 47P 1514458 N 654247 E

Calibrated Date: 13 June 2024

Site : บริษัท เอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: Quest

Model: DLX

Serial : 53

Environment: Temperature 25 °C Humidity 65 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No. 1351075

Date of Calibration : 10 Apr 2024

Result of Test

| Reference Standard (dB) | Instrument reading (dB) | Error (dB) | Adjust (dB) |
|----------------------------|----------------------------|---------------|----------------|
| 93.72 | 93.69 | -0.03 | 93.72 |

Calibrated By:

Date:

13 June 2024

Approve By:

Date:

13 June 2024

This report shall not be reproduced except in full, without the written approval of Envilab Co., Ltd.





Certificate of Calibration

Page : 1 of 3

Certificate Number : SPR23070059-5

Customer : Envilab Co., Ltd.

540, 540/1 Soi Bangkhae 7, Bangkhae, Bangkhae Bangkok 10160

Equipment Name : Sound Level Meter
Manufacturer : Pulsar
Model : 44
Serial Number : PN1879
ID. Number : NSMPUMD44N1879

Environmental Conditions

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

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

Location of Calibration : In-Lab

Calibration Procedure : SP-CPE-04-01

Received Date : 05 Jul 2023

Calibration Date : 06 Jul 2023

Recommend Due Date : 06 Jul 2024

Date of Issue : 07 Jul 2023

Method of Calibration

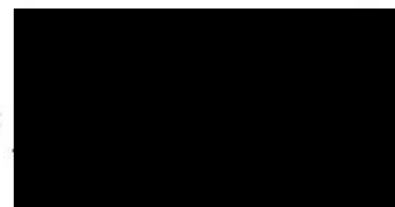
This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Calibration Officer

Approved by :



Authorized Signatory



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



METROLOGY SYSTEM (THAILAND) CO.,LTD.



ANAB
ANSI National Accreditation Board
ACCREDITED
CALIBRATION AND
DIMENSIONAL MEASUREMENT
ACT - 2009

Calibration Report

Certificate Number : SPR23070059-5

Page : 2 of 3

Reference Standards

| Equipment Name | Model | Serial No. | Certificate No. | Due. Date |
|------------------------|--------|------------|------------------|-------------|
| Sound Level Calibrator | ST-120 | 211203773 | EEL.BP. 114/0166 | 17 Jan 2024 |

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongsi Klongluang Patthumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่มือสาย WWW.สอบเทียบเครื่องมือวัด.com



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Result of Calibration

Certificate No. : SPR23070059-5

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.1 | 94.1 | 0.1 | 0.1 | 0.15 |
| 114 | 113.8 | 113.8 | -0.2 | -0.2 | 0.15 |

Select C

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.1 | 94.1 | 0.1 | 0.1 | 0.15 |
| 114 | 113.8 | 113.8 | -0.2 | -0.2 | 0.15 |

Select Z

Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.2 | 94.2 | 0.2 | 0.2 | 0.15 |
| 114 | 113.8 | 113.8 | -0.2 | -0.2 | 0.15 |

Note:

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

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -





Certificate of Calibration

Certificate Number : SPR23080277-1

Page : 1 of 3

Customer : Envilab Co., Ltd.

540, 540/1 Soi Bangkhae 7, Bangkhae, Bangkhae Bangkok 10160

Equipment Name : Noise Dosimeter

Manufacturer : Quest Technologies

Model : NoisePro DLX Dosimeter

Serial Number : NXC120053

ID. Number : N/A

Environmental Conditions

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

Received Date : 18 Aug 2023

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

Calibration Date : 22 Aug 2023

Location of Calibration : In-Lab

Recommend Due Date : 22 Aug 2024

Calibration Procedure : SP-CPE-04-01

Date of Issue : 23 Aug 2023

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system

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

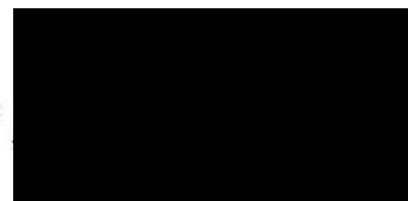
The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Calibration Officer

Approved by :



Authorized Signatory



Envilab Co., Ltd.

รับรองและควบคุมคุณภาพ
ผู้จัดการฝ่ายควบคุมคุณภาพ



Calibration Report

Certificate Number : SPR23080277-1

Page : 2 of 3

Reference Standards

| Equipment Name | Model | Serial No. | Certificate No. | Due. Date |
|------------------------|--------|------------|------------------|-------------|
| Sound Level Calibrator | ST-120 | 211203773 | EEL.BP. 114/0166 | 17 Jan 2024 |

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR23080277-1

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.0 | 94.0 | 0.0 | 0.0 | 0.15 |
| 114 | 113.9 | 113.9 | -0.1 | -0.1 | 0.15 |

Select C Unit : dB

| Standard Setting | UUC Reading | | Error | | Uncertainty (±) |
|------------------|-------------|-------|-------|------|-------------------|
| | Fast | Slow | Fast | Slow | |
| 94 | 94.1 | 94.1 | 0.1 | 0.1 | 0.15 |
| 114 | 114.0 | 114.0 | 0.0 | 0.0 | 0.15 |

Note:

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

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -





SCIMET Co., Ltd.
1194 Soi Wachirathamsathit 57, Bangchak,
Phrakhanong, Bangkok 10260 Thailand
Email:scimet2022@gmail.com, Tel: 02 460 9239
https://www.scimet.co.th



Certificate No. C07240032

Calibration Certificate

Equipment: SPECTROPHOTOMETER
Model: CARY 60UV-VIS
Serial No.(or ID): MY17490026 (ELABSPECTRO0002)
Manufacturer: Agilent
Condition: In Condition

Job No.: KSMT2400444
Received Date: 04 March 2024
Issued Date: 04 March 2024
Page: 1 of 3

Customer

Envilab Co., Ltd.
540, 540/1 Soi Bangkhuae 7,Bangkhuae, Bangkhuae, Bangkok 10160

Calibration Place

Envilab Co., Ltd.(B301 CO-THC ROOM)
540, 540/1 Soi Bangkhuae 7,Bangkhuae, Bangkhuae, Bangkok 10160

Calibration Date

04 March 2024

Environment Condition

Temperature: 22.3 °C ± 0.6 °C
Humidity: 65.7 %RH ± 0.5 %RH

The Method used

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

Traceability

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

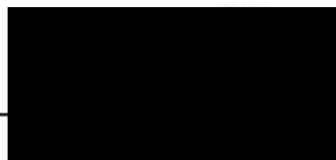
The standard for Wavelength Certificate No. 108691 and 108692

The standard for Photometric Certificate No. 109010 , 114655 and 109009

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

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

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



Person in charge



Authorized signatory

รับรองสำเนาถูกต้อง 04-05 MAY 2023
ผู้จัดการฝ่ายควบคุมคุณภาพ

Calibration Results:

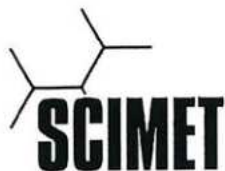
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 1.5 nm and UUC at 1.5 nm

| Standard Wavelength (nm) | Unit Under Calibration (nm) | Correction (nm) | Uncertainty of Measurement (\pm nm) |
|-----------------------------|--------------------------------|--------------------|---|
| 219.73 | 220.0 | -0.27 | 0.14 |
| 241.55 | 241.8 | -0.25 | 0.16 |
| 287.56 | 287.6 | -0.04 | 0.14 |
| 333.77 | 333.7 | 0.07 | 0.19 |
| 360.45 | 360.1 | 0.35 | 0.14 |
| 417.59 | 417.0 | 0.59 | 0.14 |
| 472.50 | 472.3 | 0.20 | 0.14 |
| 513.47 | 513.4 | 0.07 | 0.14 |
| 528.88 | 528.9 | -0.02 | 0.14 |
| 537.18 | 537.1 | 0.08 | 0.14 |
| 641.58 | 642.3 | -0.72 | 0.16 |
| 740.72 | 741.3 | -0.58 | 0.14 |
| 748.55 | 749.1 | -0.55 | 0.14 |
| 807.03 | 807.4 | -0.37 | 0.14 |
| 879.28 | 879.0 | 0.28 | 0.14 |

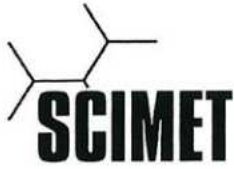
Photometric Accuracy (Absorbance)

| Wavelength | Standard absorbance (Abs) | Unit Under Calibration (Abs) | Correction (Abs) | Uncertainty of Measurement (\pm Abs) |
|------------|------------------------------|---------------------------------|---------------------|--|
| 235 nm | 0.0000 | 0.0000 | 0.0000 | 0.0080 |
| | 0.7293 | 0.7273 | 0.0020 | 0.0080 |
| 257 nm | 0.0000 | -0.0003 | 0.0003 | 0.0080 |
| | 0.8497 | 0.8457 | 0.0040 | 0.0080 |
| 313 nm | 0.0000 | 0.0004 | -0.0004 | 0.0080 |
| | 0.2833 | 0.2810 | 0.0023 | 0.0080 |
| 350 nm | 0.0000 | 0.0001 | -0.0001 | 0.0080 |
| | 0.6299 | 0.6259 | 0.0040 | 0.0080 |

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

| Wavelength | Standard absorbance (Abs) | Unit Under Calibration (Abs) | Correction (Abs) | Uncertainty of Measurement(\pm Abs) |
|------------|------------------------------|---------------------------------|---------------------|---|
| 420 nm | 0.0000 | 0.0000 | 0.0000 | 0.0045 |
| | 0.2373 | 0.2386 | -0.0013 | 0.0045 |
| | 0.5617 | 0.5637 | -0.0020 | 0.0045 |
| | 0.7392 | 0.7382 | 0.0010 | 0.0045 |
| | 1.0550 | 1.0542 | 0.0008 | 0.0045 |
| 440 nm | 0.0000 | 0.0000 | 0.0000 | 0.0045 |
| | 0.2335 | 0.2354 | -0.0019 | 0.0045 |
| | 0.5513 | 0.5539 | -0.0026 | 0.0045 |
| | 0.7230 | 0.7222 | 0.0008 | 0.0045 |
| | 1.0324 | 1.0343 | -0.0019 | 0.0045 |
| 465 nm | 0.0000 | 0.0000 | 0.0000 | 0.0045 |
| | 0.2126 | 0.2143 | -0.0017 | 0.0045 |
| | 0.5036 | 0.5059 | -0.0023 | 0.0045 |
| | 0.6735 | 0.6729 | 0.0006 | 0.0045 |
| | 0.9615 | 0.9638 | -0.0023 | 0.0045 |
| 546.1 nm | 0.0000 | 0.0000 | 0.0000 | 0.0045 |
| | 0.2201 | 0.2213 | -0.0012 | 0.0045 |
| | 0.5176 | 0.5196 | -0.0020 | 0.0045 |
| | 0.6930 | 0.6925 | 0.0005 | 0.0045 |
| | 0.9908 | 0.9925 | -0.0017 | 0.0045 |
| 590 nm | 0.0000 | 0.0000 | 0.0000 | 0.0045 |
| | 0.2443 | 0.2452 | -0.0009 | 0.0045 |
| | 0.5530 | 0.5544 | -0.0014 | 0.0045 |
| | 0.7196 | 0.7195 | 0.0001 | 0.0045 |
| | 1.0301 | 1.0316 | -0.0015 | 0.0045 |
| 635 nm | 0.0000 | 0.0000 | 0.0000 | 0.0045 |
| | 0.2646 | 0.2651 | -0.0005 | 0.0045 |
| | 0.5370 | 0.5394 | -0.0024 | 0.0045 |
| | 0.6862 | 0.6872 | -0.0010 | 0.0045 |
| | 0.9822 | 0.9855 | -0.0033 | 0.0045 |

The End of Certificate**บริษัท ขายน้เมก จำกัด (SCIMET CO., LTD.)**1194 Soi Wachirathamsathit 57, Bangchak, Phrakhanong, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 02 460 9239รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
30 MAY 2023



Refer to Certificate No.: C07240032

Page: 1 of 3

Statements of conformity:

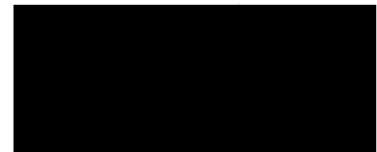
This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The error of temperature determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, ASTM E 275-08 and ASTM E 387-04. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

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

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



Authorized signatory

บริษัท ชายนิเมท จำกัด (SCIMET CO., LTD.)

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



รับรองสำเนาถูกต้อง 30 MAY 2023
ผู้จัดการฝ่ายควบคุมคุณภาพ

Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 1.5 nm and UUC at 1.5 nm

| Unit Under Calibration | Correction | Guard Band (w) | Tolerance (\pm) | Conformity |
|------------------------|------------|----------------|---------------------|------------|
| 220.0 | -0.27 | 0.14 | 1.0 | Pass |
| 241.8 | -0.25 | 0.16 | 1.0 | Pass |
| 287.6 | -0.04 | 0.14 | 1.0 | Pass |
| 333.7 | 0.07 | 0.19 | 1.0 | Pass |
| 360.1 | 0.35 | 0.14 | 1.0 | Pass |
| 417.0 | 0.59 | 0.14 | 1.0 | Pass |
| 472.3 | 0.20 | 0.14 | 1.0 | Pass |
| 513.4 | 0.07 | 0.14 | 1.0 | Pass |
| 528.9 | -0.02 | 0.14 | 1.0 | Pass |
| 537.1 | 0.08 | 0.14 | 1.0 | Pass |
| 642.3 | -0.72 | 0.16 | 1.0 | Pass |
| 741.3 | -0.58 | 0.14 | 1.0 | Pass |
| 749.1 | -0.55 | 0.14 | 1.0 | Pass |
| 807.4 | -0.37 | 0.14 | 1.0 | Pass |
| 879.0 | 0.28 | 0.14 | 1.0 | Pass |

Photometric Accuracy (Absorbance)

| Wavelength | Unit Under Calibration | Correction | Guard Band (w) | Tolerance (\pm) | Conformity |
|------------|------------------------|------------|----------------|---------------------|------------|
| 235 nm | 0.0000 | 0.0000 | 0.0080 | 0.020 | Pass |
| | 0.7273 | 0.0020 | 0.0080 | 0.020 | Pass |
| 257 nm | -0.0003 | 0.0003 | 0.0080 | 0.020 | Pass |
| | 0.8457 | 0.0040 | 0.0080 | 0.020 | Pass |
| 313 nm | 0.0004 | -0.0004 | 0.0080 | 0.020 | Pass |
| | 0.2810 | 0.0023 | 0.0080 | 0.020 | Pass |
| 350 nm | 0.0001 | -0.0001 | 0.0080 | 0.020 | Pass |
| | 0.6259 | 0.0040 | 0.0080 | 0.020 | Pass |

Without Adjustment

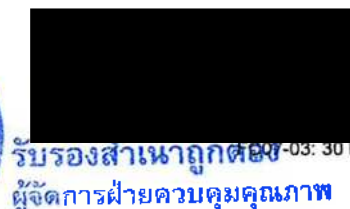
Photometric Accuracy (Absorbance)

| Wavelength | Unit Under Calibration | Correction | Guard Band (w) | Tolerance (\pm) | Conformity |
|------------|------------------------|------------|----------------|---------------------|------------|
| 420 nm | 0.0000 | 0.0000 | 0.0045 | 0.015 | Pass |
| | 0.2386 | -0.0013 | 0.0045 | 0.015 | Pass |
| | 0.5637 | -0.0020 | 0.0045 | 0.015 | Pass |
| | 0.7382 | 0.0010 | 0.0045 | 0.015 | Pass |
| | 1.0542 | 0.0008 | 0.0045 | 0.015 | Pass |
| 440 nm | 0.0000 | 0.0000 | 0.0045 | 0.015 | Pass |
| | 0.2354 | -0.0019 | 0.0045 | 0.015 | Pass |
| | 0.5539 | -0.0026 | 0.0045 | 0.015 | Pass |
| | 0.7222 | 0.0008 | 0.0045 | 0.015 | Pass |
| | 1.0343 | -0.0019 | 0.0045 | 0.015 | Pass |
| 465 nm | 0.0000 | 0.0000 | 0.0045 | 0.015 | Pass |
| | 0.2143 | -0.0017 | 0.0045 | 0.015 | Pass |
| | 0.5059 | -0.0023 | 0.0045 | 0.015 | Pass |
| | 0.6729 | 0.0006 | 0.0045 | 0.015 | Pass |
| | 0.9638 | -0.0023 | 0.0045 | 0.015 | Pass |
| 546.1 nm | 0.0000 | 0.0000 | 0.0045 | 0.015 | Pass |
| | 0.2213 | -0.0012 | 0.0045 | 0.015 | Pass |
| | 0.5196 | -0.0020 | 0.0045 | 0.015 | Pass |
| | 0.6925 | 0.0005 | 0.0045 | 0.015 | Pass |
| | 0.9925 | -0.0017 | 0.0045 | 0.015 | Pass |
| 590 nm | 0.0000 | 0.0000 | 0.0045 | 0.015 | Pass |
| | 0.2452 | -0.0009 | 0.0045 | 0.015 | Pass |
| | 0.5544 | -0.0014 | 0.0045 | 0.015 | Pass |
| | 0.7195 | 0.0001 | 0.0045 | 0.015 | Pass |
| | 1.0316 | -0.0015 | 0.0045 | 0.015 | Pass |
| 635 nm | 0.0000 | 0.0000 | 0.0045 | 0.015 | Pass |
| | 0.2651 | -0.0005 | 0.0045 | 0.015 | Pass |
| | 0.5394 | -0.0024 | 0.0045 | 0.015 | Pass |
| | 0.6872 | -0.0010 | 0.0045 | 0.015 | Pass |
| | 0.9855 | -0.0033 | 0.0045 | 0.015 | Pass |

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

The End of Statements of Conformity

บริษัท ชายน์เมท จำกัด (SCIMET CO., LTD.)

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

รับรองสำเนาถูกต้อง - 03: 30 MAY 2023
ผู้จัดการฝ่ายควบคุมคุณภาพ