

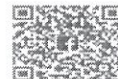
ภาคผนวก ง.

เอกสารผลการสอบเทียบเครื่องมือตรวจวัด

ประจำเดือนพฤศจิกายน พ.ศ. 2564



บริษัท เอ็นไวเล็บ 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



GENERATOR OF PRODUCTION SUPPLY CERTIFICATE

TSP High Volume Sampler Calibration

Verification Report No.

HO2100150-D001 -TSP 01

| | |
|---|--|
| <input type="checkbox"/> PM | <input checked="" type="checkbox"/> Onsite |
| Site: โครงการก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย | |
| UTM: 47P 1532758 N 673757 E | Date: 15 Nov 21 |
| Sampler: NTSP#14 | Technical: Hasan S. |
| Recorder: ECRANG15314321 | Approval: Sarawut K. |

CONDITIONS

Barometric Press. (hPa): 1009.8

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.4

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#: 2067

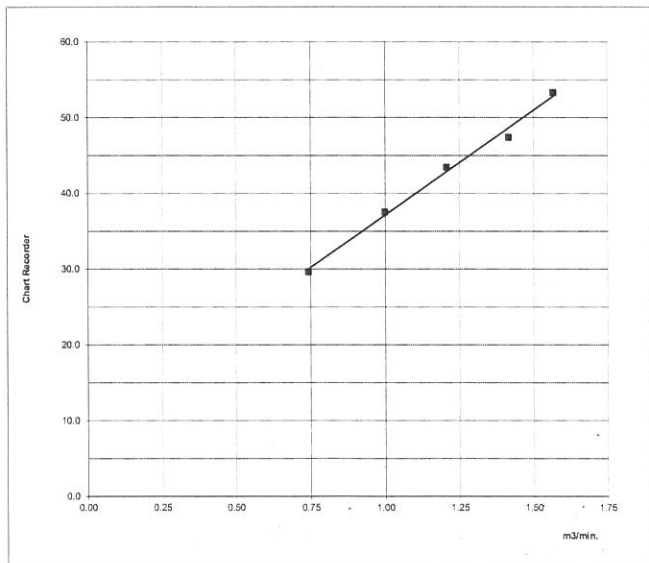
Qstd Slope: 2.05054

Qstd Intercept: -0.00430

Date Certified: 11 Jan 21

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|---|
| 1 | 10.57 | 1.567 | 54.0 | 53.29 | Slope = 27.6645 |
| 2 | 8.62 | 1.415 | 48.0 | 47.37 | Intercept = 9.4300 |
| 3 | 6.27 | 1.207 | 44.0 | 43.42 | Corr. coeff. = 0.9964 |
| 4 | 4.29 | 0.999 | 38.0 | 37.50 | # of Observations: 5 |
| 5 | 2.36 | 0.741 | 30.0 | 29.60 | Range of Chart at 1.1 - 1.7 m3/min. 41 57 |



Calibrated by : ฮาสน์ สิง
(Hasan Seng)
15 November 2021

Approved by : สรวุทธิ์
(Sarawut Keawsrinual)
15 November 2021

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Environmental responsibility with accuracy measurement

FE-MNT-29 Rev.00:01/08/63



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 Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160

PM10 High Volume Sampler Calibration

Verification Report No.

HO2100150-D001 -PM 01

☐ PM ☒ Onsite

Site: โครงการก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย
UTM : 47P 1532758 N 673757 E
Sampler: EPM#38
Recorder: ECRDS01618025857

Date: 15 Nov 21

Technical: Hasan S.

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1009.8

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.4

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#: 2067

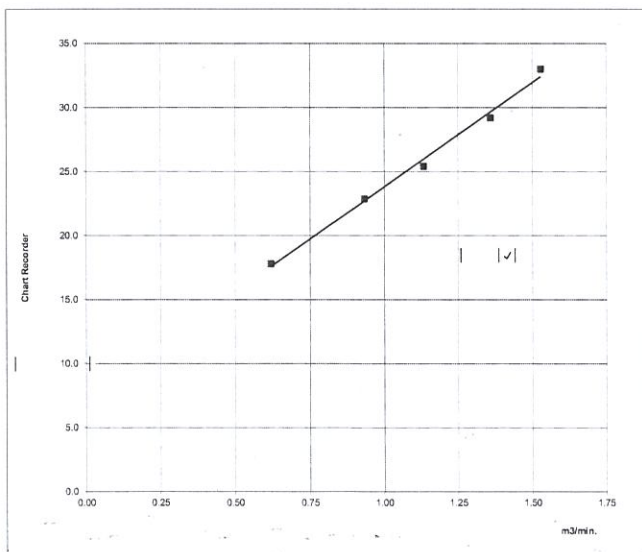
Slope: 1.28401

Intercept: -0.00265

Date Certified: 11 Jan 21

CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|----------------------|----------|-------------|-----------|----------------|-----------------------|
| 1 | 9.54 | 1.529 | 52.0 | 33.00 | Slope = 16.3058 |
| 2 | 7.54 | 1.359 | 46.0 | 29.19 | Intercept = 7.4647 |
| 3 | 5.24 | 1.133 | 40.0 | 25.38 | Corr. coeff. = 0.9965 |
| 4 | 3.54 | 0.932 | 36.0 | 22.84 | SFR = 1.141 |
| 5 | 1.56 | 0.619 | 28.0 | 17.77 | SSP = 41.08 |
| # of Observations: 5 | | | | | |
| Range of Chart | | | | | 39 |
| at SFR $\pm 10\%$ | | | | | 43 |



Calibrated by :

Hasan Seng

(Hasan Seng)

15 November 2021

Approved by :

Sarawut Keawsrinual

(Sarawut Keawsrinual)

15 November 2021

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Environmental responsibility with accuracy measurement

FE-MNT-29 Rev.00-01/08/63



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6411002

Page:1/1

Calibrated Date: 1-Nov-21

☒ PM ☐ Onsite

Instruments Information

| | |
|---|--|
| Analyzer Type: SO2 Analyzer Model: THERMO.,43C | Manufacturer THERMO S/N: ESOTE43C668327 |
|---|--|

Calibration System

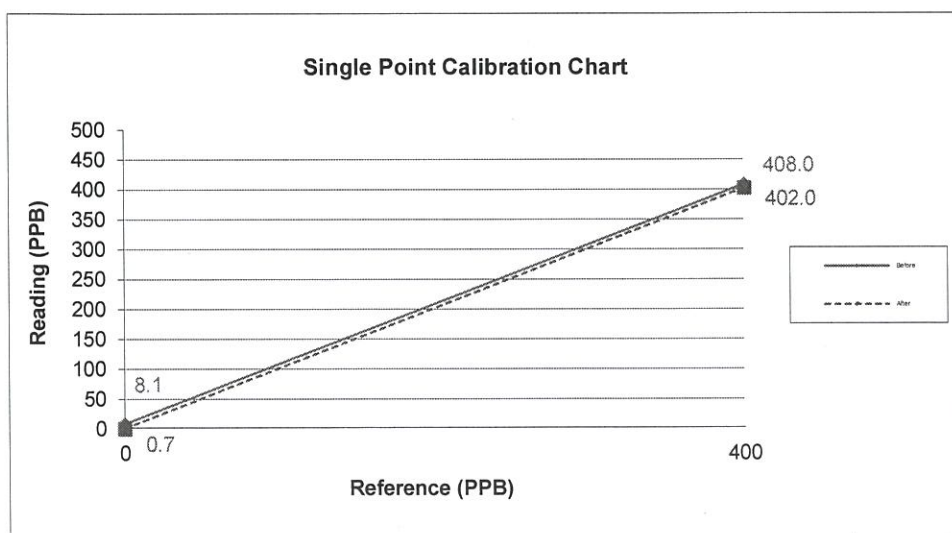
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 24.6 °C

Humidity: 60 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0 | 8.1 | 8.1 | 400.0 | 408 | 2.0 |
| After | 0.0 | 0.7 | 0.7 | 400.0 | 402 | 0.5 |



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MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-11-2021

S/N : ESOTE43C668327

| Test Function Value | Before | After |
|---------------------------------|--------|-------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -650 | -653 |
| LAMP VOLTAGE 950 - 1,200 (V) | 990 | 985 |
| LAMP INTENSITY 20000 - 50000 Hz | 32568 | 32577 |
| INTER TEMP 15 - 45 DEG C | 37 | 37 |
| CHAMBER TEMP 47 - 51 C | 49 | 49 |
| COOLER TEMP -5 - (-2) DEG C | -2.5 | -2.5 |
| PRESSURE 400 - 1000.0 mm Hg | 764 | 765 |
| FLOW 0.350 - 0.650 LPM | 0.42 | 0.4 |
| | | |
| | | |
| | | |

Calibrate By : Sirint Poonlak

Approve By : Sarawut Keawsrinual

Sirint Poonlak

Sarawut Keawsrinual

Date: 1-Nov-21

Date: 1-Nov-21

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NOx Analyzer Verification Test Report

Calibration Report No.: 6411007

Page:1/2

Calibrated Date: 1-Nov-21

☒ PM ☐ Onsite

Instruments Information

| | |
|--|---|
| Analyzer Type: NO/NO2/NOx Analyzer Model: 42C | Manufacturer: THERMO S/N: ENOTE42C497375 |
|--|---|

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 SO2 Conc: 45.34 PPM CO Conc: 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 25.9 °C

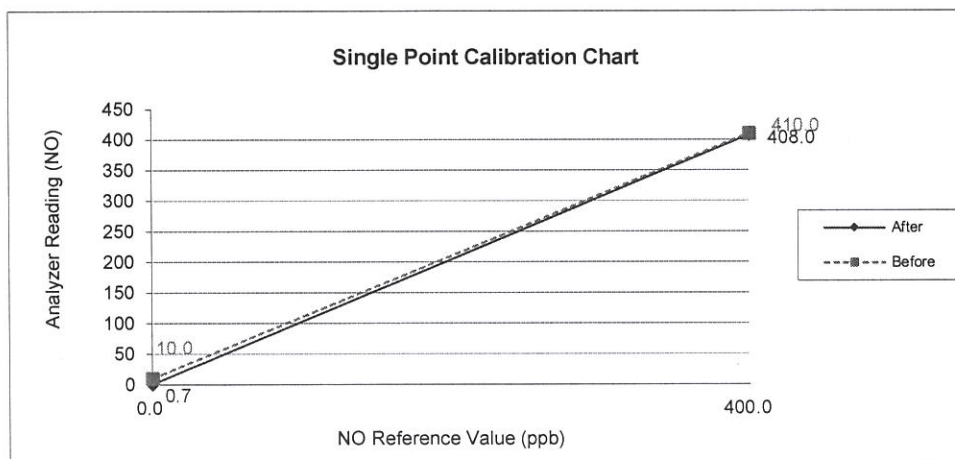
Humidity: 52 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 10.0 | 0.0 | 10.0 | 410 | 400.0 | 1.2 |
| NO ₂ | 5.4 | 0.0 | 5.4 | 8.0 | 0.0 | 1.0 |
| NOx | 15.4 | 0.0 | 15.4 | 418 | 400.0 | 2.2 |

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 | 408 | 400.0 | 1.0 |
| NO ₂ | 0.3 | 0.0 | 0.3 | 2.0 | 0.0 | 0.2 |
| NOx | 1.0 | 0.0 | 1.0 | 410 | 400.0 | 1.2 |



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**neediss**บริษัท นีดิส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E:info@neediss.com

MODEL : NOx ANALYZER Model 42C THERMO

DATE : 1-11-2021

S/N : ENOTE42C497375

Page:2/2

| Test Function Value | Before | After |
|----------------------------------|---------|---------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -675 | -678 |
| LAMP VOLTAGE 950 - 1,200 (V) | | |
| INTER TEMP 15 - 45 DEG C | 43 | 43 |
| CHAMBER TEMP 47 - 51 C | 49 | 50 |
| COOLER TEMP -5 - (-2) DEG C | -2 | -2 |
| PRESSURE 400 - 1000.0 mm Hg | 350 | 380 |
| SAMPLE FLOW 0.350 - 0.900 LPM | 0.45 | 0.46 |
| OZONEATOR FLOW 0.035 - 0.075 LPM | 0.05 | 0.05 |
| No/Nox BKG | 12/9.0 | 12/9.1 |
| No/Nox Slope | 1.0/0.8 | 0.9/0.8 |
| | | |

Calibrate By : Sirirat PoonlakApprove By : Sarawat Keawsrinual

Sirirat Poonlak

Sarawat Keawsrinual

Date: 1-Nov-21

Date: 1-Nov-21

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



Envilab is a leading supply instrument

Verification Test Report

Report No.:

HO2100150-D001 -SLM 01

☐ PM ☒ Onsite UTM : 47 P 1532744 N 673776 E

Calibrated Date: 15 November 2021

Site : โครงการ ก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 1977

Environment: Temperature 30 °C Humidity 58 %RH

Reference Standard: Sound Calibrator Class 1 Model 4230,Brue&Kjaer

Serial No. 1351075

Date of Calibration : Feb.18, 2021

Result of Test

| Reference Standard (dB) | Instrument reading (dB) | Error (dB) | Adjust (dB) |
|----------------------------|----------------------------|---------------|----------------|
| 93.8 | 94.0 | 0.2 | 93.8 |

Calibrated By:

ฮาสน์ บัง

(Hasan Seng)

Date:

15 November 2021

Approve By:

สรวุฒ

(Sarawut Keawsrinual)

Date:

15 November 2021

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RECALIBRATION

DUE DATE:

January 11, 2022

Certificate of Calibration

Calibration Certification Information

Cal. Date: January 11, 2021 Rootsmeter S/N: 438320 Ta: 293 °K
 Operator: Jim Tisch Pa: 757.9 mm Hg
 Calibration Model #: TE-5025A Calibrator S/N: 2067

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.4470 | 3.3 | 2.00 |
| 2 | 3 | 4 | 1 | 1.0260 | 6.4 | 4.00 |
| 3 | 5 | 6 | 1 | 0.9120 | 8.0 | 5.00 |
| 4 | 7 | 8 | 1 | 0.8660 | 8.9 | 5.50 |
| 5 | 9 | 10 | 1 | 0.7170 | 12.9 | 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) |
|-----------|---------------|--|--------|-------------|---|
| 1.0099 | 0.6979 | 1.4243 | 0.9956 | 0.6881 | 0.8793 |
| 1.0057 | 0.9803 | 2.0143 | 0.9916 | 0.9664 | 1.2435 |
| 1.0036 | 1.1004 | 2.2520 | 0.9894 | 1.0849 | 1.3903 |
| 1.0024 | 1.1575 | 2.3619 | 0.9883 | 1.1412 | 1.4581 |
| 0.9970 | 1.3906 | 2.8486 | 0.9830 | 1.3710 | 1.7586 |
| QSTD | m= | 2.05054 | QA | m= | 1.28401 |
| | b= | -0.00430 | | b= | -0.00265 |
| | r= | 0.99994 | | r= | 0.99994 |

Calculations

| | | | |
|--|---|-----|--|
| Vstd= | $\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$ | Va= | $\Delta Vol((Pa-\Delta P)/Pa)$ |
| 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

Tisch Environmental, Inc.
 45 South Miami Avenue
 Village of Cleves, OH 45002

www.tisch-env.com

TOLL FREE: (877)263-7610

FAX: (513)467-9009



รับรองสำเนาถูกต้อง
 ผู้จัดการฝ่ายควบคุมคุณภาพ

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. : 64-200011-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.
536 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Electronic Balance
Manufacturer : Sartorius Model : SECURA224-1S
Serial No. : 0034803270 ID No. : ELABBALANCEN04
Capacity : 220 g Resolution : 0.0001 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.
Ambient Temperature : (22.2 to 22.9) °C
Relative Humidity : (55.9 to 62.2) %
Air Pressure : (1014.0 to 1015.0) mbar

Date of Received : 05 February 2021

Date of Calibration : 05 February 2021

Date of Issue : 08 February 2021

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-----------|-------------|--|
| E261-E2624 | C02204101 | 17 Nov 2021 | National Institute of Metrology (Thailand), (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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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. : 64-200011-1

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) |
|----------------------|-------------------|--------------------------|
| 0.01 | 0.0001 | 0.00011 |
| 0.1 | 0.0001 | 0.00011 |
| 1 | 0.0000 | 0.00011 |
| 2 | 0.0001 | 0.00011 |
| 5 | 0.0000 | 0.00011 |
| 10 | 0.0000 | 0.00011 |
| 20 | -0.0001 | 0.00012 |
| 50 | -0.0001 | 0.00014 |
| 100 | -0.0001 | 0.00020 |
| 200 | -0.0002 | 0.00038 |

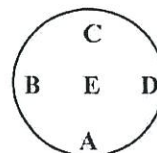
This result of calibration was found accurate as shown on date and place of calibration only.

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

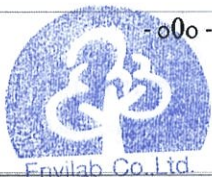
A B C D E
0.0001 0.0000 0.0000 0.0000 0.0000 g



Repeatability

Load test : 200 g

Stdev. : 0.00005 g



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



CAL

Calibratech Co.,Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-410010-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Digital Thermo-Hygrometer

Manufacturer : ebro

Model : EBI 20-TH1

Range Temperature : -30 °C to 60 °C **Resolution :** 0.1 °C

Range Humidity : 0 %R.H. to 100 %R.H. **Resolution :** 0.1 %R.H.

Serial No. : 62227425

ID No. : N/A

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

Relative Humidity : (50 ± 15) %

Date of Received : 05 February 2021

Date of Calibration : 11 February to 13 February 2021

Date of Issue : 13 February 2021

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 & 400036 | SG-H-00041/64 | 12 Jul 2021 | Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268 |
|-----------------|---------------|-------------|---|



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03

CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 64-410010-1

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) |
|--------------------------------|-----------------------|----------------------|-------------------------|
| 10.04 | 9.8 | 0.2 | 0.46 |
| 25.00 | 25.0 | 0.0 | 0.46 |
| 30.02 | 30.0 | 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.) |
|--------------------------------|--------------------------|-------------------------|----------------------------|
| 39.99 | 47.7 | -7.7 | 2.2 |
| 50.03 | 56.2 | -6.1 | 2.2 |
| 59.99 | 66.0 | -6.0 | 2.3 |

Remark

UUC : Unit Under Calibration

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

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

- ๐0๐ -



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0312

MTC No. EEL. BP. 57/0264

CALIBRATION CERTIFICATE

Submitted by : Envilab Co., Ltd.

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

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1 C, 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/N 4106495.

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

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

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

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

Date of Receipt : 10 Feb. 2021

Date of Calibration : 18 Feb. 2021



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

1 / 2

The results relate only to the items tested or calibrated.

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FM.BL.MTC.002 Rev.3

Head Office

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

Office/Laboratory

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

Office

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



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0312

MTC No. EEL. BP. 57/0264

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 | 93.78 | -0.22 | ± 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 | 998.3 | -1.7 | ± 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 | 0.68 | ± 0.50 | $\pm 3.0\%$ |

- Note :
1. No adjustment.
 2. The calibrator pressure correction was not included.
 3. The microphone volume correction was not included.

Calibrated by :

.....
(Mr.Tawikiat Iamsamran)

Approved by :

.....
(Mr.Pavate Kluyapa)
Antine Director
TISTR

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 18 Feb. 2021

Date of Issue : 19 Feb. 2021

Ref : 2011264021000592001

2 / 2

End of Certificate

The results relate only to the items tested or calibrated.

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FM.BL.MTC.002 Rev.3

Head Office

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

Office/Laboratory

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

Office

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

รับรองสำเนาถูกต้อง
Envilab Co.,Ltd. ผู้จัดการฝ่ายควบคุมคุณภาพ

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A00V3
Cylinder Number: EB0140762
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12021
Gas Code: CO,NO,NOX,SO2,BALN

Reference Number: 160-402021734-1
Cylinder Volume: 144.4 Cubic Feet
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Feb 19, 2021

Expiration Date: Feb 19, 2024

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.

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 | 44.68 PPM | G1 | +/- 1.4% NIST Traceable | 02/12/2021, 02/19/2021 |
| NITRIC OXIDE | 45.00 PPM | 44.62 PPM | G1 | +/- 1.4% NIST Traceable | 02/12/2021, 02/19/2021 |
| SULFUR DIOXIDE | 45.00 PPM | 45.34 PPM | G1 | +/- 1.1% NIST Traceable | 02/12/2021, 02/19/2021 |
| CARBON MONOXIDE | 4500 PPM | 4500 PPM | G1 | +/- 1.0% NIST Traceable | 02/12/2021, 02/19/2021 |
| NITROGEN | Balance | | | | 02/15/2021 |

| CALIBRATION STANDARDS | | | | | |
|-----------------------|-----------|-------------|-------------------------------------|-------------|-----------------|
| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
| NTRM | 200611-04 | CC707968 | 49.82 PPM NITRIC OXIDE/NITROGEN | +/-1.0% | Feb 02, 2025 |
| PRM | 12386 | D685025 | 9.91 PPM AIR/NITROGEN DIOXIDE | 2.0% | Feb 20, 2020 |
| GMIS | 124206889 | CC323707 | 4.028 PPM NITROGEN DIOXIDE/NITROGEN | 2.1% | Aug 15, 2021 |
| NTRM | 0141709 | KAL003190 | 49.67 PPM SULFUR DIOXIDE/NITROGEN | +/- 1.0% | Jun 20, 2022 |
| NTRM | 08012341 | KAL004716 | 4857 PPM CARBON MONOXIDE/NITROGEN | +/- 0.6% | Jun 07, 2024 |

The SRM, 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 | Jan 27, 2021 |
| Nicolet iS50 FTIR AUP2010245 NO | FTIR | Feb 11, 2021 |
| Nicolet iS50 FTIR AUP2010245 NO2 | FTIR | Jan 21, 2021 |
| Nicolet iS50 FTIR AUP2010245 SO2 | FTIR | Jan 21, 2021 |

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.4 Kg

Net Weight: 4.5 Kg

PO# 5221000405



Michael A. Harker
Approved for Release



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Calibration Certificate

Part Number: 721A2601
Description: Micromate with DIN Geophone
Serial Number: UM18218
Calibration Date: **MAR 24 2021**
Calibration Reference Equipment: 714J7402

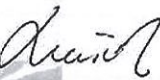
Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: _____



Xiaoming Yang



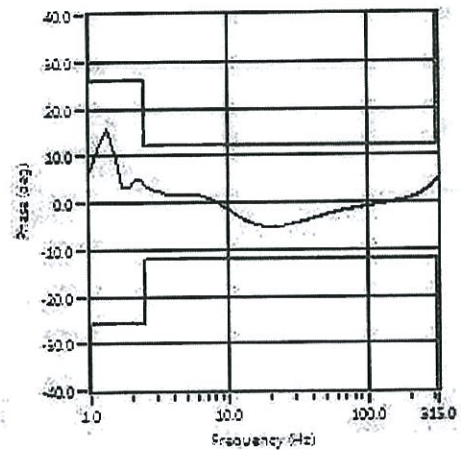
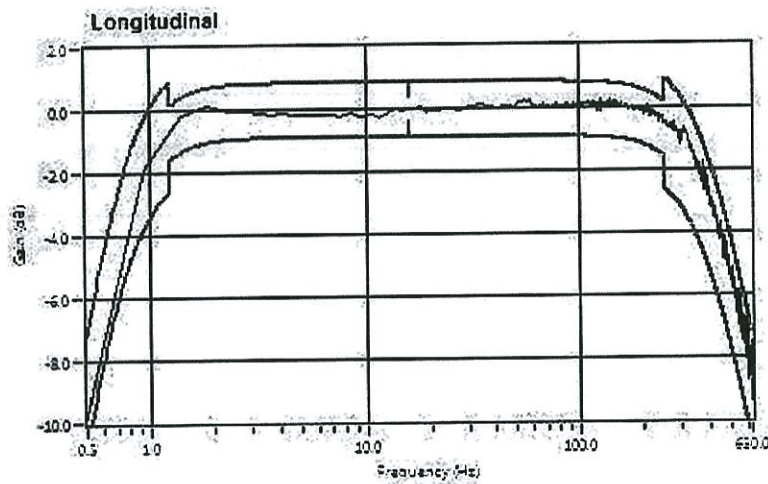
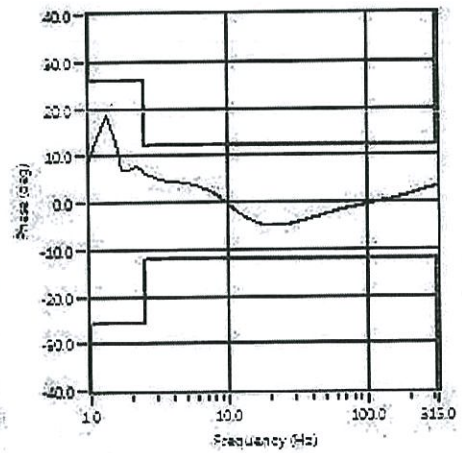
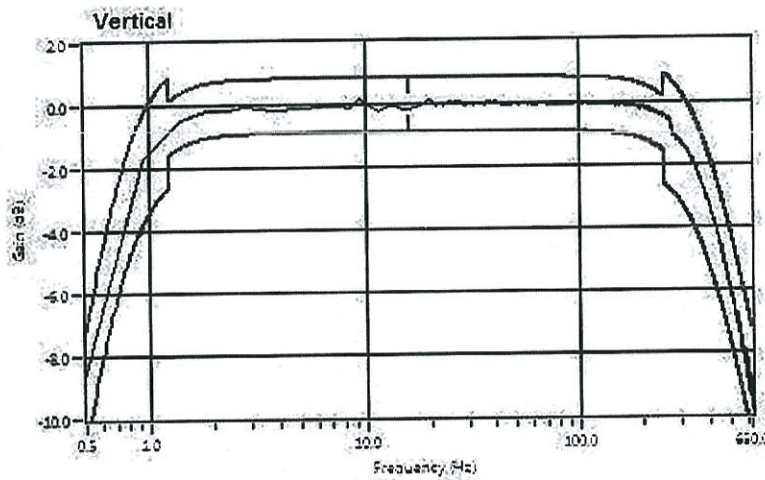
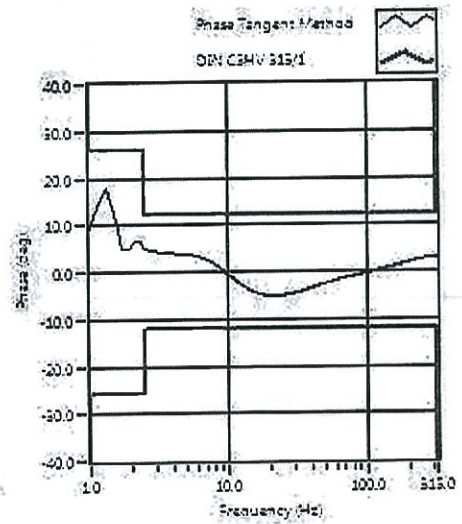
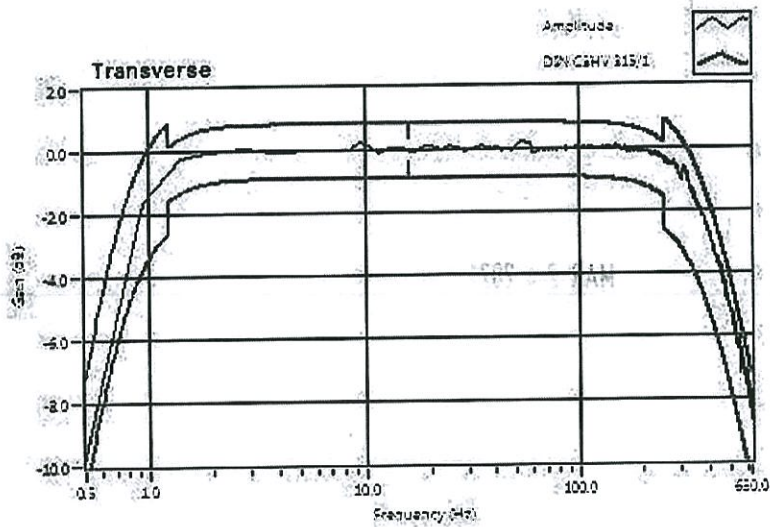
Instantel

309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Frequency Response of UM18218



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Certificate of Calibration

Certificate No. : 64-200049-1

Page : 1 of 2

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

Equipment : Electronic Balance
Manufacturer : Sartorius **Model :** SECURA125-1S
Serial No. : 0034606552 **ID No. :** ELABBALANCEN05
Capacity : 120 g **Resolution :** 0.00001 g

Environment : On site calibration was carried out at the Laboratory, Envilab Co., Ltd.
Ambient Temperature : (23.1 to 24.0) °C
Relative Humidity : (56.7 to 61.9) %
Air Pressure : 1013.0 mbar

Date of Received : 02 March 2021
Date of Calibration : 02 March 2021
Date of Issue : 06 March 2021
Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-----------|-------------|--|
| E261-E2624 | C02204101 | 17 Nov 2021 | National Institute of Metrology (Thailand), (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :



(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 64-200049-1

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 | 0.000017 |
| 0.5 | -0.00001 | 0.000022 |
| 1 | 0.00001 | 0.000026 |
| 2 | 0.00000 | 0.000034 |
| 5 | -0.00001 | 0.000043 |
| 10 | 0.00000 | 0.000053 |
| 20 | -0.00002 | 0.000071 |
| 50 | -0.00003 | 0.00011 |
| 100 | -0.00005 | 0.00020 |
| 120 | -0.00006 | 0.00038 |

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

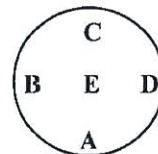
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.11$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 20 g

A B C D E

0.00003 0.00003 -0.00001 0.00001 0.00000 g



Repeatability

Load test : 100 g

Stdev. : 0.000014 g

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รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



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Calibratech Co.,Ltd.

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



Certificate of Calibration

Certificate No. : 64-410010-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Digital Thermo-Hygrometer

Manufacturer : ebro

Model : EBI 20-TH1

Range Temperature : -30 °C to 60 °C

Resolution : 0.1 °C

Range Humidity : 0 %R.H. to 100 %R.H.

Resolution : 0.1 %R.H.

Serial No. : 62227425

ID No. : N/A

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

Relative Humidity : (50 ± 15) %

Date of Received : 05 February 2021

Date of Calibration : 11 February to 13 February 2021

Date of Issue : 13 February 2021

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 & 400036 | SG-H-00041/64 | 12 Jul 2021 | Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268 |
|-----------------|---------------|-------------|---|



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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

Certificate of Calibration

Certificate No. : 64-410010-1

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) |
|--------------------------------|-----------------------|----------------------|-------------------------|
| 10.04 | 9.8 | 0.2 | 0.46 |
| 25.00 | 25.0 | 0.0 | 0.46 |
| 30.02 | 30.0 | 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.) |
|--------------------------------|--------------------------|-------------------------|----------------------------|
| 39.99 | 47.7 | -7.7 | 2.2 |
| 50.03 | 56.2 | -6.1 | 2.2 |
| 59.99 | 66.0 | -6.0 | 2.3 |

Remark

UUC : Unit Under Calibration

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

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

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Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



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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. : 64-420055-1

Page : 1 of 2

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

Equipment : pH Meter (Pocket)
pH meter
Manufacturer : Eutech Model : pHTestr 30
Range : -1.00 to 15.00 pH Resolution : 0.01 pH
Serial No. : 2856418 ID No. : ELABPHTEST3016

Environment : On site calibration was carried out at the Laboratory, Envilab Co.,Ltd.
Ambient Temperature : (24.5 to 25.0) °C
Relative Humidity : (50 to 54) %

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 24 March 2021

Calibrated by : Bunjerd Masri

Calibration Method : In-house method CAL-M4201 direct measurement by using certified reference material (CRM)

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

Standard Buffer Solution

| pH | Cert. No. | Lot No. | Exp. Date | Traceability |
|-------|-----------|---------|-------------|--------------|
| 4.004 | 61208711 | 684575 | 01 Sep 2021 | CPA chem |
| 6.985 | 61191143 | 684576 | 01 Sep 2021 | CPA chem |
| 9.963 | 61208865 | 684577 | 01 Sep 2021 | CPA chem |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03



Certificate of Calibration

Certificate No. : 64-420055-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

| Adjustment Curve at nominal pH | Standard Buffer (pH) | UUC Reading (pH) | Correction (pH) | Uncertainty (\pm pH) |
|-----------------------------------|---------------------------|-----------------------|----------------------|-----------------------------|
| 4, 7, 10 | 4.004 | 4.00 | 0.01 | 0.011 |
| | 6.985 | 7.00 | -0.01 | 0.020 |
| | 9.963 | 10.00 | -0.04 | 0.053 |

Remark

1 UUC : Unit Under Calibration

2 pH meter does not have voltage mode because the plug can not BNC socket

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

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

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รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

[Signature]





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 21TW57

Page.: 1 of 2

Certificate of Testing

| | |
|-------------------------------|---|
| Equipment : | DO Meter |
| Manufacturer : | Hanna |
| Model : | HI 9146 |
| Serial No. : | G0007931 |
| ID No. : | EDOH1914607931 |
| Received Date : | 16 March 2021 |
| Test Date : | 19 March 2021 |
| Reference : | 2103-0669DN-1 |
| Submitted by : | Envilab Co.,Ltd (Head office) 540, 540/1 Soi Bangkhuae 7, Bangkhuae, Bangkhuae, Bangkok 10160 |
| Laboratory Condition : | Temperature (25 ± 5) °C Humidity (50 ± 20) % |
| Test Procedure : | In - house method : CP-CH9 by Comparison Technique with Azide Modification Method |
| Calibrated by : | Walalak Sirithean |

Approved by :

Approved Signatory

- (✓) Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date :

23 March 2021



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

B 0257191



Cert.No.: 21TW57

Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: KC1A01TAF

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|---|-------------------------------|------------------------------|
| 8.00 | 8.17 | 0.00 |

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Maler

a 1047872

CAL

Calibratech Co.,Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400569-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Air Chamber (Refrigerator)

Manufacturer : M-LAB

Model : BIC-140

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 1011

ID No. : ELABBODC140N03

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

Ambient Temperature : (23.0 to 23.8) °C

Relative Humidity : (55 to 60) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 12 November 2021

Date of Calibration : 12 November 2021

Date of Issue : 18 November 2021

Calibrated by : Bunjerd Masri

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No.

Cert. No.

Due Date

Traceability

400046 & 400023

64-400443-1

29 Mar 2022

National Institute of Metrology Thailand (NIMT)



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03



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. : 64-400569-1

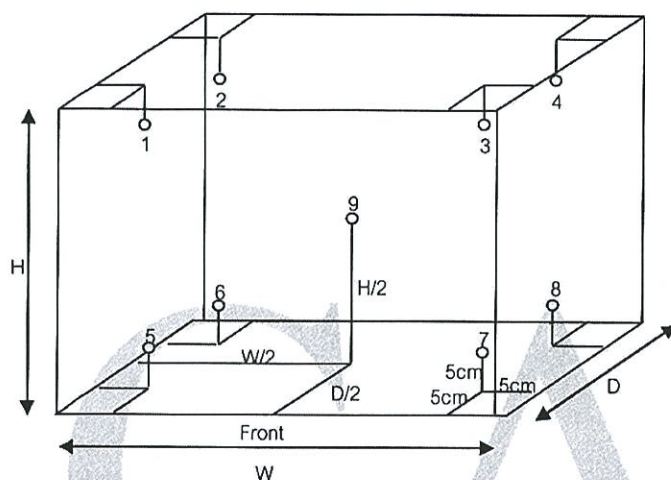
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.38 m

D = 0.35 m

H = 1.15 m

Capacity = 0.15 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|--------------------|-----------------------------|--------------------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 4.0 | 4.0 | 4.0 | 3.3 | 3.2 | 3.4 | 3.4 | 3.9 | 3.9 | 4.0 | 3.4 | 4.2 | 0.57 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 4.0 | 4.0 | 4.0 | 1.0 | 0.1 | 1.0 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

- oOo -



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

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

Place of Calibration MICRO ROOM (B302)

Description Incubator

Model IF75

Serial No. D319.0066

ID.No. -

Date of Receipt Feb 12, 2021

Date of Calibration Feb 12, 2021

Environment

Temperature (Min) 25.1 °C (Max) 26.1 °C

Relative Humidity (Min) 67.2 %RH (Max) 69.3 %RH

Calibration Method

WI-17 : The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.

The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY49007789, Certificate No. QR20-2119, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292.

This certificate is traceable to SI unit.

Page 1 of 3

D.Mi

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.



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ผู้จัดการฝ่ายควบคุมคุณภาพ



Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th

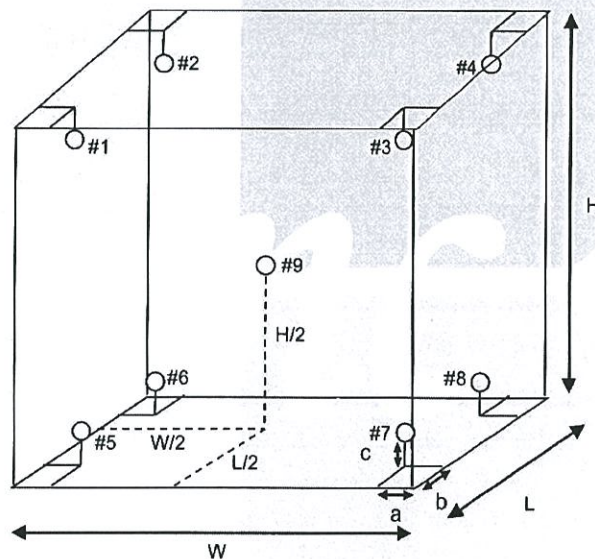


CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021
Site Calibration

Cert No. 21/0323
Order No. 21020066

Results (without adjustment)



Position of reference thermometers were placed

Note.

- 1). Dimension (W x L x H) is 40 x 33 x 56 cm.
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

Page 2 of 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

D.Mi



Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

Results (without adjustment)

| UUC Setting (°C) | UUC Reading (°C) | Reference Thermometer (°C) | | Stability \pm (°C) | Uniformity (°C) | Uncertainty \pm (°C) |
|------------------------|------------------------|----------------------------------|--------|-------------------------|--------------------|---------------------------|
| 44.5 | 44.5 | Position 1 | 44.536 | 0.048 | 0.448 | 0.31 |
| | | Position 2 | 44.593 | | | |
| | | Position 3 | 44.601 | | | |
| | | Position 4 | 44.570 | | | |
| | | Position 5 | 44.532 | | | |
| | | Position 6 | 44.386 | | | |
| | | Position 7 | 44.131 | | | |
| | | Position 8 | 44.523 | | | |
| | | Position 9 | 44.536 | | | |

The stability and uniformity was taken into account in the measurement uncertainty stated.

The above results are valid exclusively for calibration samples as mentioned in the report.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :

(MR. DAMRONG MULSING)

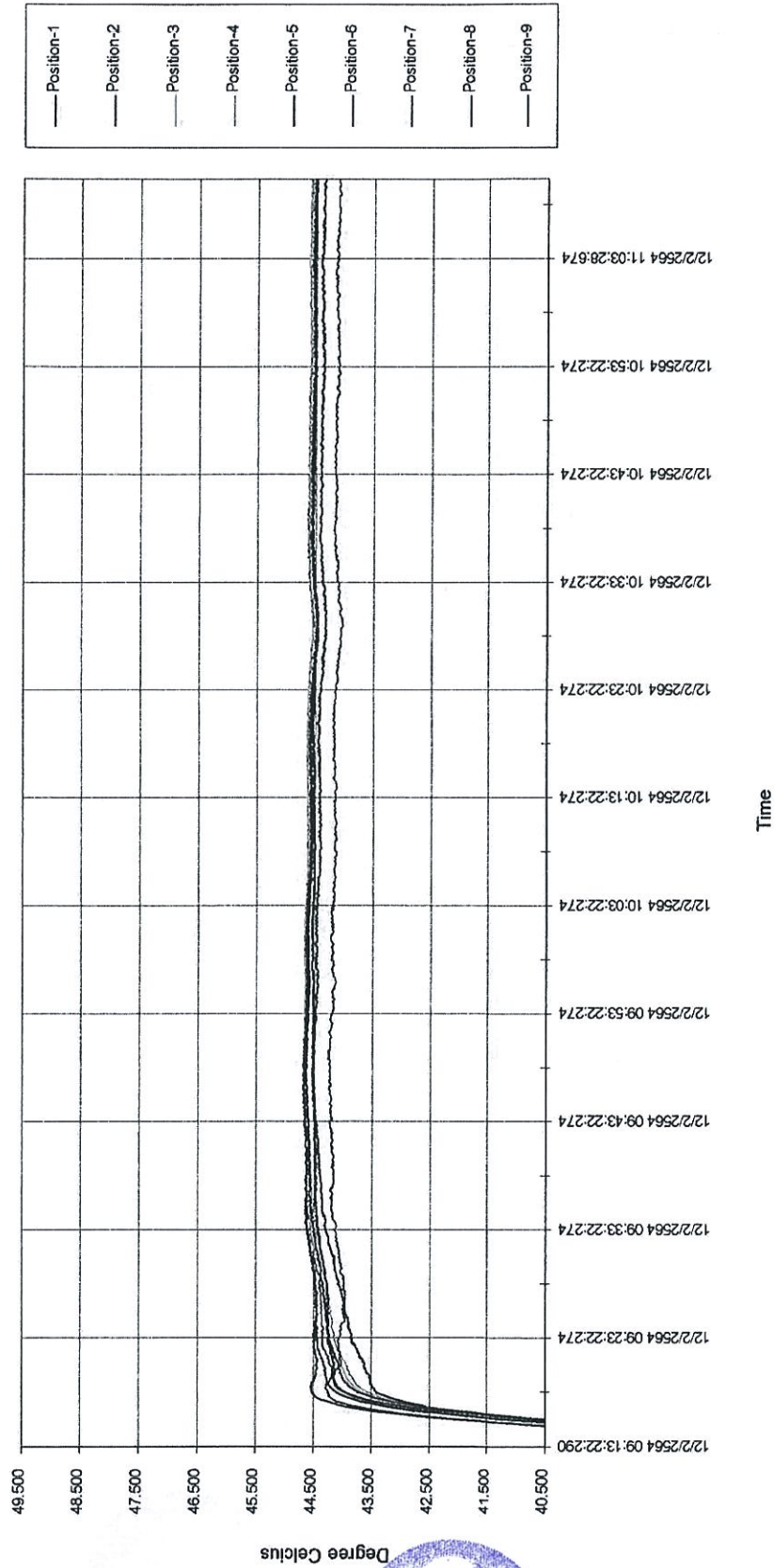
Page 3 of 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Cert.No. 21/0323

Incubator
Model. IF75 S/N. D319.0066 ID.No. -



ผู้จัดการฝ่ายควบคุมคุณภาพ
ต้องสำเนาใบรับรอง
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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400163-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Oven)

Manufacturer : Memmert

Model : UF 75

Range : N/A °C

Resolution : 0.1 °C

Serial No. : B319.0600

ID No. : N/A

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

Ambient Temperature : (30.0 to 31.5) °C

Relative Humidity : (50 to 55) %

Line Voltage : (224.2 to 225.2) V

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 25 March 2021

Calibrated by : Permpon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No.

Cert. No.

Due Date

Traceability

400029 & 400032

63-400450-1

30 Mar 2021

National Institute of Metrology Thailand (NIMT)



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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

Certificate of Calibration

Certificate No. : 64-400163-2

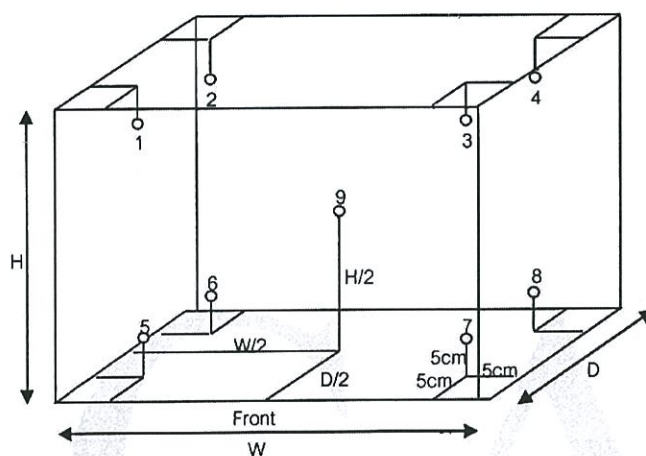
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.56 m

Capacity = 0.07 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|-----------------|--------------------------|-----------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 104.0 | 103.5 | 103.5 | 104.0 | 104.3 | 104.3 | 104.2 | 104.2 | 103.9 | 103.7 | 104.2 | 104.1 | 0.69 |
| 110.0 | 109.5 | 109.5 | 110.0 | 110.4 | 110.4 | 110.2 | 110.2 | 109.9 | 109.6 | 110.2 | 110.1 | 0.69 |
| 180.0 | 179.0 | 179.0 | 179.0 | 180.3 | 180.2 | 180.2 | 180.3 | 180.0 | 179.0 | 180.4 | 180.3 | 0.95 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|-----------------|--------------------------|-----------------------------|--------------------------|-------------------------|------------------------|
| 104.0 | 103.5 | 103.5 | 0.5 | 0.1 | 0.8 |
| 110.0 | 109.5 | 109.5 | 0.7 | 0.1 | 1.0 |
| 180.0 | 179.0 | 179.0 | 1.5 | 0.2 | 1.7 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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



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NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400049-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.
540,540/1 Soi Bangkhac7, Bangkhac, Bangkok 10160

Equipment : Water Bath
Manufacturer : Memmert Model : WNB29
Range : N/A °C Resolution : 0.1 °C
Serial No. : L617.0156 ID No. : ELABWBWNB29N01

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

Ambient Temperature : (26.0 to 26.5) °C

Relative Humidity : (45 to 50) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 05 February 2021

Date of Calibration : 05 February 2021

Date of Issue : 06 February 2021

Calibrated by : Permpon Chanpu

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

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

| ID No. | Cert. No. | Due Date | Traceability |
|-----------------|-------------|-------------|---|
| 400029 & 400031 | 63-400449-1 | 28 Mar 2021 | National Institute of Metrology Thailand (NIMT) |



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

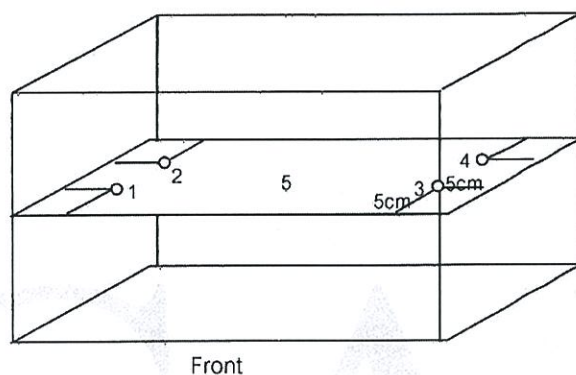
Certificate No. : 64-400049-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



| Test Point (° C) | Setting | Indicating Temperature (° C) | Measured Temperature (° C) @ | | | | | Uncertainty (± ° C) | Measured Uniformity (° C) | Measured Stability (° C) |
|-----------------------|------------------------|-----------------------------------|--------------------------------|-------|-------|-------|-------|--------------------------|--------------------------------|-------------------------------|
| | Temperature (° C) | | Sensor No. | | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | | | |
| 95.0 | 95.0 | 95.0 | 95.35 | 95.44 | 95.53 | 95.38 | 95.46 | 0.20 | 0.19 | 0.09 |

Remark The uncertainty is not combine uniformity of the water bath

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

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

- o0o -



Envilab Co.,Ltd.

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[Signature]



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NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-300152-2

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : PYREX

Class : A

Capacity : 50 ml

Graduation : 1 ml

ID No. : C-WW-002/21

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |

Approved by :

(Wipa Tovadee)

Supervisor



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ผู้จัดการฝ่ายควบคุมคุณภาพ

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Certificate of Calibration

Certificate No. : 64-300152-2

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 30 | 29.93 |
| 50 | 50.01 |

Uncertainty of measurement with in \pm 0.054 ml

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%

- o0o -



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ผู้จัดการฝ่ายควบคุมคุณภาพ

D.



www.cal-tech.co.th

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NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-300152-6

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : Witeg

Class : A

Capacity : 1000 ml

Graduation : 10 ml

ID No. : C-WW-029/18

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |

Approved by :

(Wipa Tovadee)

Supervisor



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

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Certificate of Calibration

Certificate No. : 64-300152-6

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 500 | 502.85 |
| 1000 | 1001.86 |

Uncertainty of measurement with in \pm 0.17 ml

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%

- o0o -



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

D.



ประจำเดือนธันวาคม พ.ศ. 2564



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 Bangkok 10160
Tel : 02-802-3577-9 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.

HO2100150-D002 -TSP 01

☐ PM ☒ Onsite

Site: โครงการก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย

UTM : 47P 1532758 N 673757 E

Date: 1 Dec 21

Sampler: NTSP#14

Technical: Hasan S.

Recorder: ECRANG15314321

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1010.0

Corrected Pressure (mm Hg): 757.6

Temperature (deg C): 30.0

Temperature (deg K): 303.0

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: 2.05054

Model: TE-5025A

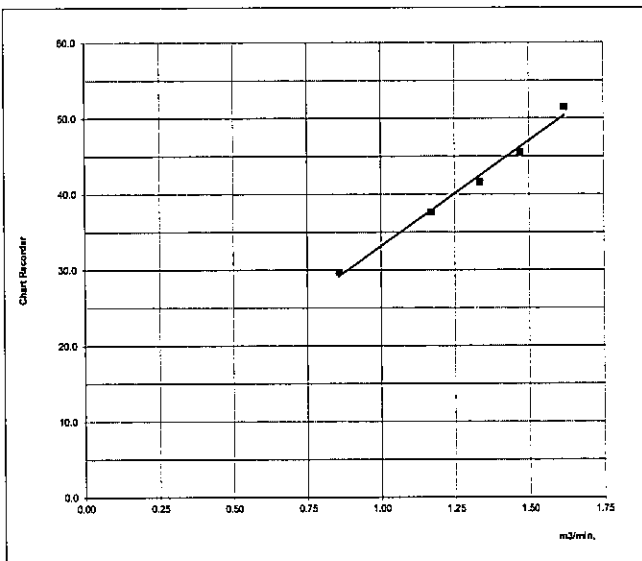
Qstd Intercept: -0.00430

Serial#: 2067

Date Certified: 11 Jan 21

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|--|
| 1 | 11.21 | 1.619 | 52.0 | 51.49 | |
| 2 | 9.24 | 1.470 | 46.0 | 45.55 | Slope = 27.8599 Intercept = 5.2480 Corr. coeff.= 0.9948 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 37 53 |
| 3 | 7.62 | 1.335 | 42.0 | 41.59 | |
| 4 | 5.84 | 1.169 | 38.0 | 37.62 | |
| 5 | 3.14 | 0.858 | 30.0 | 29.70 | |



Calibrated by :

Hasan Seng

(Hasan Seng)
1 December 2021

Approved by :

Sarawut Keawsrinual

(Sarawut Keawsrinual)
1 December 2021

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www.evltesting.com

Environmental responsibility with accuracy measurement



บริษัท เอ็นวิเทล จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envikab Co., Ltd. 540,540/1 Soi Bangkok 7 Bangkok Bangkok Bangkok 10160
Tel : 02-602-3577-8 Fax: 02-602-3775 E-mail : info@evltesting.com



Envikab Co., Ltd. 540,540/1 Soi Bangkok 7 Bangkok Bangkok Bangkok 10160

PM10 High Volume Sampler Calibration

Verification Report No.

HO2100150-D002 -PM 01

L PM ☒ Onsite

Site: โครงการก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย
UTM : 47P 1532758 N 673757 E
Sampler: EPM#38
Recorder: ECRDS01618025857

Date: 1 Dec 21

Technical: Hasan S.

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1010.0
Temperature (deg C): 30.0
Average Press. (hPa): 1013.0
Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.6
Temperature (deg K): 303.0
Corrected Avg. Press. (mm Hg): 759.8
Average Temp. (deg K): 303.0

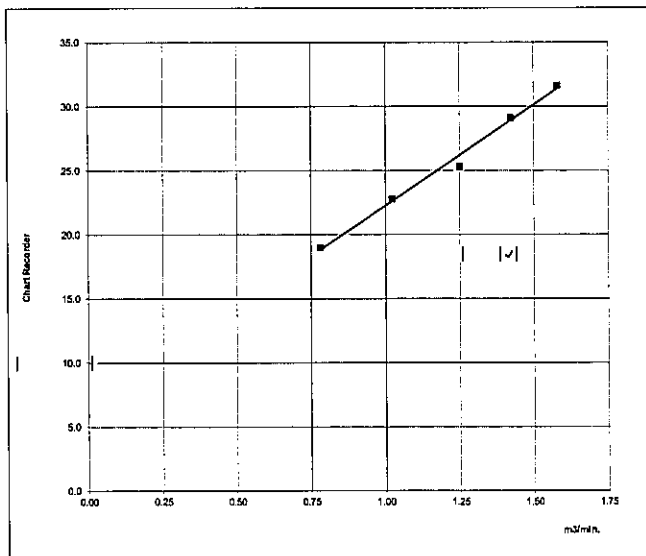
CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc
Model: TE-5025A
Serial#: 2067

Slope: 1.28401
Intercept: -0.00265
Date Certified: 11 Jan 21

CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|-------------|-----------|----------------|----------------------------------|
| 1 | 10.26 | 1.580 | 50.0 | 31.62 | Slope = 15.7456 |
| 2 | 8.32 | 1.423 | 46.0 | 29.09 | Intercept = 6.4783 |
| 3 | 6.41 | 1.249 | 40.0 | 25.30 | Corr. coeff = 0.9955 |
| 4 | 4.29 | 1.022 | 36.0 | 22.77 | SFR = 1.133 |
| 5 | 2.51 | 0.782 | 30.0 | 18.97 | SSP = 38.46 |
| | | | | | # of Observations: 5 |
| | | | | | Range of Chart at SFR $\pm 10\%$ |
| | | | | | 36 |
| | | | | | 40 |



Calibrated by :

(Hasan Seng)

1 December 2021

Approved by :

(Sarawut Keawsrinual)

1 December 2021

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www.evltesting.com

Environmental responsibility with accuracy measurement

FE-AMT-29 Rev.00-01/08/23



neediss

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

536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E:info@neediss.com



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6412002

Page:1/1

Calibrated Date: 1-Dec-21

☒ PM ☐ Onsite

Instruments Information

| | |
|---|--|
| Analyzer Type: SO2 Analyzer Model: THERMO.,43C | Manufacturer THERMO S/N: ESOTE43C668327 |
|---|--|

Calibration System

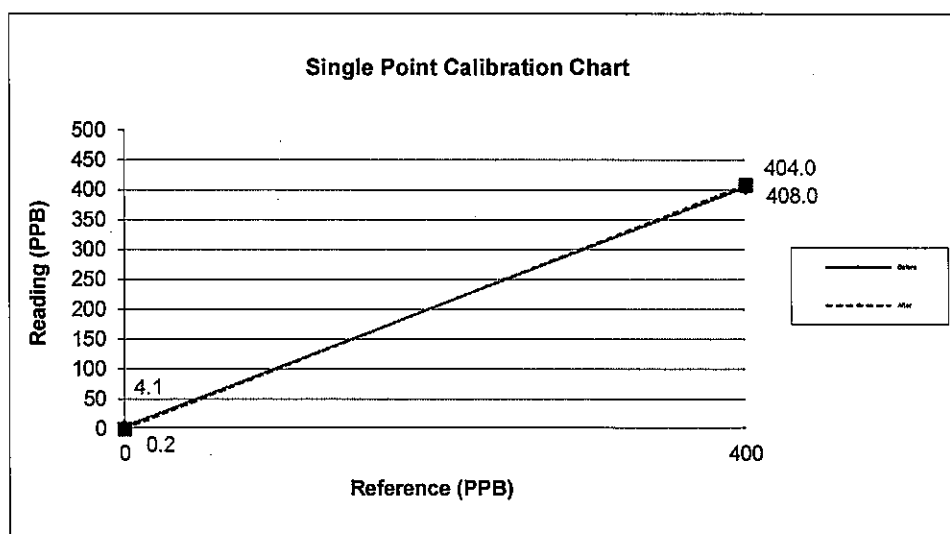
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 25.4 °C

Humidity: 60 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0 | 4.1 | 4.1 | 400.0 | 404 | 1.0 |
| After | 0.0 | 0.2 | 0.2 | 400.0 | 408 | 2.0 |



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12/21/2021



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-12-2021

S/N : ESOTE43C668327

| Test Function Value | Before | After |
|---------------------------------|--------|-------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -650 | -653 |
| LAMP VOLTAGE 950 - 1,200 (V) | 990 | 985 |
| LAMP INTENSITY 20000 - 50000 Hz | 32568 | 32577 |
| INTER TEMP 15 - 45 DEG C | 37 | 37 |
| CHAMBER TEMP 47 - 51 C | 49 | 49 |
| COOLER TEMP -5 - (-2) DEG C | -2.5 | -2.5 |
| PRESSURE 400 - 1000.0 mm Hg | 764 | 765 |
| FLOW 0.350 - 0.650 LPM | 0.42 | 0.4 |
| | | |
| | | |
| | | |

Calibrate By :

Sirir Poonlak

Approve By :

Sarawut Keawsrinual

Sirirat Poonlak

Sarawut Keawsrinual

Date:

1-Dec-21

Date:

1-Dec-21

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Neediss Supply Instrument Co., Ltd.536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E:info@neediss.com

NOx Analyzer Verification Test Report

Calibration Report No.: 6412007
Calibrated Date: 1-Dec-21

Page:1/2

☒ PM ☐ Onsite

Instruments Information

| | |
|--|--|
| Analyzer Type: NO/NO2/NOx Analyzer Model: 42C | Manufacturer THERMO S/N: ENOTE42C497375 |
|--|--|

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 SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

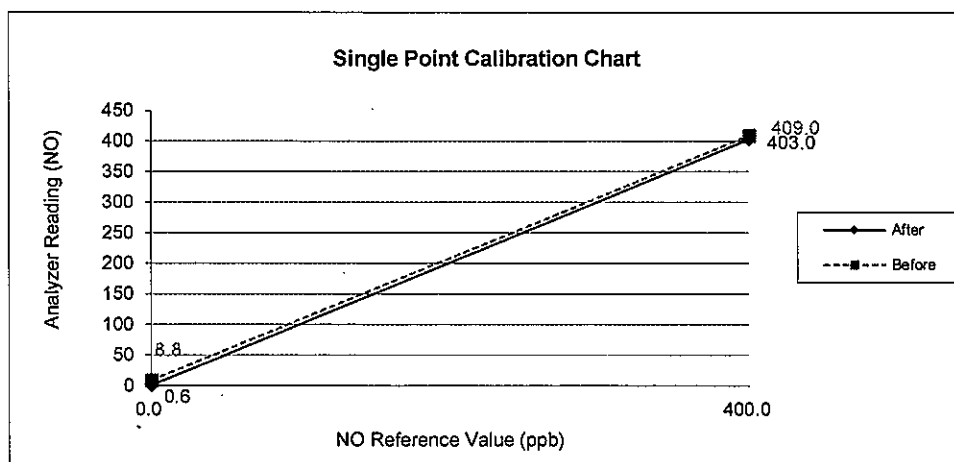
Environment: Temperature 25.4 °CHumidity: 62 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 8.8 | 0.0 | 8.8 | 409 | 400.0 | 1.1 |
| NO ₂ | 1.4 | 0.0 | 1.4 | 4.0 | 0.0 | 0.5 |
| NOx | 10.2 | 0.0 | 10.2 | 413 | 400.0 | 1.6 |

Calibration Check (After adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.6 | 0.0 | 0.6 | 403 | 400.0 | 0.4 |
| NO ₂ | -0.2 | 0.0 | -0.2 | 3.0 | 0.0 | 0.4 |
| NOx | 0.4 | 0.0 | 0.4 | 406 | 400.0 | 0.7 |



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Neediss Supply Instrument Co., Ltd.535 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพมหานคร 10160 535 Soi Bangkhae 7 Bangkhae Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E: info@neediss.com

MODEL : NOx ANALYZER Model 42C THERMO

DATE : 1-12-2021

S/N : ENOTE42C497375

Page:2/2

| Test Function Value | Before | After |
|----------------------------------|---------|---------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -675 | -678 |
| LAMP VOLTAGE 950 - 1,200 (V) | | |
| INTER TEMP 15 - 45 DEG C | 43 | 43 |
| CHAMBER TEMP 47 - 51 C | 49 | 50 |
| COOLER TEMP -5 - (-2) DEG C | -2 | -2 |
| PRESSURE 400 - 1000.0 mm Hg | 350 | 380 |
| SAMPLE FLOW 0.350 - 0.900 LPM | 0.45 | 0.46 |
| OZONEATOR FLOW 0.035 - 0.075 LPM | 0.05 | 0.05 |
| No/Nox BKG | 12/9.0 | 12/9.1 |
| No/Nox Slope | 1.0/0.8 | 0.9/0.8 |
| | | |

Calibrate By :

Sirirat Poonlak

Date:

1-Dec-21


Approve By :

Sarawut Keawsriniual

Date:

1-Dec-21

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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 & Neediss Supply Instrument

Verification Test Report

Report No.:

HO2100150-D002 -SLM 01

☐ PM

☒ Onsite UTM :

47 P 1532744 N 673776 E

Calibrated Date: 1 December 2021

Site : โครงการ ก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 8007

Environment: Temperature 28 °C Humidity 56 %RH

Reference Standard: Sound Calibrator Class 1 Model 4230,Brue&Kjaer

Serial No. 1351075

Date of Calibration : Feb.18, 2021

Result of Test

| Reference Standard (dB) | Instrument reading (dB) | Error (dB) | Adjust (dB) |
|----------------------------|----------------------------|---------------|----------------|
| 93.8 | 39.9 | -53.9 | 93.8 |

Calibrated By:

(Hasan Seng)

Date:

1 December 2021

Approve By:

(Sarawut Keawsrinual)

Date:

1 December 2021

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Certificate of Calibration

Calibration Certification Information

Cal. Date: January 11, 2021 Rootsmeter S/N: 438320 Ta: 293 °K
 Operator: Jim Tisch Pa: 757.9 mm Hg
 Calibration Model #: TE-5025A Calibrator S/N: 2067

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.4470 | 3.3 | 2.00 |
| 2 | 3 | 4 | 1 | 1.0260 | 6.4 | 4.00 |
| 3 | 5 | 6 | 1 | 0.9120 | 8.0 | 5.00 |
| 4 | 7 | 8 | 1 | 0.8660 | 8.9 | 5.50 |
| 5 | 9 | 10 | 1 | 0.7170 | 12.9 | 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) |
|-----------|---------------|--|--------|-------------|---|
| 1.0099 | 0.6979 | 1.4243 | 0.9956 | 0.6881 | 0.8793 |
| 1.0057 | 0.9803 | 2.0143 | 0.9916 | 0.9664 | 1.2435 |
| 1.0036 | 1.1004 | 2.2520 | 0.9894 | 1.0849 | 1.3903 |
| 1.0024 | 1.1575 | 2.3619 | 0.9883 | 1.1412 | 1.4581 |
| 0.9970 | 1.3906 | 2.8486 | 0.9830 | 1.3710 | 1.7586 |
| QSTD | m= | 2.05054 | QA | m= | 1.28401 |
| | b= | -0.00430 | | b= | -0.00265 |
| | r= | 0.99994 | | r= | 0.99994 |

Calculations

| | |
|---|--|
| Vstd= ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta) | Va= ΔVol((Pa-ΔP)/Pa) |
| 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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-200011-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.
536 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Electronic Balance
Manufacturer : Sartorius Model : SECURA224-1S
Serial No. : 0034803270 ID No. : ELABBALANCEN04
Capacity : 220 g Resolution : 0.0001 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.
Ambient Temperature : (22.2 to 22.9) °C
Relative Humidity : (55.9 to 62.2) %
Air Pressure : (1014.0 to 1015.0) mbar

Date of Received : 05 February 2021

Date of Calibration : 05 February 2021

Date of Issue : 08 February 2021

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-----------|-------------|--|
| E261-E2624 | C02204101 | 17 Nov 2021 | National Institute of Metrology (Thailand), (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%.

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CAL

Calibratech Co., Ltd.

7/106-7 Moo 2, Sukhaphrasan 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. : 64-200011-1

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) |
|----------------------|-------------------|--------------------------|
| 0.01 | 0.0001 | 0.00011 |
| 0.1 | 0.0001 | 0.00011 |
| 1 | 0.0000 | 0.00011 |
| 2 | 0.0001 | 0.00011 |
| 5 | 0.0000 | 0.00011 |
| 10 | 0.0000 | 0.00011 |
| 20 | -0.0001 | 0.00012 |
| 50 | -0.0001 | 0.00014 |
| 100 | -0.0001 | 0.00020 |
| 200 | -0.0002 | 0.00038 |

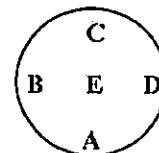
This result of calibration was found accurate as shown on date and place of calibration only.

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
0.0001 0.0000 0.0000 0.0000 0.0000 g



Repeatability

Load test : 200 g

Stdev. : 0.00005 g



- 000 -

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ผู้จัดการฝ่ายควบคุมคุณภาพ



CAL

Calibratech Co., Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpoo, 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. : 64-410010-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Digital Thermo-Hygrometer

Manufacturer : ebro

Model : EBI 20-TH1

Range Temperature : -30 °C to 60 °C

Resolution : 0.1 °C

Range Humidity : 0 %R.H. to 100 %R.H.

Resolution : 0.1 %R.H.

Serial No. : 62227425

ID No. : N/A

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

Relative Humidity : (50 ± 15) %

Date of Received : 05 February 2021

Date of Calibration : 11 February to 13 February 2021

Date of Issue : 13 February 2021

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 & 400036 SG-H-00041/64

12 Jul 2021

Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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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. : 64-410010-1

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) |
|--------------------------------|-----------------------|----------------------|-------------------------|
| 10.04 | 9.8 | 0.2 | 0.46 |
| 25.00 | 25.0 | 0.0 | 0.46 |
| 30.02 | 30.0 | 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.) |
|--------------------------------|--------------------------|-------------------------|----------------------------|
| 39.99 | 47.7 | -7.7 | 2.2 |
| 50.03 | 56.2 | -6.1 | 2.2 |
| 59.99 | 66.0 | -6.0 | 2.3 |

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 -



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0312

MTC No. EEL. BP. 57/0264

CALIBRATION CERTIFICATE

Submitted by : Envilab Co., Ltd.

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

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1 C, 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 ± 1.500) kPa

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

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

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

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

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

Date of Receipt : 10 Feb. 2021

Date of Calibration : 18 Feb. 2021

1 / 2

The results relate only to the items tested or calibrated.

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.3

Head Office

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

Tel. (66) 0 2577 9000

Fax: (66) 0 2577 9009

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

Office/Laboratory

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

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

Fax: (66) 0 2323 1655

E-mail : tistr@tistr.or.th

Office

196 Pahonyothin Road, Chatuchak, Bangkok 10900,
Thailand

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

Fax: (66) 0 2579 8592

E-mail : sumalee@tistr.or.th



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



MTC No. EEL. BP. 57/0264

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 | 93.78 | -0.22 | ±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 | 998.3 | -1.7 | ± 1.5 | ±1.0% |

3. Total Distortion

| Standard Microphone Type | Measured Total Distortion (%) | Uncertainty (%) | Tolerance limit IEC60942:2003 Class 1 |
|---------------------------|-------------------------------|-----------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 0.68 | ± 0.50 | ± 3.0% |

- Note :**
1. No adjustment.
 2. The calibrator pressure correction was not included.
 3. The microphone volume correction was not included.

Approved by :

(Mr. Tawikiat Iamsamran)

(Mr. P. V. Kalyappa)

Acting Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 18 Feb. 2021

Date of Issue : 19 Feb. 2021

Ref : 2011264021000592001

2/2

End of Certificate

The results relate only to the items tested or calibrated.

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FM.BL.MTC.002 Rev.3

Head Office.

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

Office/Laboratory

Sol 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0-2623-1042-80 ext. 115, 116
Fax (66) 0-2623-9163
E-mail: mtc@dstb.or.th

Office

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

Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

1011 15 25 2500-2

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A00V3 Reference Number: 160-402021734-1
Cylinder Number: EB0140762 Cylinder Volume: 144.4 Cubic Feet
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12021 Valve Outlet: 660
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Feb 19, 2021

Expiration Date: Feb 19, 2024

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.

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 | 44.68 PPM | G1 | +/- 1.4% NIST Traceable | 02/12/2021, 02/19/2021 |
| NITRIC OXIDE | 45.00 PPM | 44.62 PPM | G1 | +/- 1.4% NIST Traceable | 02/12/2021, 02/19/2021 |
| SULFUR DIOXIDE | 45.00 PPM | 45.34 PPM | G1 | +/- 1.1% NIST Traceable | 02/12/2021, 02/19/2021 |
| CARBON MONOXIDE | 4500 PPM | 4500 PPM | G1 | +/- 1.0% NIST Traceable | 02/15/2021 |
| NITROGEN | Balance | | | | |

| CALIBRATION STANDARDS | | | | | |
|-----------------------|-----------|-------------|-------------------------------------|-------------|-----------------|
| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
| NTRM | 200611-04 | CC707968 | 49.82 PPM NITRIC OXIDE/NITROGEN | +/-1.0% | Feb 02, 2025 |
| PRM | 12386 | D685025 | 9.91 PPM AIR/NITROGEN DIOXIDE | 2.0% | Feb 20, 2020 |
| GMIS | 124206889 | CC323707 | 4.028 PPM NITROGEN DIOXIDE/NITROGEN | 2.1% | Aug 15, 2021 |
| NTRM | 0141709 | KAL003190 | 49.67 PPM SULFUR DIOXIDE/NITROGEN | +/- 1.0% | Jun 20, 2022 |
| NTRM | 08012341 | KAL004716 | 4857 PPM CARBON MONOXIDE/NITROGEN | +/- 0.6% | Jun 07, 2024 |

The SRM, 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 | Jan 27, 2021 |
| Nicolet IS50 FTIR AUP2010245 NO | FTIR | Feb 11, 2021 |
| Nicolet IS50 FTIR AUP2010245 NO2 | FTIR | Jan 21, 2021 |
| Nicolet IS50 FTIR AUP2010245 SO2 | FTIR | Jan 21, 2021 |

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.4 Kg
Net Weight: 4.5 Kg
PO# 5221000405



Michael A. Parker
Approved for Release



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM18218

Calibration Date: MAR 24 2021

Calibration Reference Equipment: 714J7402

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard.

Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: 

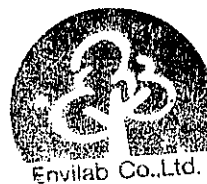
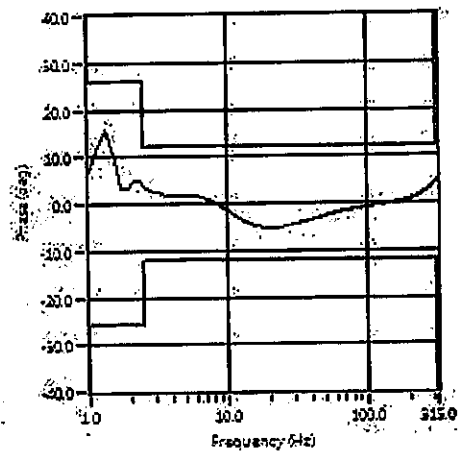
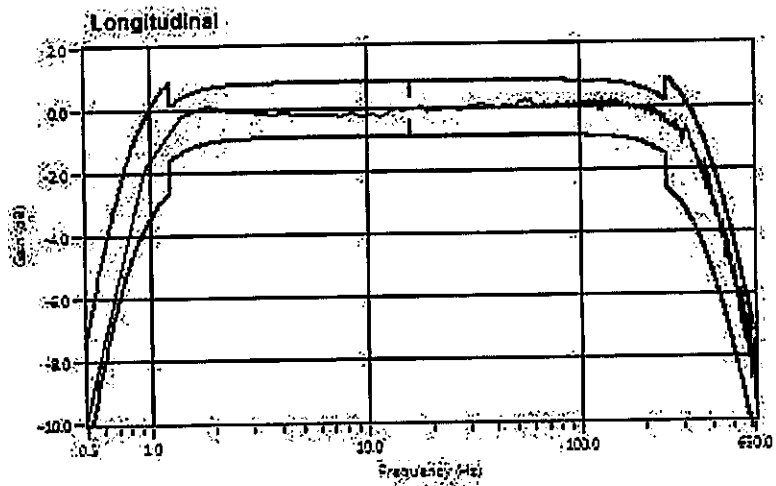
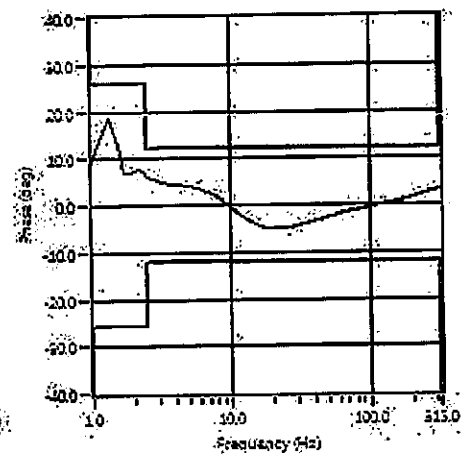
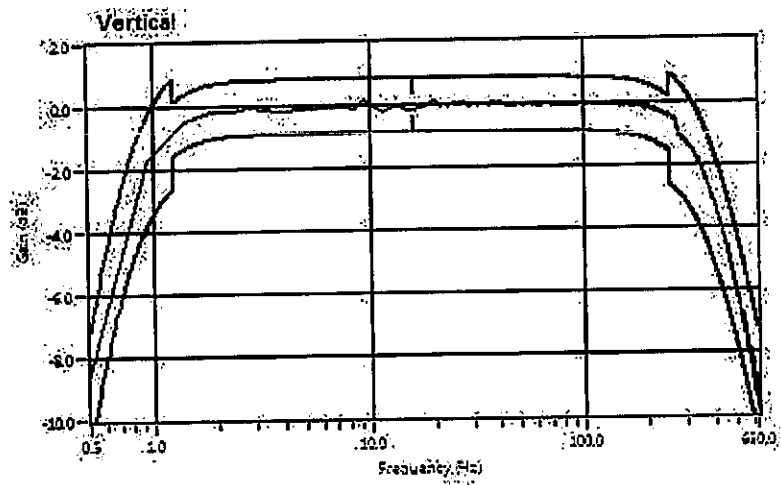
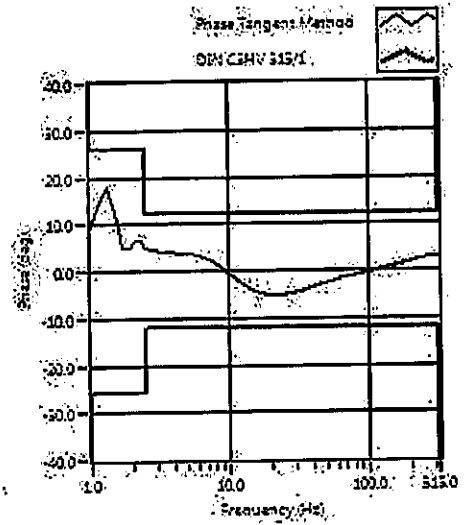
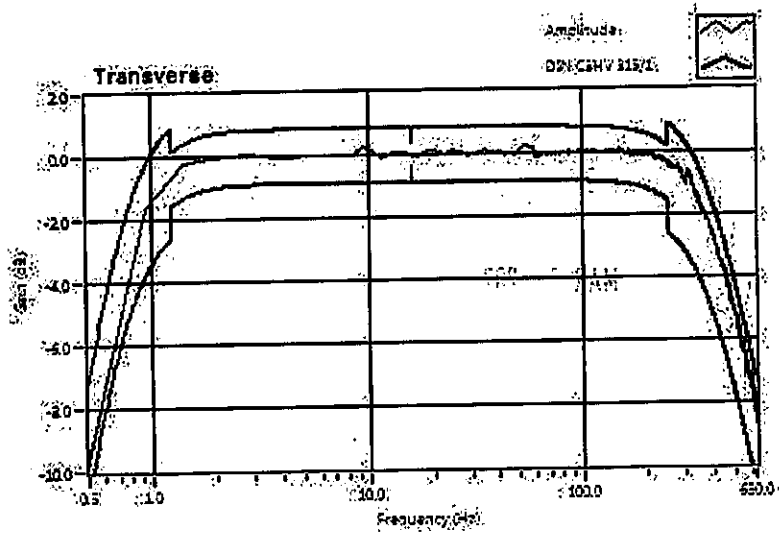
Xiaoming Yang



309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642



Frequency Response of UM18218



Envilab Co., Ltd.

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CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-200049-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540, 540/1 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA125-1S

Serial No. : 0034606552

ID No. : ELABBALANCEN05

Capacity : 120 g

Resolution : 0.00001 g

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

Ambient Temperature : (23.1 to 24.0) °C

Relative Humidity : (56.7 to 61.9) %

Air Pressure : 1013.0 mbar

Date of Received : 02 March 2021

Date of Calibration : 02 March 2021

Date of Issue : 06 March 2021

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| <u>ID No.</u> | <u>Cert. No.</u> | <u>Due Date</u> | <u>Traceability</u> |
|---------------|------------------|-----------------|--|
| E261-E2624 | C02204101 | 17 Nov 2021 | National Institute of Metrology (Thailand), (NIMT) |



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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7/106-7 Moo 2, Sukhaphrasan 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. : 64-200049-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

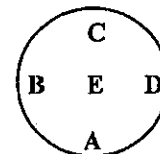
Departure of indication from nominal value

| Nominal Value (g) | Correction (g) | Uncertainty \pm (g) |
|----------------------|-------------------|--------------------------|
| 0.1 | 0.00000 | 0.000017 |
| 0.5 | -0.00001 | 0.000022 |
| 1 | 0.00001 | 0.000026 |
| 2 | 0.00000 | 0.000034 |
| 5 | -0.00001 | 0.000043 |
| 10 | 0.00000 | 0.000053 |
| 20 | -0.00002 | 0.000071 |
| 50 | -0.00003 | 0.00011 |
| 100 | -0.00005 | 0.00020 |
| 120 | -0.00006 | 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 $k = 2.11$, providing a level of confidence of approximately 95%

Eccentric error Load test : 20 g
A B C D E
0.00003 0.00003 -0.00001 0.00001 0.00000 g



Repeatability Load test : 100 g
Stdev. : 0.000014 g



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7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpoo, 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. : 64-410010-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Digital Thermo-Hygrometer

Manufacturer : ebro

Model : EBI 20-TH1

Range Temperature : -30 °C to 60 °C

Resolution : 0.1 °C

Range Humidity : 0 %R.H. to 100 %R.H.

Resolution : 0.1 %R.H.

Serial No. : 62227425

ID No. : N/A

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

Relative Humidity : (50 ± 15) %

Date of Received : 05 February 2021

Date of Calibration : 11 February to 13 February 2021

Date of Issue : 13 February 2021

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 & 400036 SG-H-00041/64

12 Jul 2021

Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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

Certificate of Calibration

Certificate No. : 64-410010-1

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) |
|------------------------------|---------------------|--------------------|-----------------------|
| 10.04 | 9.8 | 0.2 | 0.46 |
| 25.00 | 25.0 | 0.0 | 0.46 |
| 30.02 | 30.0 | 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.) |
|------------------------------|------------------------|-----------------------|--------------------------|
| 39.99 | 47.7 | -7.7 | 2.2 |
| 50.03 | 56.2 | -6.1 | 2.2 |
| 59.99 | 66.0 | -6.0 | 2.3 |

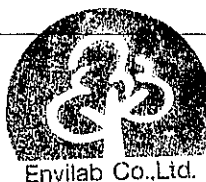
Remark

UUC : Unit Under Calibration

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

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

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Calibratech Co.,Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-420055-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : pH Meter (Pocket)

pH meter

Manufacturer : Eutech

Model : pHTestr 30

Range : -1.00 to 15.00 pH

Resolution : 0.01 pH

Serial No. : 2856418

ID No. : ELABPHTEST3016

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

Ambient Temperature : (24.5 to 25.0) °C

Relative Humidity : (50 to 54) %

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 24 March 2021

Calibrated by : Bunjerd Masri

Calibration Method : In-house method CAL-M4201 direct measurement by using certified reference material (CRM)

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

Standard Buffer Solution

| pH | Cert. No. | Lot No. | Exp. Date | Traceability |
|-------|-----------|---------|-------------|--------------|
| 4.004 | 61208711 | 684575 | 01 Sep 2021 | CPA chem |
| 6.985 | 61191143 | 684576 | 01 Sep 2021 | CPA chem |
| 9.963 | 61208865 | 684577 | 01 Sep 2021 | CPA chem |



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Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%.

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Certificate of Calibration

Certificate No. : 64-420055-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

| Adjustment Curve at nominal pH | Standard Buffer (pH) | UUC Reading (pH) | Correction (pH) | Uncertainty (± pH) |
|-----------------------------------|---------------------------|-----------------------|----------------------|-------------------------|
| 4, 7, 10 | 4.004 | 4.00 | 0.01 | 0.011 |
| | 6.985 | 7.00 | -0.01 | 0.020 |
| | 9.963 | 10.00 | -0.04 | 0.053 |

Remark

1 UUC : Unit Under Calibration

2 pH meter does not have voltage mode because the plug can not BNC socket

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

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

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ผู้จัดการฝ่ายควบคุมคุณภาพ





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 21TW57

Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : Hanna
Model : HI 9146
Serial No. : G0007931
ID No. : EDOHI914607931
Received Date : 16 March 2021
Test Date : 19 March 2021
Reference : 2103-0669DN-1
Submitted by : Envilab Co.,Ltd (Head office)
540, 540/1 Soi Bangkhuae 7, Bangkhuae,
Bangkhuae, Bangkok 10160
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Calibrated by : Walalak Sirithean

Approved by :

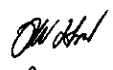

Approved Signatory

(✓) Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date :

23 March 2021




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ผู้จัดการฝ่ายควบคุมคุณภาพ

B 0257191



Cert.No.: 21TW57

Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: KC1A01TAF

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|---|-------------------------------|------------------------------|
| 8.00 | 8.17 | 0.00 |

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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Malee

a 1047872

CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400569-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Refrigerator)

Manufacturer : M-LAB

Model : BIC-140

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 1011

ID No. : ELABBODC140N03

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

Ambient Temperature : (23.0 to 23.8) °C

Relative Humidity : (55 to 60) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 12 November 2021

Date of Calibration : 12 November 2021

Date of Issue : 18 November 2021

Calibrated by : Bunjerd Masri

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No.

Cert. No.

Due Date

Traceability

400046 & 400023

64-400443-1

29 Mar 2022

National Institute of Metrology Thailand (NIMT)



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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7/106-7 Moo 2, Sukhaphrasan 3 Rd., Bangpoo, Pakkred, Nonthaburi 11120

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Certificate of Calibration

Certificate No. : 64-400569-1

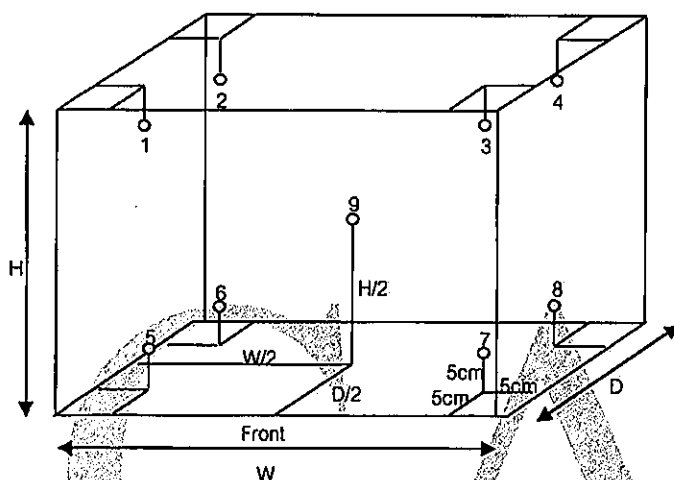
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.38 m

D = 0.35 m

H = 1.15 m

Capacity = 0.15 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (±°C) |
|--------------------|-----------------------------|--------------------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|----------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 4.0 | 4.0 | 4.0 | 3.3 | 3.2 | 3.4 | 3.4 | 3.9 | 3.9 | 4.0 | 3.4 | 4.2 | 0.57 |

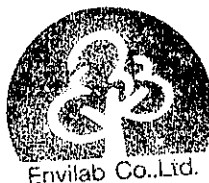
| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 4.0 | 4.0 | 4.0 | 1.0 | 0.1 | 1.0 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

- ooo -



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ผู้จัดการฝ่ายควบคุมคุณภาพ





Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

Customer Envilab Co.,Ltd.

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

Place of Calibration MICRO ROOM (B302)

Description Incubator

Model IF75

Serial No. D319.0066

ID.No. -

Date of Receipt Feb 12, 2021

Date of Calibration Feb 12, 2021

Environment

| | | | | | | |
|-------------------|-------|------|-----|-------|------|-----|
| Temperature | (Min) | 25.1 | °C | (Max) | 26.1 | °C |
| Relative Humidity | (Min) | 67.2 | %RH | (Max) | 69.3 | %RH |

Calibration Method

WI-17 : The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.

The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY49007789, Certificate No. QR20-2119, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292.

This certificate is traceable to SI unit.

Page 1 of 3

D.Mi

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.



Onth
รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



NSC-TISI-TIS17025
CALIBRATION 0109

CALIBRATION CERTIFICATE

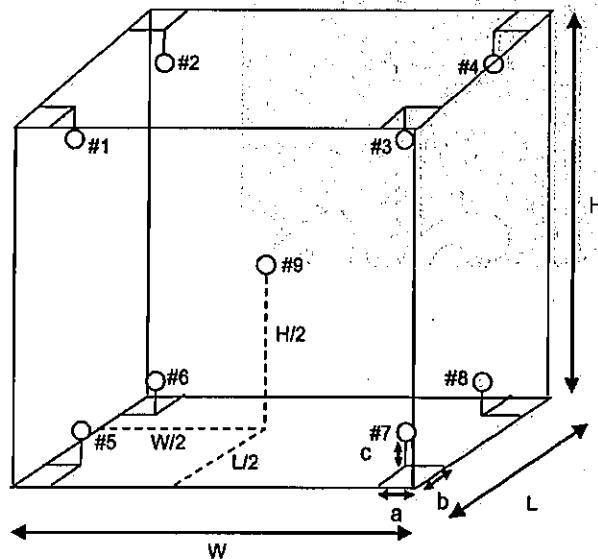
Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

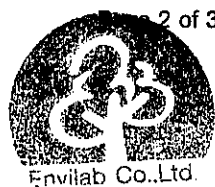
Results (without adjustment)



Position of reference thermometers were placed

Note.

- 1). Dimension (W x L x H) is 40 x 33 x 56 cm.
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

D.Mi



Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

Results (without adjustment)

| UUC Setting (°C) | UUC Reading (°C) | Reference Thermometer (°C) | | Stability \pm (°C) | Uniformity (°C) | Uncertainty \pm (°C) |
|------------------------|------------------------|----------------------------------|--------|-------------------------|--------------------|---------------------------|
| 44.5 | 44.5 | Position 1 | 44.536 | 0.048 | 0.448 | 0.31 |
| | | Position 2 | 44.593 | | | |
| | | Position 3 | 44.601 | | | |
| | | Position 4 | 44.570 | | | |
| | | Position 5 | 44.532 | | | |
| | | Position 6 | 44.386 | | | |
| | | Position 7 | 44.131 | | | |
| | | Position 8 | 44.523 | | | |
| | | Position 9 | 44.536 | | | |

The stability and uniformity was taken into account in the measurement uncertainty stated.

The above results are valid exclusively for calibration samples as mentioned in the report.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :

(MR. DAMRONG MULSING)

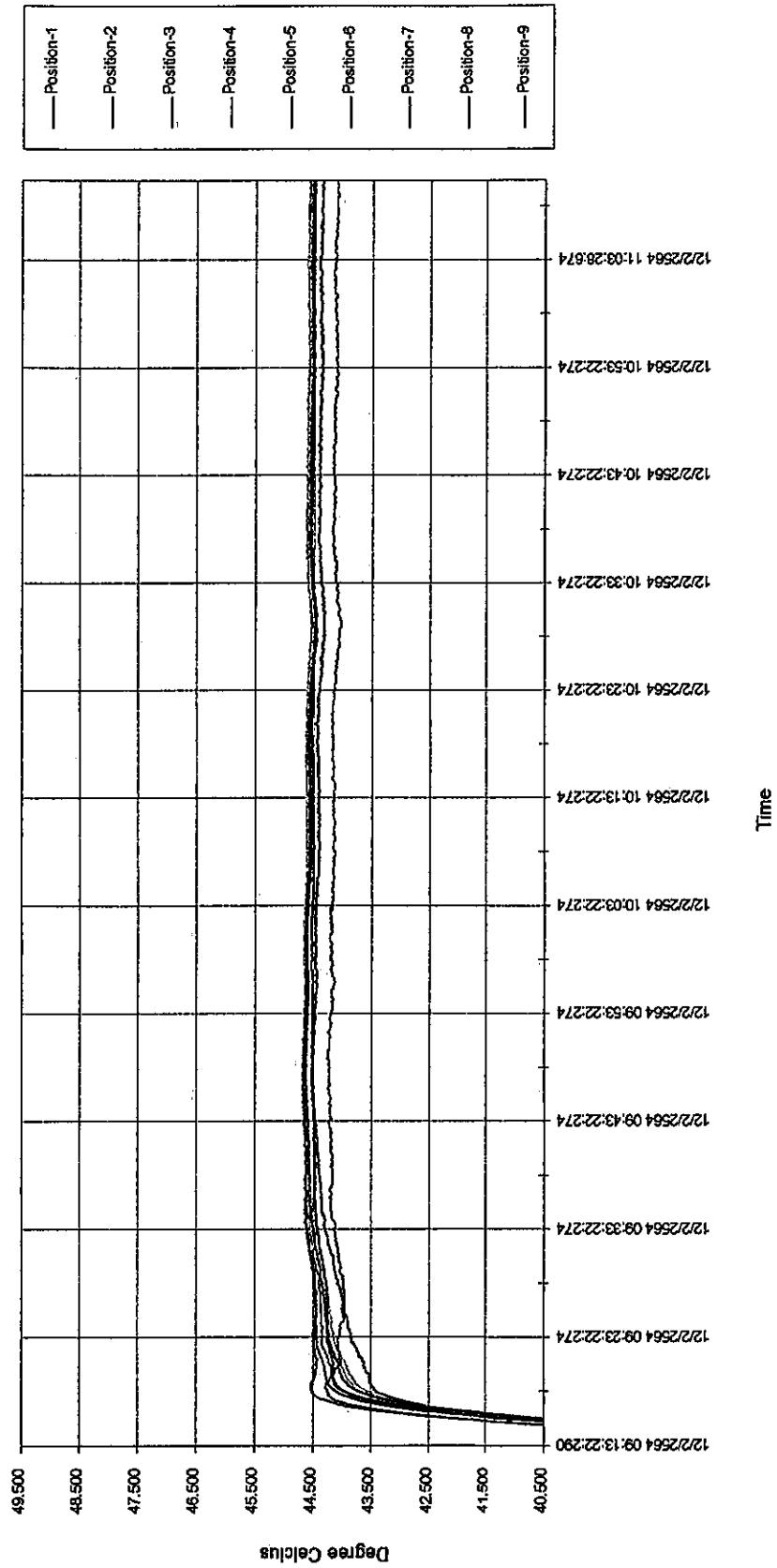
Page 3 of 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Cert.No. 21/0323

Incubator
Model IF75 S/N. D319.0066 ID.No. -



Envitab Co., Ltd.
ผู้จัดการฝ่ายควบคุมคุณภาพ
รณรงค์สำเนาถูกต้อง

CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400163-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Oven)

Manufacturer : Memmert

Model : UF 75

Range : N/A °C

Resolution : 0.1 °C

Serial No. : B319.0600

ID No. : N/A

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

Ambient Temperature : (30.0 to 31.5) °C

Relative Humidity : (50 to 55) %

Line Voltage : (224.2 to 225.2) V

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 25 March 2021

Calibrated by : Permpon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

ID No.

Cert. No.

Due Date

Traceability

400029 & 400032

63-400450-1

30 Mar 2021

National Institute of Metrology Thailand (NIMT)



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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

Certificate of Calibration

Certificate No. : 64-400163-2

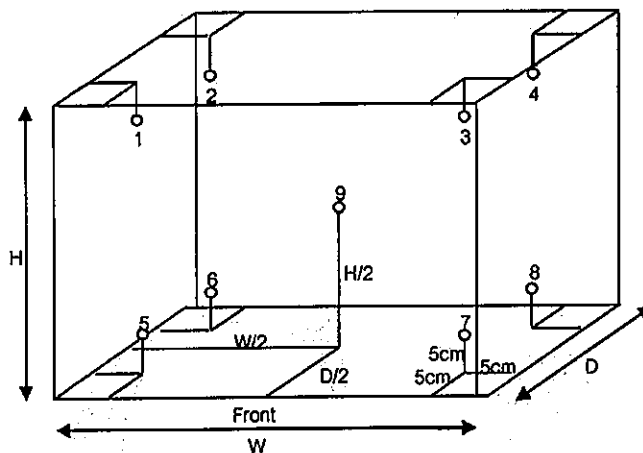
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.56 m

Capacity = 0.07 m³

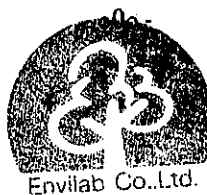
| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|-----------------|--------------------------|-----------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 104.0 | 103.5 | 103.5 | 104.0 | 104.3 | 104.3 | 104.2 | 104.2 | 103.9 | 103.7 | 104.2 | 104.1 | 0.69 |
| 110.0 | 109.5 | 109.5 | 110.0 | 110.4 | 110.4 | 110.2 | 110.2 | 109.9 | 109.6 | 110.2 | 110.1 | 0.69 |
| 180.0 | 179.0 | 179.0 | 179.0 | 180.3 | 180.2 | 180.2 | 180.3 | 180.0 | 179.0 | 180.4 | 180.3 | 0.95 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|-----------------|--------------------------|-----------------------------|--------------------------|-------------------------|------------------------|
| 104.0 | 103.5 | 103.5 | 0.5 | 0.1 | 0.8 |
| 110.0 | 109.5 | 109.5 | 0.7 | 0.1 | 1.0 |
| 180.0 | 179.0 | 179.0 | 1.5 | 0.2 | 1.7 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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



Envilab Co.,Ltd.

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Signature



CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400049-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhac7, Bangkhac, Bangkok 10160

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB29

Range : N/A °C

Resolution : 0.1 °C

Serial No. : L617.0156

ID No. : ELABWBWNB29N01

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

Ambient Temperature : (26.0 to 26.5) °C

Relative Humidity : (45 to 50) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 05 February 2021

Date of Calibration : 05 February 2021

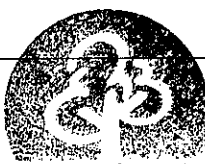
Date of Issue : 06 February 2021

Calibrated by : Permpon Chanpu

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

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

| <u>ID No.</u> | <u>Cert. No.</u> | <u>Due Date</u> | <u>Traceability</u> |
|-----------------|------------------|-----------------|---|
| 400029 & 400031 | 63-400449-1 | 28 Mar 2021 | National Institute of Metrology Thailand (NIMT) |



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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

Certificate of Calibration

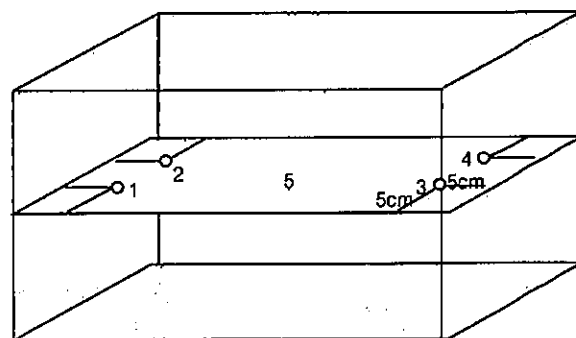
Certificate No. : 64-400049-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Front

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | Uncertainty (±°C) | Measured Uniformity (°C) | Measured Stability (°C) |
|--------------------|-----------------------------|--------------------------------|---|-------|-------|-------|-------|----------------------|-----------------------------|----------------------------|
| | | | 1 | 2 | 3 | 4 | 5 | | | |
| 95.0 | 95.0 | 95.0 | 95.35 | 95.44 | 95.53 | 95.38 | 95.46 | 0.20 | 0.19 | 0.09 |

Remark The uncertainty is not combine uniformity of the water bath

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

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

- o0o -



Envilab Co.,Ltd.

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-300152-2

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : PYREX

Class : A

Capacity : 50 ml

Graduation : 1 ml

ID No. : C-WW-002/21

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Wipa Tovadec)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%.

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

Certificate of Calibration

Certificate No. : 64-300152-2

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

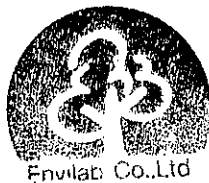
| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 30 | 29.93 |
| 50 | 50.01 |

Uncertainty of measurement with in \pm 0.054 ml

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%

- o0o -



Envilab Co.,Ltd

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ผู้จัดการฝ่ายควบคุมคุณภาพ

D.



CAL

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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. : 64-300152-6

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : Witeg

Class : A

Capacity : 1000 ml

Graduation : 10 ml

ID No. : C-WW-029/18

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Wipa Tovadee)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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

Certificate of Calibration

Certificate No. : 64-300152-6

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 500 | 502.85 |
| 1000 | 1001.86 |

Uncertainty of measurement with in \pm 0.17 ml

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%

- o O o -

D.



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



ประจำเดือนมกราคม พ.ศ. 2565



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 Bangkok 10160
Tel : 02-802-3577-9 Fax: 02-802-3773 E-mail : info@evltesting.com



EnviLab is a member of the ISO 9001:2015 certified company

TSP High Volume Sampler Calibration

Verification Report No.

HO2100150-D002 -TSP 01

☐ PM ☒ Onsite

Site: โครงการก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย

UTM : 47P 1532758 N 673757 E

Date: 1 Dec 21

Sampler: NTSP#14

Technical: Hasan S.

Recorder: ECRANG15314321

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1010.0

Corrected Pressure (mm Hg): 757.6

Temperature (deg C): 30.0

Temperature (deg K): 303.0

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: 2.05054

Model: TE-5025A

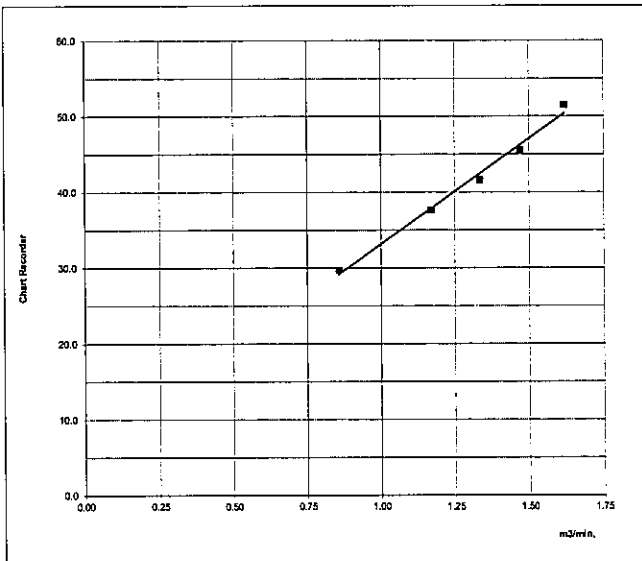
Qstd Intercept: -0.00430

Serial#: 2067

Date Certified: 11 Jan 21

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|---|
| 1 | 11.21 | 1.619 | 52.0 | 51.49 | |
| 2 | 9.24 | 1.470 | 46.0 | 45.55 | Slope = 27.8599 Intercept = 5.2480 Corr. coeff.= 0.9948 # of Observations: 5 Range of Chart 37 at 1.1 - 1.7 m3/min. 53 |
| 3 | 7.62 | 1.335 | 42.0 | 41.59 | |
| 4 | 5.84 | 1.169 | 38.0 | 37.62 | |
| 5 | 3.14 | 0.858 | 30.0 | 29.70 | |



Calibrated by :

Hasan Seng

(Hasan Seng)
1 December 2021

Approved by :

Sarawut Keawsrinual
(Sarawut Keawsrinual)
1 December 2021

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www.evltesting.com

Environmental responsibility with accuracy measurement



บริษัท เอ็นวิเทล จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envikab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkok Bangkok Bangkok 10160
Tel : 02-602-3577-8 Fax: 02-602-3775 E-mail : info@evltesting.com



ISO 9001:2015 & ISO 14001:2015

PM10 High Volume Sampler Calibration

Verification Report No.

HO2100150-D002 -PM 01

L PM ☒ Onsite

Site: โครงการก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย
UTM : 47P 1532758 N 673757 E Date: 1 Dec 21
Sampler: EPM#38 Technical: Hasan S.
Recorder: ECRDS01618025857 Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1010.0
Temperature (deg C): 30.0
Average Press. (hPa): 1013.0
Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.6
Temperature (deg K): 303.0
Corrected Avg. Press. (mm Hg): 759.8
Average Temp. (deg K): 303.0

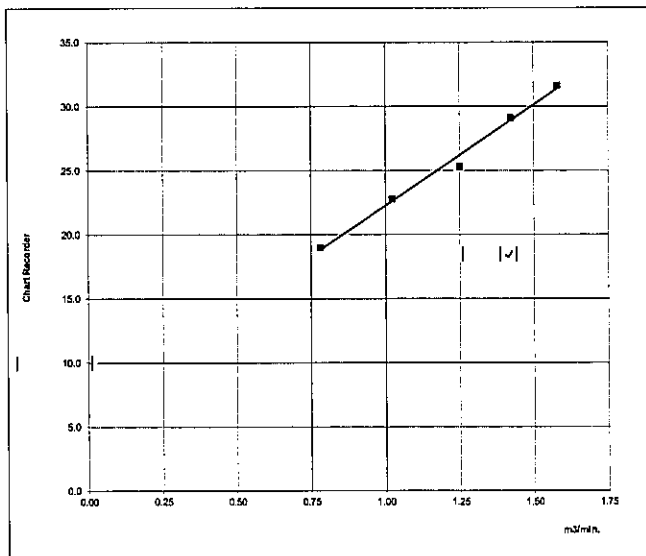
CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc
Model: TE-5025A
Serial#: 2067

Slope: 1.28401
Intercept: -0.00265
Date Certified: 11 Jan 21

CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|-------------|-----------|----------------|----------------------------------|
| 1 | 10.26 | 1.580 | 50.0 | 31.62 | Slope = 15.7456 |
| 2 | 8.32 | 1.423 | 46.0 | 29.09 | Intercept = 6.4783 |
| 3 | 6.41 | 1.249 | 40.0 | 25.30 | Corr. coeff = 0.9955 |
| 4 | 4.29 | 1.022 | 36.0 | 22.77 | SFR = 1.133 |
| 5 | 2.51 | 0.782 | 30.0 | 18.97 | SSP = 38.46 |
| | | | | | # of Observations: 5 |
| | | | | | Range of Chart at SFR $\pm 10\%$ |
| | | | | | 36 |
| | | | | | 40 |



Calibrated by :

(Hasan Seng)

1 December 2021

Approved by :

(Sarawut Keawsrinual)

1 December 2021

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Environmental responsibility with accuracy measurement

FE-AMT-29 Rev.00-01/08/23



neediss

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

536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E:info@neediss.com



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6412002

Page:1/1

Calibrated Date: 1-Dec-21

☒ PM ☐ Onsite

Instruments Information

| | |
|---|--|
| Analyzer Type: SO2 Analyzer Model: THERMO.,43C | Manufacturer THERMO S/N: ESOTE43C668327 |
|---|--|

Calibration System

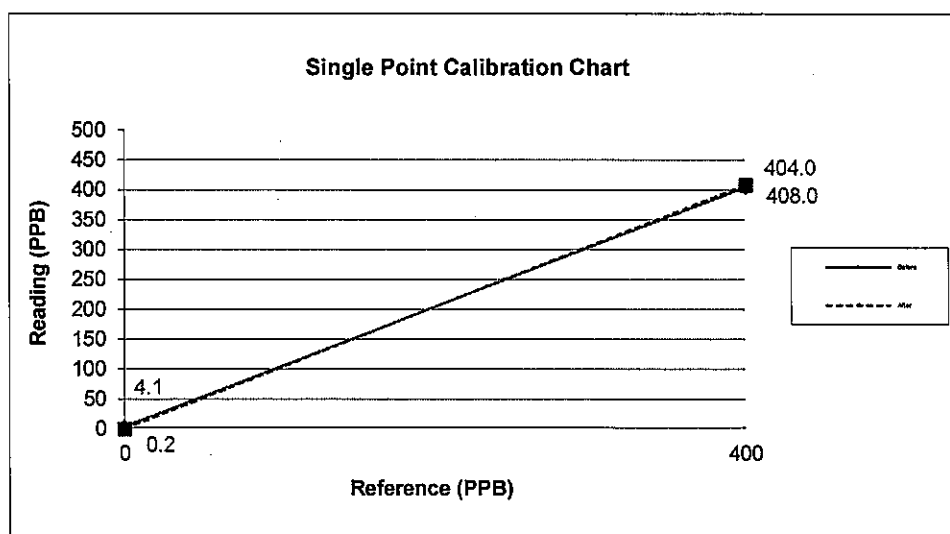
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 25.4 °C

Humidity: 60 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0 | 4.1 | 4.1 | 400.0 | 404 | 1.0 |
| After | 0.0 | 0.2 | 0.2 | 400.0 | 408 | 2.0 |



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12/21/21



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-12-2021

S/N : ESOTE43C668327

| Test Function Value | Before | After |
|---------------------------------|--------|-------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -650 | -653 |
| LAMP VOLTAGE 950 - 1,200 (V) | 990 | 985 |
| LAMP INTENSITY 20000 - 50000 Hz | 32568 | 32577 |
| INTER TEMP 15 - 45 DEG C | 37 | 37 |
| CHAMBER TEMP 47 - 51 C | 49 | 49 |
| COOLER TEMP -5 - (-2) DEG C | -2.5 | -2.5 |
| PRESSURE 400 - 1000.0 mm Hg | 764 | 765 |
| FLOW 0.350 - 0.650 LPM | 0.42 | 0.4 |
| | | |
| | | |
| | | |

Calibrate By :

Sirir Poonlak

Approve By :

Sarawut Keawsrinual

Sirirat Poonlak

Sarawut Keawsrinual

Date:

1-Dec-21

Date:

1-Dec-21

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**neediss**บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E:info@neediss.com

NOx Analyzer Verification Test Report

Calibration Report No.: 6412007
Calibrated Date: 1-Dec-21

Page:1/2

☒ PM ☐ Onsite

Instruments Information

| | |
|--|--|
| Analyzer Type: NO/NO2/NOx Analyzer Model: 42C | Manufacturer THERMO S/N: ENOTE42C497375 |
|--|--|

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 SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

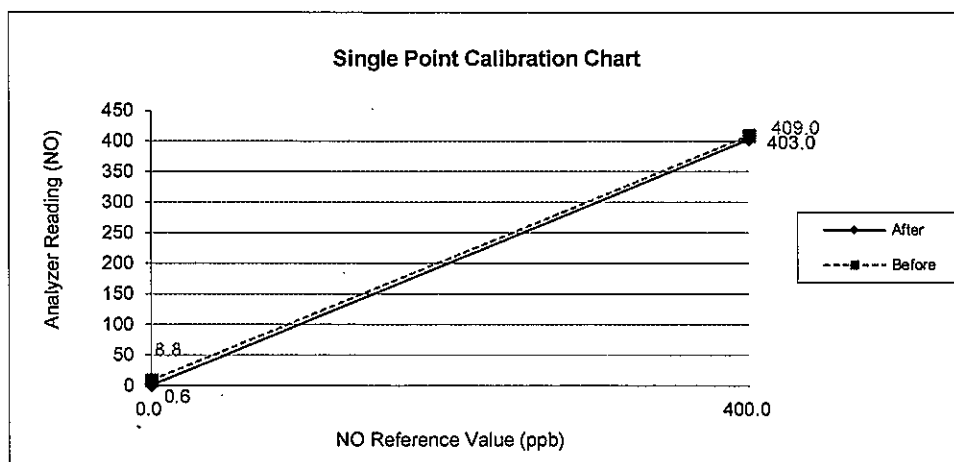
Environment: Temperature 25.4 °CHumidity: 62 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 8.8 | 0.0 | 8.8 | 409 | 400.0 | 1.1 |
| NO ₂ | 1.4 | 0.0 | 1.4 | 4.0 | 0.0 | 0.5 |
| NOx | 10.2 | 0.0 | 10.2 | 413 | 400.0 | 1.6 |

Calibration Check (After adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.6 | 0.0 | 0.6 | 403 | 400.0 | 0.4 |
| NO ₂ | -0.2 | 0.0 | -0.2 | 3.0 | 0.0 | 0.4 |
| NOx | 0.4 | 0.0 | 0.4 | 406 | 400.0 | 0.7 |



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Neediss Supply Instrument Co., Ltd.535 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพมหานคร 10160 535 Soi Bangkhae 7 Bangkhae Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E: info@neediss.com

MODEL : NOx ANALYZER Model 42C THERMO

DATE : 1-12-2021

S/N : ENOTE42C497375

Page:2/2

| Test Function Value | Before | After |
|----------------------------------|---------|---------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -675 | -678 |
| LAMP VOLTAGE 950 - 1,200 (V) | | |
| INTER TEMP 15 - 45 DEG C | 43 | 43 |
| CHAMBER TEMP 47 - 51 C | 49 | 50 |
| COOLER TEMP -5 - (-2) DEG C | -2 | -2 |
| PRESSURE 400 - 1000.0 mm Hg | 350 | 380 |
| SAMPLE FLOW 0.350 - 0.900 LPM | 0.45 | 0.46 |
| OZONEATOR FLOW 0.035 - 0.075 LPM | 0.05 | 0.05 |
| No/Nox BKG | 12/9.0 | 12/9.1 |
| No/Nox Slope | 1.0/0.8 | 0.9/0.8 |
| | | |

Calibrate By :

Sirirat Poonlak

Date:

1-Dec-21


Approve By :

Sarawut Keawsrinual

Date:

1-Dec-21

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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 & Neediss Supply Instrument

Verification Test Report

Report No.:

HO2100150-D002 -SLM 01

☐ PM

☒ Onsite UTM :

47 P 1532744 N 673776 E

Calibrated Date: 1 December 2021

Site : โครงการ ก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 8007

Environment: Temperature 28 °C Humidity 56 %RH

Reference Standard: Sound Calibrator Class 1 Model 4230,Brue&Kjaer

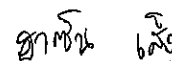
Serial No. 1351075

Date of Calibration : Feb.18, 2021

Result of Test

| Reference Standard (dB) | Instrument reading (dB) | Error (dB) | Adjust (dB) |
|----------------------------|----------------------------|---------------|----------------|
| 93.8 | 39.9 | -53.9 | 93.8 |

Calibrated By:



(Hasan Seng)

Date:

1 December 2021

Approve By:



(Sarawut Keawsrinual)

Date:

1 December 2021

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Certificate of Calibration

Calibration Certification Information

Cal. Date: January 11, 2021 Rootsmeter S/N: 438320 Ta: 293 °K
 Operator: Jim Tisch Pa: 757.9 mm Hg
 Calibration Model #: TE-5025A Calibrator S/N: 2067

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.4470 | 3.3 | 2.00 |
| 2 | 3 | 4 | 1 | 1.0260 | 6.4 | 4.00 |
| 3 | 5 | 6 | 1 | 0.9120 | 8.0 | 5.00 |
| 4 | 7 | 8 | 1 | 0.8660 | 8.9 | 5.50 |
| 5 | 9 | 10 | 1 | 0.7170 | 12.9 | 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) |
|-----------|---------------|--|--------|-------------|---|
| 1.0099 | 0.6979 | 1.4243 | 0.9956 | 0.6881 | 0.8793 |
| 1.0057 | 0.9803 | 2.0143 | 0.9916 | 0.9664 | 1.2435 |
| 1.0036 | 1.1004 | 2.2520 | 0.9894 | 1.0849 | 1.3903 |
| 1.0024 | 1.1575 | 2.3619 | 0.9883 | 1.1412 | 1.4581 |
| 0.9970 | 1.3906 | 2.8486 | 0.9830 | 1.3710 | 1.7586 |
| QSTD | m= | 2.05054 | QA | m= | 1.28401 |
| | b= | -0.00430 | | b= | -0.00265 |
| | r= | 0.99994 | | r= | 0.99994 |

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



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 ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-200011-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.
536 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Electronic Balance
Manufacturer : Sartorius Model : SECURA224-1S
Serial No. : 0034803270 ID No. : ELABBALANCEN04
Capacity : 220 g Resolution : 0.0001 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.
Ambient Temperature : (22.2 to 22.9) °C
Relative Humidity : (55.9 to 62.2) %
Air Pressure : (1014.0 to 1015.0) mbar

Date of Received : 05 February 2021

Date of Calibration : 05 February 2021

Date of Issue : 08 February 2021

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-----------|-------------|--|
| E261-E2624 | C02204101 | 17 Nov 2021 | National Institute of Metrology (Thailand), (NIMT) |



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%.

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7/106-7 Moo 2, Sukhaphrasan 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. : 64-200011-1

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) |
|----------------------|-------------------|--------------------------|
| 0.01 | 0.0001 | 0.00011 |
| 0.1 | 0.0001 | 0.00011 |
| 1 | 0.0000 | 0.00011 |
| 2 | 0.0001 | 0.00011 |
| 5 | 0.0000 | 0.00011 |
| 10 | 0.0000 | 0.00011 |
| 20 | -0.0001 | 0.00012 |
| 50 | -0.0001 | 0.00014 |
| 100 | -0.0001 | 0.00020 |
| 200 | -0.0002 | 0.00038 |

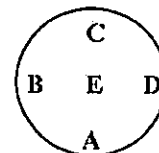
This result of calibration was found accurate as shown on date and place of calibration only.

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
0.0001 0.0000 0.0000 0.0000 0.0000 g



Repeatability

Load test : 200 g

Stdev. : 0.00005 g



- 000 -

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CAL

Calibratech Co., Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpoo, 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. : 64-410010-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhao7, Bangkhao, Bangkok 10160

Equipment : Digital Thermo-Hygrometer

Manufacturer : ebro

Model : EBI 20-TH1

Range Temperature : -30 °C to 60 °C

Resolution : 0.1 °C

Range Humidity : 0 %R.H. to 100 %R.H.

Resolution : 0.1 %R.H.

Serial No. : 62227425

ID No. : N/A

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

Relative Humidity : (50 ± 15) %

Date of Received : 05 February 2021

Date of Calibration : 11 February to 13 February 2021

Date of Issue : 13 February 2021

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 & 400036 SG-H-00041/64

12 Jul 2021

Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL

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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. : 64-410010-1

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) |
|--------------------------------|-----------------------|----------------------|-------------------------|
| 10.04 | 9.8 | 0.2 | 0.46 |
| 25.00 | 25.0 | 0.0 | 0.46 |
| 30.02 | 30.0 | 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.) |
|--------------------------------|--------------------------|-------------------------|----------------------------|
| 39.99 | 47.7 | -7.7 | 2.2 |
| 50.03 | 56.2 | -6.1 | 2.2 |
| 59.99 | 66.0 | -6.0 | 2.3 |

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 -



Envilab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0312

MTC No. EEL. BP. 57/0264

CALIBRATION CERTIFICATE

Submitted by : Envilab Co., Ltd.

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

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1 C, 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 ± 1.500) kPa

- Standards used :**
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Keithley 2015-P S/N 4106495.
 7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

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

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

Date of Receipt : 10 Feb. 2021

Date of Calibration : 18 Feb. 2021

1 / 2

The results relate only to the items tested or calibrated.

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FM.BL.MTC.002 Rev.3

Head Office

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

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax: (66) 0 2323 1655
E-mail : msc@tistr.or.th

Office

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



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0312

MTC No. EEL. BP. 57/0264

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 | 93.78 | -0.22 | ± 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 | 998.3 | -1.7 | ± 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 | 0.68 | ± 0.50 | $\pm 3.0\%$ |

- Note:
1. No adjustment.
 2. The calibrator pressure correction was not included.
 3. The microphone volume correction was not included.

Calibrated by:

.....

(Mr. Tawikiat Iamsamran)

Approved by:



(Mr. P. P. Kulkarni)

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 18 Feb. 2021

Date of Issue : 19 Feb. 2021

Ref : 2011264021000592001

2 / 2

End of Certificate

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FM.BL.MTC.002 Rev.3

Head Office

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

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2623 1000 ext. 115, 116
Fax. (66) 0 2623 1000
E-mail : mtc@tistr.or.th

Office

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

Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A00V3 Reference Number: 160-402021734-1
Cylinder Number: EB0140762 Cylinder Volume: 144.4 Cubic Feet
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12021 Valve Outlet: 660
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Feb 19, 2021

Expiration Date: Feb 19, 2024

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.

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 | 44.68 PPM | G1 | +/- 1.4% NIST Traceable | 02/12/2021, 02/19/2021 |
| NITRIC OXIDE | 45.00 PPM | 44.62 PPM | G1 | +/- 1.4% NIST Traceable | 02/12/2021, 02/19/2021 |
| SULFUR DIOXIDE | 45.00 PPM | 45.34 PPM | G1 | +/- 1.1% NIST Traceable | 02/12/2021, 02/19/2021 |
| CARBON MONOXIDE | 4500 PPM | 4500 PPM | G1 | +/- 1.0% NIST Traceable | 02/15/2021 |
| NITROGEN | Balance | | | | |

| CALIBRATION STANDARDS | | | | | |
|-----------------------|-----------|-------------|-------------------------------------|-------------|-----------------|
| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
| NTRM | 200611-04 | CC707968 | 49.82 PPM NITRIC OXIDE/NITROGEN | +/-1.0% | Feb 02, 2025 |
| PRM | 12386 | D685025 | 9.91 PPM AIR/NITROGEN DIOXIDE | 2.0% | Feb 20, 2020 |
| GMIS | 124206889 | CC323707 | 4.028 PPM NITROGEN DIOXIDE/NITROGEN | 2.1% | Aug 15, 2021 |
| NTRM | 0141709 | KAL003190 | 49.67 PPM SULFUR DIOXIDE/NITROGEN | +/- 1.0% | Jun 20, 2022 |
| NTRM | 08012341 | KAL004716 | 4857 PPM CARBON MONOXIDE/NITROGEN | +/- 0.6% | Jun 07, 2024 |

The SRM, 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 | Jan 27, 2021 |
| Nicolet IS50 FTIR AUP2010245 NO | FTIR | Feb 11, 2021 |
| Nicolet IS50 FTIR AUP2010245 NO2 | FTIR | Jan 21, 2021 |
| Nicolet IS50 FTIR AUP2010245 SO2 | FTIR | Jan 21, 2021 |

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.4 Kg
Net Weight: 4.5 Kg
PO# 5221000405



Michael A. Parker
Approved for Release



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM18218

Calibration Date: MAR 24 2021

Calibration Reference Equipment: 714J7402

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard.

Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: 

Xiaoming Yang



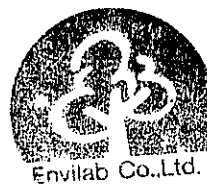
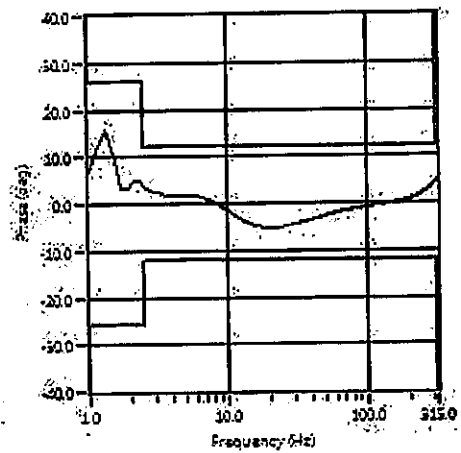
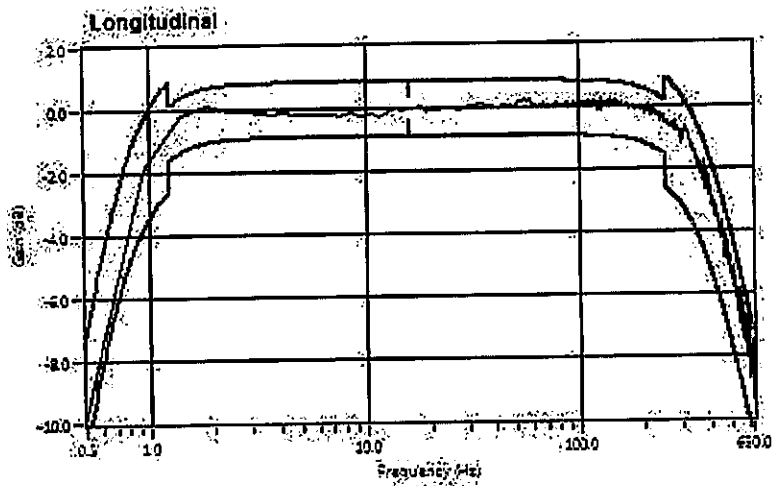
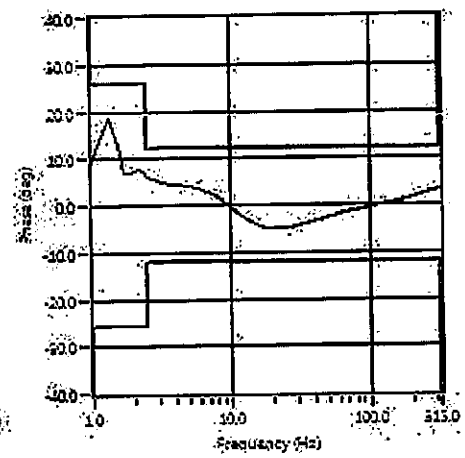
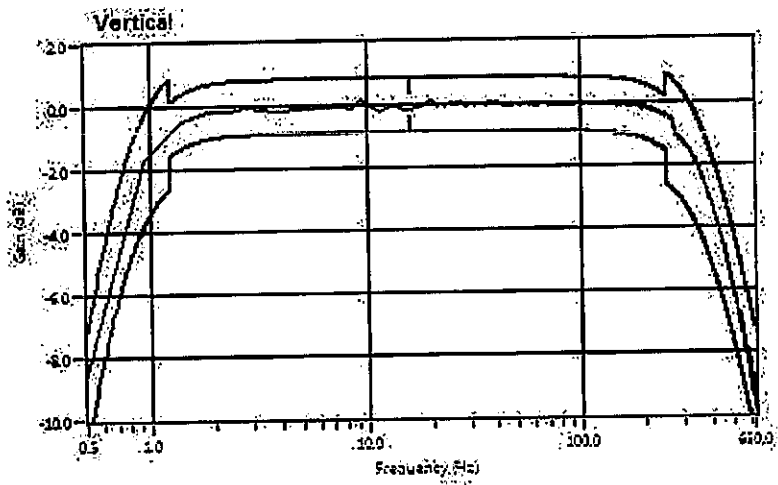
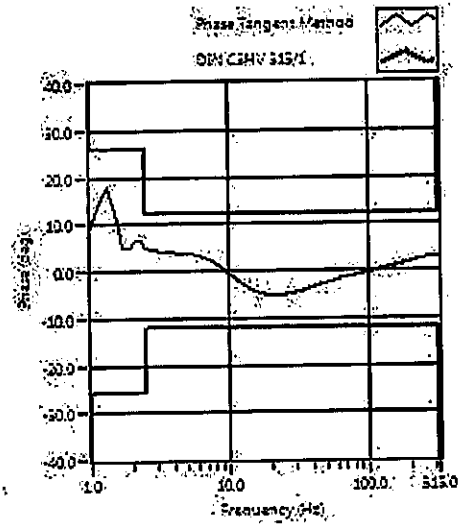
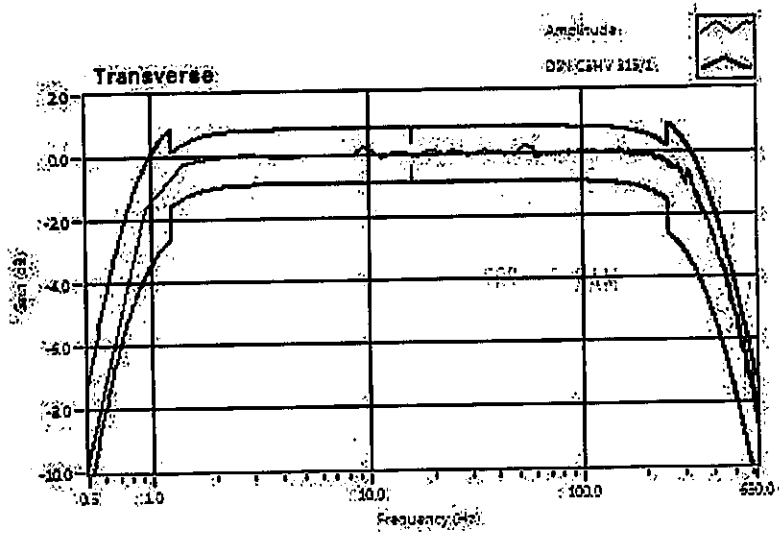
Instantel

309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Frequency Response of UM18218



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-200049-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540, 540/1 Soi Bangkhuae7, Bangkhuae, Bangkok 10160

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA125-1S

Serial No. : 0034606552

ID No. : ELABBALANCEN05

Capacity : 120 g

Resolution : 0.00001 g

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

Ambient Temperature : (23.1 to 24.0) °C

Relative Humidity : (56.7 to 61.9) %

Air Pressure : 1013.0 mbar

Date of Received : 02 March 2021

Date of Calibration : 02 March 2021

Date of Issue : 06 March 2021

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-----------|-------------|--|
| E261-E2624 | C02204101 | 17 Nov 2021 | National Institute of Metrology (Thailand), (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-200049-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

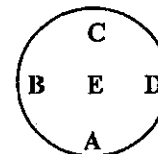
Departure of indication from nominal value

| Nominal Value (g) | Correction (g) | Uncertainty \pm (g) |
|----------------------|-------------------|--------------------------|
| 0.1 | 0.00000 | 0.000017 |
| 0.5 | -0.00001 | 0.000022 |
| 1 | 0.00001 | 0.000026 |
| 2 | 0.00000 | 0.000034 |
| 5 | -0.00001 | 0.000043 |
| 10 | 0.00000 | 0.000053 |
| 20 | -0.00002 | 0.000071 |
| 50 | -0.00003 | 0.00011 |
| 100 | -0.00005 | 0.00020 |
| 120 | -0.00006 | 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 $k = 2.11$, providing a level of confidence of approximately 95%

Eccentric error Load test : 20 g
A B C D E
0.00003 0.00003 -0.00001 0.00001 0.00000 g



Repeatability Load test : 100 g
Stdev. : 0.000014 g



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Certificate of Calibration

Certificate No. : 64-410010-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Digital Thermo-Hygrometer

Manufacturer : ebro

Model : EBI 20-TH1

Range Temperature : -30 °C to 60 °C

Resolution : 0.1 °C

Range Humidity : 0 %R.H. to 100 %R.H.

Resolution : 0.1 %R.H.

Serial No. : 62227425

ID No. : N/A

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

Relative Humidity : (50 ± 15) %

Date of Received : 05 February 2021

Date of Calibration : 11 February to 13 February 2021

Date of Issue : 13 February 2021

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 & 400036 | SG-H-00041/64 | 12 Jul 2021 | Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268 |
|-----------------|---------------|-------------|---|



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-410010-1

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) |
|------------------------------|---------------------|--------------------|-----------------------|
| 10.04 | 9.8 | 0.2 | 0.46 |
| 25.00 | 25.0 | 0.0 | 0.46 |
| 30.02 | 30.0 | 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.) |
|------------------------------|------------------------|-----------------------|--------------------------|
| 39.99 | 47.7 | -7.7 | 2.2 |
| 50.03 | 56.2 | -6.1 | 2.2 |
| 59.99 | 66.0 | -6.0 | 2.3 |

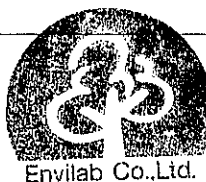
Remark

UUC : Unit Under Calibration

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

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

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NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-420055-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : pH Meter (Pocket)

pH meter

Manufacturer : Eutech

Model : pHTestr 30

Range : -1.00 to 15.00 pH

Resolution : 0.01 pH

Serial No. : 2856418

ID No. : ELABPHTEST3016

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

Ambient Temperature : (24.5 to 25.0) °C

Relative Humidity : (50 to 54) %

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 24 March 2021

Calibrated by : Bunjerd Masri

Calibration Method : In-house method CAL-M4201 direct measurement by using certified reference material (CRM)

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

Standard Buffer Solution

| pH | Cert. No. | Lot No. | Exp. Date | Traceability |
|-------|-----------|---------|-------------|--------------|
| 4.004 | 61208711 | 684575 | 01 Sep 2021 | CPA chem |
| 6.985 | 61191143 | 684576 | 01 Sep 2021 | CPA chem |
| 9.963 | 61208865 | 684577 | 01 Sep 2021 | CPA chem |



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Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%.

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Certificate of Calibration

Certificate No. : 64-420055-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

| Adjustment Curve at nominal pH | Standard Buffer (pH) | UUC Reading (pH) | Correction (pH) | Uncertainty (± pH) |
|-----------------------------------|---------------------------|-----------------------|----------------------|-------------------------|
| 4, 7, 10 | 4.004 | 4.00 | 0.01 | 0.011 |
| | 6.985 | 7.00 | -0.01 | 0.020 |
| | 9.963 | 10.00 | -0.04 | 0.053 |

Remark

1 UUC : Unit Under Calibration

2 pH meter does not have voltage mode because the plug can not BNC socket

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

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

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Envilab Co.,Ltd.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 21TW57

Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : Hanna
Model : HI 9146
Serial No. : G0007931
ID No. : EDOHI914607931
Received Date : 16 March 2021
Test Date : 19 March 2021
Reference : 2103-0669DN-1
Submitted by : Envilab Co.,Ltd (Head office)
540, 540/1 Soi Bangkhuae 7, Bangkhuae,
Bangkhuae, Bangkok 10160
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Calibrated by : Walalak Sirithean

Approved by :

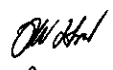

Approved Signatory

(✓) Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date :

23 March 2021




รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

B 0257191



Cert.No.: 21TW57

Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: KC1A01TAF

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|---|-------------------------------|------------------------------|
| 8.00 | 8.17 | 0.00 |

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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ผู้จัดการฝ่ายควบคุมคุณภาพ

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400569-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Refrigerator)

Manufacturer : M-LAB

Model : BIC-140

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 1011

ID No. : ELABBODC140N03

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

Ambient Temperature : (23.0 to 23.8) °C

Relative Humidity : (55 to 60) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 12 November 2021

Date of Calibration : 12 November 2021

Date of Issue : 18 November 2021

Calibrated by : Bunjerd Masri

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No.

Cert. No.

Due Date

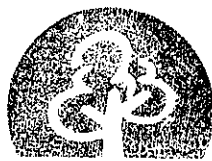
Traceability

400046 & 400023

64-400443-1

29 Mar 2022

National Institute of Metrology Thailand (NIMT)



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400569-1

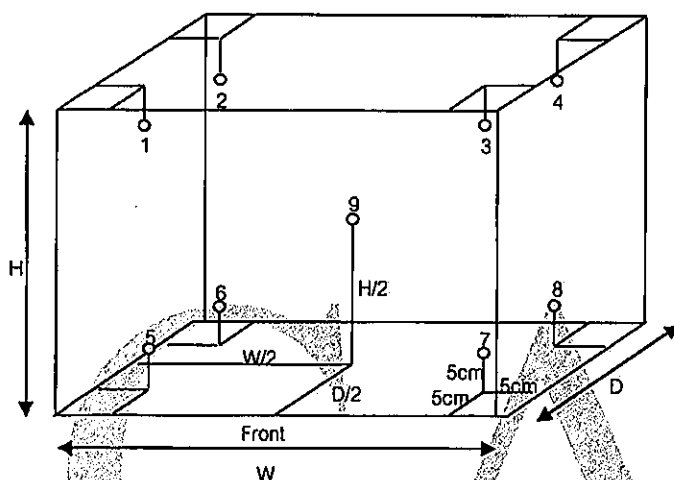
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.38 m

D = 0.35 m

H = 1.15 m

Capacity = 0.15 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (±°C) |
|--------------------|-----------------------------|--------------------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|----------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 4.0 | 4.0 | 4.0 | 3.3 | 3.2 | 3.4 | 3.4 | 3.9 | 3.9 | 4.0 | 3.4 | 4.2 | 0.57 |

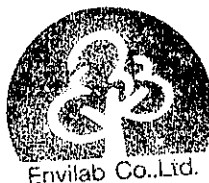
| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 4.0 | 4.0 | 4.0 | 1.0 | 0.1 | 1.0 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

- ooo -



Envilab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ





Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

Customer Envilab Co.,Ltd.

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

Place of Calibration MICRO ROOM (B302)

Description Incubator

Model IF75

Serial No. D319.0066

ID.No. -

Date of Receipt Feb 12, 2021

Date of Calibration Feb 12, 2021

Environment

| | | | | | | |
|-------------------|-------|------|-----|-------|------|-----|
| Temperature | (Min) | 25.1 | °C | (Max) | 26.1 | °C |
| Relative Humidity | (Min) | 67.2 | %RH | (Max) | 69.3 | %RH |

Calibration Method

WI-17 : The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.

The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY49007789, Certificate No. QR20-2119, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292.

This certificate is traceable to SI unit.

Page 1 of 3

O. Mi

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.



Onth
รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



NSC-TISI-TIS17025
CALIBRATION 0109

CALIBRATION CERTIFICATE

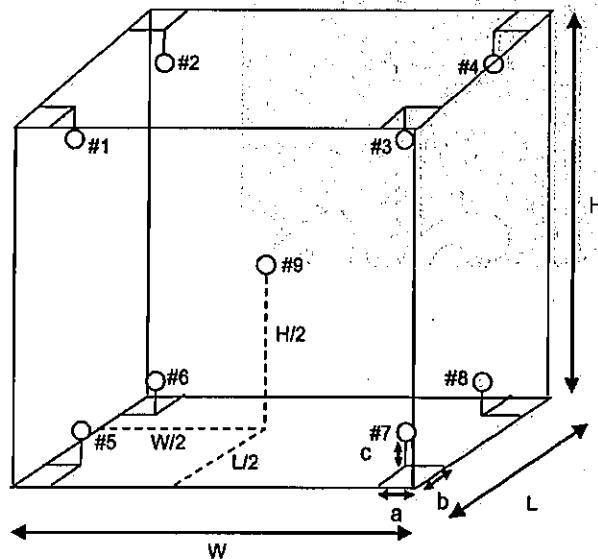
Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

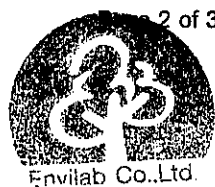
Results (without adjustment)



Position of reference thermometers were placed

Note.

- 1). Dimension (W x L x H) is 40 x 33 x 56 cm.
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

D.Mi



Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

Results (without adjustment)

| UUC Setting (°C) | UUC Reading (°C) | Reference Thermometer (°C) | | Stability \pm (°C) | Uniformity (°C) | Uncertainty \pm (°C) |
|------------------------|------------------------|----------------------------------|--------|-------------------------|--------------------|---------------------------|
| 44.5 | 44.5 | Position 1 | 44.536 | 0.048 | 0.448 | 0.31 |
| | | Position 2 | 44.593 | | | |
| | | Position 3 | 44.601 | | | |
| | | Position 4 | 44.570 | | | |
| | | Position 5 | 44.532 | | | |
| | | Position 6 | 44.386 | | | |
| | | Position 7 | 44.131 | | | |
| | | Position 8 | 44.523 | | | |
| | | Position 9 | 44.536 | | | |

The stability and uniformity was taken into account in the measurement uncertainty stated.

The above results are valid exclusively for calibration samples as mentioned in the report.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :

(MR. DAMRONG MULSING)

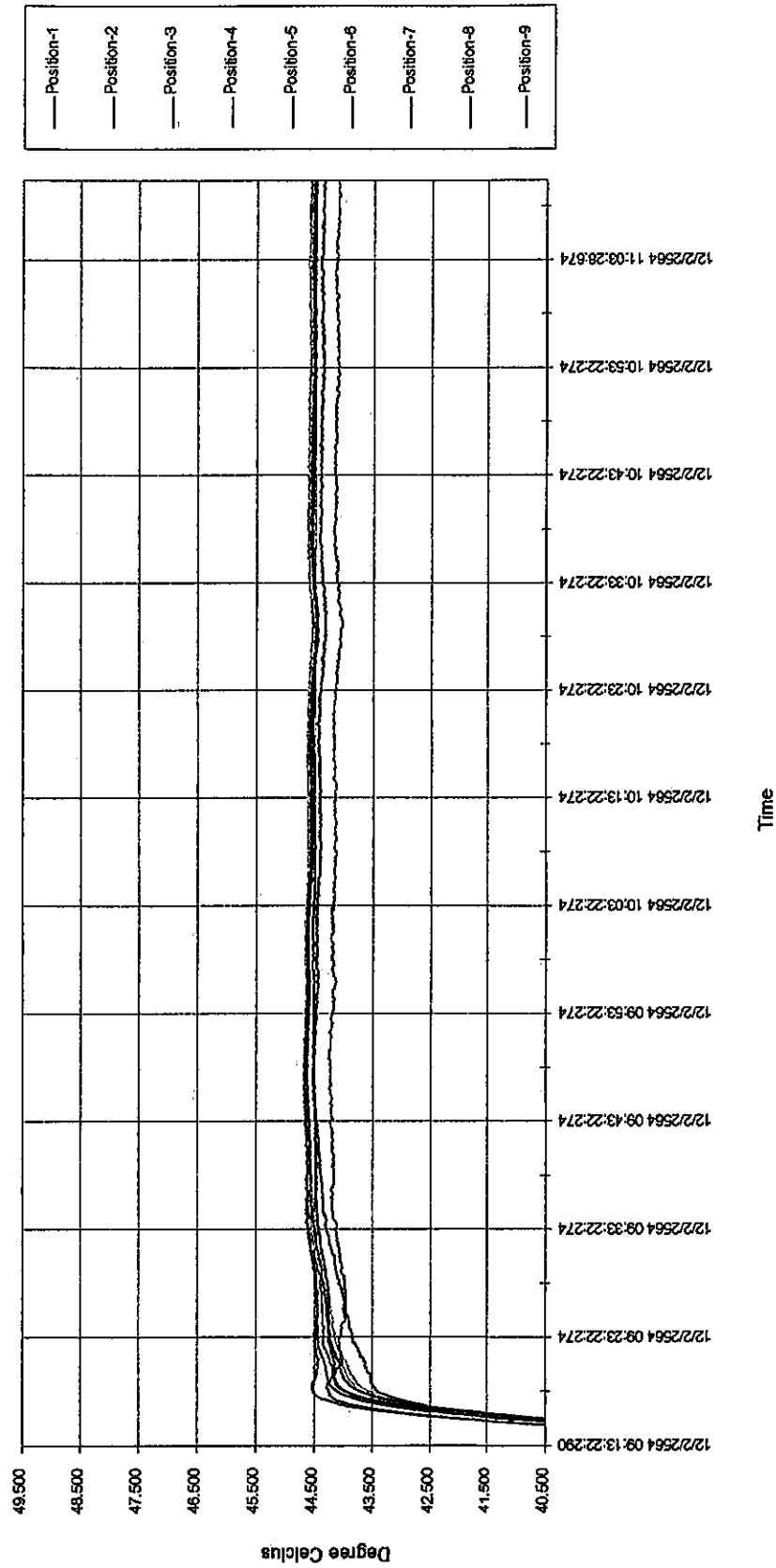
Page 3 of 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Cert.No. 21/0323

Incubator
Model IF75 S/N. D319.0066 ID.No. -



Envitab Co., Ltd.
ผู้จัดการฝ่ายควบคุมคุณภาพ
รณรงค์สำเนาถูกต้อง

CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400163-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Oven)

Manufacturer : Memmert

Model : UF 75

Range : N/A °C

Resolution : 0.1 °C

Serial No. : B319.0600

ID No. : N/A

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

Ambient Temperature : (30.0 to 31.5) °C

Relative Humidity : (50 to 55) %

Line Voltage : (224.2 to 225.2) V

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 25 March 2021

Calibrated by : Permpon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

ID No.

Cert. No.

Due Date

Traceability

400029 & 400032

63-400450-1

30 Mar 2021

National Institute of Metrology Thailand (NIMT)



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400163-2

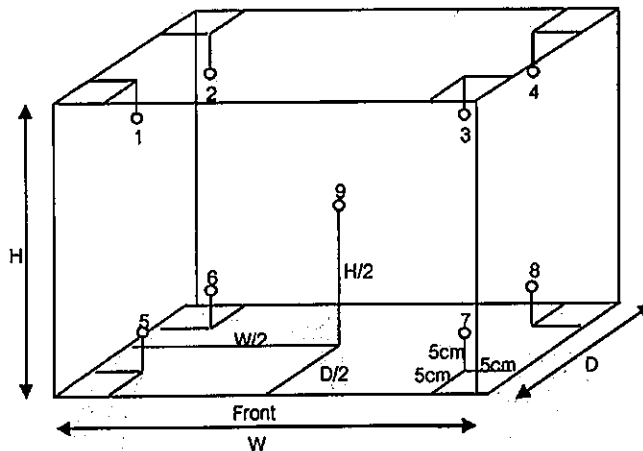
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.56 m

Capacity = 0.07 m³

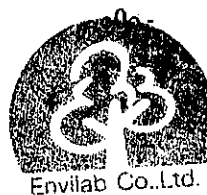
| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|-----------------|--------------------------|-----------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 104.0 | 103.5 | 103.5 | 104.0 | 104.3 | 104.3 | 104.2 | 104.2 | 103.9 | 103.7 | 104.2 | 104.1 | 0.69 |
| 110.0 | 109.5 | 109.5 | 110.0 | 110.4 | 110.4 | 110.2 | 110.2 | 109.9 | 109.6 | 110.2 | 110.1 | 0.69 |
| 180.0 | 179.0 | 179.0 | 179.0 | 180.3 | 180.2 | 180.2 | 180.3 | 180.0 | 179.0 | 180.4 | 180.3 | 0.95 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|-----------------|--------------------------|-----------------------------|--------------------------|-------------------------|------------------------|
| 104.0 | 103.5 | 103.5 | 0.5 | 0.1 | 0.8 |
| 110.0 | 109.5 | 109.5 | 0.7 | 0.1 | 1.0 |
| 180.0 | 179.0 | 179.0 | 1.5 | 0.2 | 1.7 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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



Envilab Co.,Ltd.

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Signature



CAL

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400049-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhac7, Bangkhac, Bangkok 10160

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB29

Range : N/A °C

Resolution : 0.1 °C

Serial No. : L617.0156

ID No. : ELABWBWNB29N01

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

Ambient Temperature : (26.0 to 26.5) °C

Relative Humidity : (45 to 50) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 05 February 2021

Date of Calibration : 05 February 2021

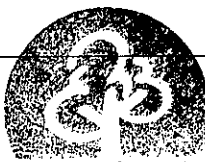
Date of Issue : 06 February 2021

Calibrated by : Permpon Chanpu

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

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

| <u>ID No.</u> | <u>Cert. No.</u> | <u>Due Date</u> | <u>Traceability</u> |
|-----------------|------------------|-----------------|---|
| 400029 & 400031 | 63-400449-1 | 28 Mar 2021 | National Institute of Metrology Thailand (NIMT) |



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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

Certificate of Calibration

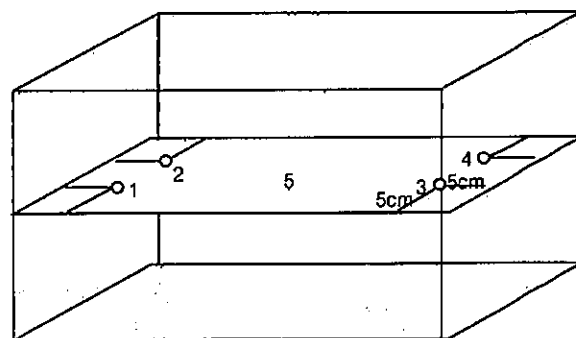
Certificate No. : 64-400049-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Front

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | Uncertainty (±°C) | Measured Uniformity (°C) | Measured Stability (°C) |
|--------------------|-----------------------------|--------------------------------|---|-------|-------|-------|-------|----------------------|-----------------------------|----------------------------|
| | | | 1 | 2 | 3 | 4 | 5 | | | |
| 95.0 | 95.0 | 95.0 | 95.35 | 95.44 | 95.53 | 95.38 | 95.46 | 0.20 | 0.19 | 0.09 |

Remark The uncertainty is not combine uniformity of the water bath

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

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

- o0o -



Envilab Co.,Ltd.

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NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-300152-2

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : PYREX

Class : A

Capacity : 50 ml

Graduation : 1 ml

ID No. : C-WW-002/21

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Wipa Tovadec)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%.

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

Certificate of Calibration

Certificate No. : 64-300152-2

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

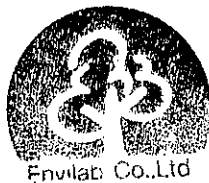
| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 30 | 29.93 |
| 50 | 50.01 |

Uncertainty of measurement with in \pm 0.054 ml

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%

- o0o -



Envilab Co.,Ltd

DM dkm
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ผู้จัดการฝ่ายควบคุมคุณภาพ

D.



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. : 64-300152-6

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : Witeg

Class : A

Capacity : 1000 ml

Graduation : 10 ml

ID No. : C-WW-029/18

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Wipa Tovadee)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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

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

Certificate of Calibration

Certificate No. : 64-300152-6

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 500 | 502.85 |
| 1000 | 1001.86 |

Uncertainty of measurement with in \pm 0.17 ml

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%

- o O o -

D.



Envilab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ



ประจำเดือนกุมภาพันธ์ พ.ศ. 2565



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 Bangkok 10160
Tel : 02-802-3577-9 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.

HO2100150-D002 -TSP 01

☐ PM ☒ Onsite

Site: โครงการก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย

UTM : 47P 1532758 N 673757 E

Date: 1 Dec 21

Sampler: NTSP#14

Technical: Hasan S.

Recorder: ECRANG15314321

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1010.0

Corrected Pressure (mm Hg): 757.6

Temperature (deg C): 30.0

Temperature (deg K): 303.0

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: 2.05054

Model: TE-5025A

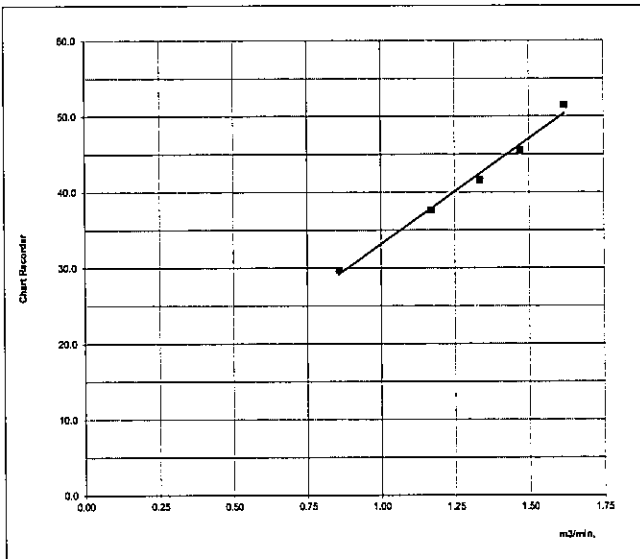
Qstd Intercept: -0.00430

Serial#: 2067

Date Certified: 11 Jan 21

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|---|
| 1 | 11.21 | 1.619 | 52.0 | 51.49 | |
| 2 | 9.24 | 1.470 | 46.0 | 45.55 | Slope = 27.8599 Intercept = 5.2480 Corr. coeff.= 0.9948 # of Observations: 5 Range of Chart 37 at 1.1 - 1.7 m3/min. 53 |
| 3 | 7.62 | 1.335 | 42.0 | 41.59 | |
| 4 | 5.84 | 1.169 | 38.0 | 37.62 | |
| 5 | 3.14 | 0.858 | 30.0 | 29.70 | |



Calibrated by :

Hasan Seng

(Hasan Seng)
1 December 2021

Approved by :

Sarawut Keawsrinual
(Sarawut Keawsrinual)
1 December 2021

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www.evltesting.com

Environmental responsibility with accuracy measurement



บริษัท เอ็นวิเทล จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envikab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkok Bangkok Bangkok 10160
Tel : 02-602-3577-8 Fax: 02-602-3775 E-mail : info@evltesting.com



Envikab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkok Bangkok Bangkok 10160

PM10 High Volume Sampler Calibration

Verification Report No.

HO2100150-D002 -PM 01

L PM ☒ Onsite

Site: โครงการก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย
UTM : 47P 1532758 N 673757 E Date: 1 Dec 21
Sampler: EPM#38 Technical: Hasan S.
Recorder: ECRDS01618025857 Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1010.0
Temperature (deg C): 30.0
Average Press. (hPa): 1013.0
Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.6
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#: 2067

Slope: 1.28401
Intercept: -0.00265
Date Certified: 11 Jan 21

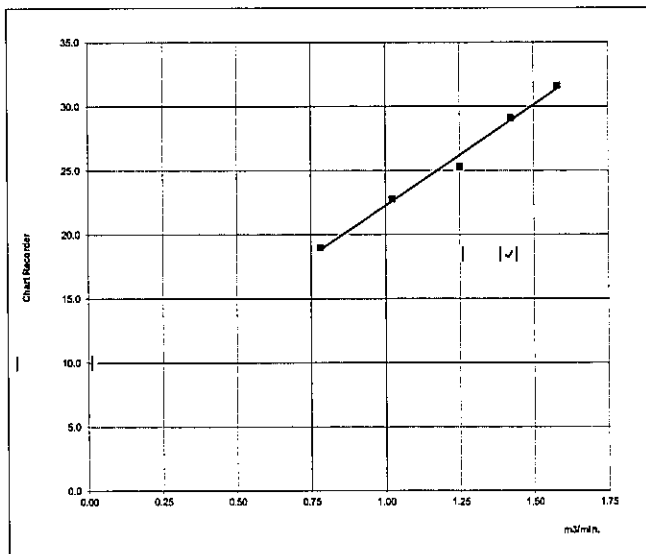
CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) |
|-----------------|----------|-------------|-----------|----------------|
| 1 | 10.26 | 1.580 | 50.0 | 31.62 |
| 2 | 8.32 | 1.423 | 46.0 | 29.09 |
| 3 | 6.41 | 1.249 | 40.0 | 25.30 |
| 4 | 4.29 | 1.022 | 36.0 | 22.77 |
| 5 | 2.51 | 0.782 | 30.0 | 18.97 |

LINEAR REGRESSION

Slope = 15.7456
Intercept = 6.4783
Corr. coeff = 0.9955
SFR = 1.133
SSP = 38.46
of Observations: 5

Range of Chart at SFR $\pm 10\%$ 36
40



Calibrated by :

(Hasan Seng)

1 December 2021

Approved by :

(Sarawut Keawsrinual)

1 December 2021

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www.evltesting.com

Environmental responsibility with accuracy measurement

FE-AMT-29 Rev.00-01/08/53



neediss

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

536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E:info@neediss.com



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6412002

Page:1/1

Calibrated Date: 1-Dec-21

☒ PM ☐ Onsite

Instruments Information

| | |
|------------------------------------|-----------------------------|
| Analyzer Type: SO2 Analyzer | Manufacturer: THERMO |
| Model: THERMO.,43C | S/N: ESOTE43C668327 |

Calibration System

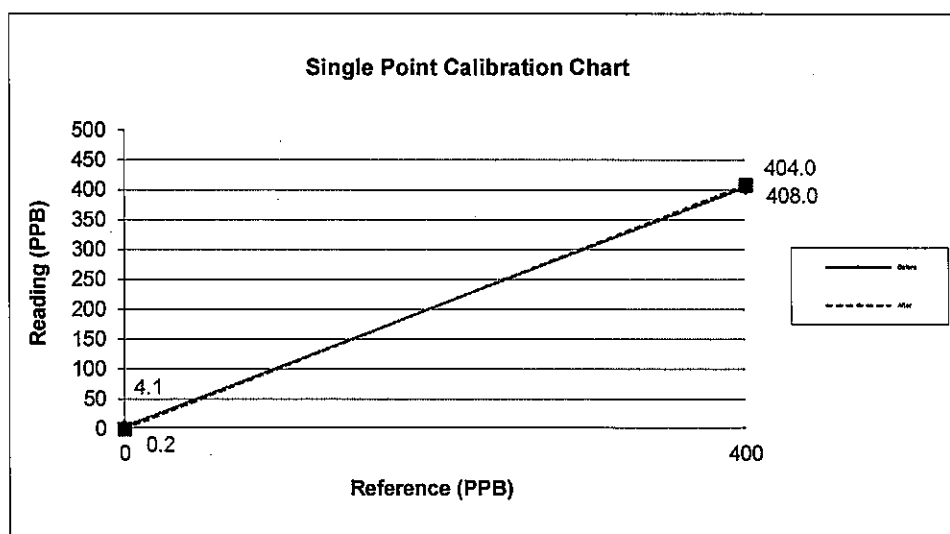
| Calibrator Unit | Standard Gas |
|----------------------------|------------------------------------|
| Dilutor Model ESA MGC101 | NO Conc 44.68 PPM |
| S/N: 792 | SO2 Conc 45.34 PPM |
| ZERO AIR Generator ZAG7001 | CO Conc 4500 PPM |
| S/N: 644 | Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 25.4 °C

Humidity: 60 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0 | 4.1 | 4.1 | 400.0 | 404 | 1.0 |
| After | 0.0 | 0.2 | 0.2 | 400.0 | 408 | 2.0 |



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12/21/2021



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-12-2021

S/N : ESOTE43C668327

| Test Function Value | Before | After |
|---------------------------------|--------|-------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -650 | -653 |
| LAMP VOLTAGE 950 - 1,200 (V) | 990 | 985 |
| LAMP INTENSITY 20000 - 50000 Hz | 32568 | 32577 |
| INTER TEMP 15 - 45 DEG C | 37 | 37 |
| CHAMBER TEMP 47 - 51 C | 49 | 49 |
| COOLER TEMP -5 - (-2) DEG C | -2.5 | -2.5 |
| PRESSURE 400 - 1000.0 mm Hg | 764 | 765 |
| FLOW 0.350 - 0.650 LPM | 0.42 | 0.4 |
| | | |
| | | |
| | | |

Calibrate By :

Sirirat Poonlak

Approve By :

Sarawut Keawsrinual

Sirirat Poonlak

Sarawut Keawsrinual

Date:

1-Dec-21

Date:

1-Dec-21

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**neediss**บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E:info@neediss.com

NOx Analyzer Verification Test Report

Calibration Report No.: 6412007
Calibrated Date: 1-Dec-21

Page:1/2

☒ PM ☐ Onsite

Instruments Information

| | |
|--|--|
| Analyzer Type: NO/NO2/NOx Analyzer Model: 42C | Manufacturer THERMO S/N: ENOTE42C497375 |
|--|--|

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 SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

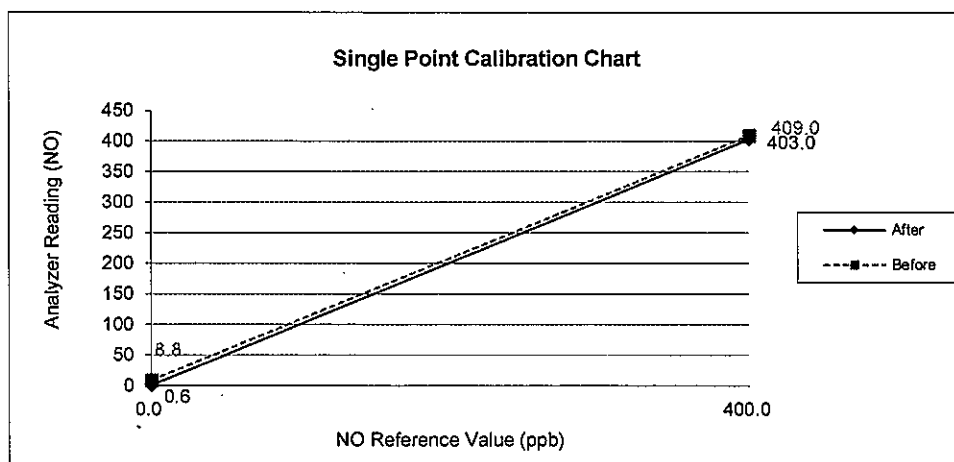
Environment: Temperature 25.4 °CHumidity: 62 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 8.8 | 0.0 | 8.8 | 409 | 400.0 | 1.1 |
| NO ₂ | 1.4 | 0.0 | 1.4 | 4.0 | 0.0 | 0.5 |
| NOx | 10.2 | 0.0 | 10.2 | 413 | 400.0 | 1.6 |

Calibration Check (After adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.6 | 0.0 | 0.6 | 403 | 400.0 | 0.4 |
| NO ₂ | -0.2 | 0.0 | -0.2 | 3.0 | 0.0 | 0.4 |
| NOx | 0.4 | 0.0 | 0.4 | 406 | 400.0 | 0.7 |



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Neediss Supply Instrument Co., Ltd.535 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 535 Soi Bangkhae 7 Bangkhae Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E: info@neediss.com

MODEL : NOx ANALYZER Model 42C THERMO

DATE : 1-12-2021

S/N : ENOTE42C497375

Page:2/2

| Test Function Value | Before | After |
|----------------------------------|---------|---------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -675 | -678 |
| LAMP VOLTAGE 950 - 1,200 (V) | | |
| INTER TEMP 15 - 45 DEG C | 43 | 43 |
| CHAMBER TEMP 47 - 51 C | 49 | 50 |
| COOLER TEMP -5 - (-2) DEG C | -2 | -2 |
| PRESSURE 400 - 1000.0 mm Hg | 350 | 380 |
| SAMPLE FLOW 0.350 - 0.900 LPM | 0.45 | 0.46 |
| OZONEATOR FLOW 0.035 - 0.075 LPM | 0.05 | 0.05 |
| No/Nox BKG | 12/9.0 | 12/9.1 |
| No/Nox Slope | 1.0/0.8 | 0.9/0.8 |
| | | |

Calibrate By :

Sirirat Poonlak

Date:

1-Dec-21


Approve By :

Sarawut Keawsrinual

Date:

1-Dec-21

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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 & Neediss Supply Instrument

Verification Test Report

Report No.:

HO2100150-D002 -SLM 01

☐ PM

☒ Onsite UTM :

47 P 1532744 N 673776 E

Calibrated Date: 1 December 2021

Site : โครงการ ก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 8007

Environment: Temperature 28 °C Humidity 56 %RH

Reference Standard: Sound Calibrator Class 1 Model 4230,Brue&Kjaer

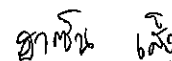
Serial No. 1351075

Date of Calibration : Feb.18, 2021

Result of Test

| Reference Standard (dB) | Instrument reading (dB) | Error (dB) | Adjust (dB) |
|----------------------------|----------------------------|---------------|----------------|
| 93.8 | 39.9 | -53.9 | 93.8 |

Calibrated By:



(Hasan Seng)

Date:

1 December 2021

Approve By:



(Sarawut Keawsrinual)

Date:

1 December 2021

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Certificate of Calibration

Calibration Certification Information

Cal. Date: January 11, 2021 Rootsmeter S/N: 438320 Ta: 293 °K
 Operator: Jim Tisch Pa: 757.9 mm Hg
 Calibration Model #: TE-5025A Calibrator S/N: 2067

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.4470 | 3.3 | 2.00 |
| 2 | 3 | 4 | 1 | 1.0260 | 6.4 | 4.00 |
| 3 | 5 | 6 | 1 | 0.9120 | 8.0 | 5.00 |
| 4 | 7 | 8 | 1 | 0.8660 | 8.9 | 5.50 |
| 5 | 9 | 10 | 1 | 0.7170 | 12.9 | 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) |
|-----------|---------------|--|--------|-------------|---|
| 1.0099 | 0.6979 | 1.4243 | 0.9956 | 0.6881 | 0.8793 |
| 1.0057 | 0.9803 | 2.0143 | 0.9916 | 0.9664 | 1.2435 |
| 1.0036 | 1.1004 | 2.2520 | 0.9894 | 1.0849 | 1.3903 |
| 1.0024 | 1.1575 | 2.3619 | 0.9883 | 1.1412 | 1.4581 |
| 0.9970 | 1.3906 | 2.8486 | 0.9830 | 1.3710 | 1.7586 |
| QSTD | m= | 2.05054 | QA | m= | 1.28401 |
| | b= | -0.00430 | | b= | -0.00265 |
| | r= | 0.99994 | | r= | 0.99994 |

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



รับรองสำเนาถูกต้อง
 ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-200011-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.
536 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Electronic Balance
Manufacturer : Sartorius Model : SECURA224-1S
Serial No. : 0034803270 ID No. : ELABBALANCEN04
Capacity : 220 g Resolution : 0.0001 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.
Ambient Temperature : (22.2 to 22.9) °C
Relative Humidity : (55.9 to 62.2) %
Air Pressure : (1014.0 to 1015.0) mbar

Date of Received : 05 February 2021

Date of Calibration : 05 February 2021

Date of Issue : 08 February 2021

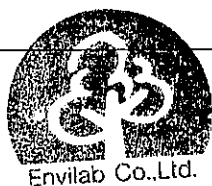
Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-----------|-------------|--|
| E261-E2624 | C02204101 | 17 Nov 2021 | National Institute of Metrology (Thailand), (NIMT) |



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%.

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CAL

Calibratech Co., Ltd.

7/106-7 Moo 2, Sukhaphrasan 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. : 64-200011-1

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) |
|----------------------|-------------------|--------------------------|
| 0.01 | 0.0001 | 0.00011 |
| 0.1 | 0.0001 | 0.00011 |
| 1 | 0.0000 | 0.00011 |
| 2 | 0.0001 | 0.00011 |
| 5 | 0.0000 | 0.00011 |
| 10 | 0.0000 | 0.00011 |
| 20 | -0.0001 | 0.00012 |
| 50 | -0.0001 | 0.00014 |
| 100 | -0.0001 | 0.00020 |
| 200 | -0.0002 | 0.00038 |

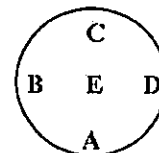
This result of calibration was found accurate as shown on date and place of calibration only.

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
0.0001 0.0000 0.0000 0.0000 0.0000 g



Repeatability

Load test : 200 g

Stdev. : 0.00005 g



- 000 -

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Calibratech Co., Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpoo, 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. : 64-410010-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Digital Thermo-Hygrometer

Manufacturer : ebro

Model : EBI 20-TH1

Range Temperature : -30 °C to 60 °C

Resolution : 0.1 °C

Range Humidity : 0 %R.H. to 100 %R.H.

Resolution : 0.1 %R.H.

Serial No. : 62227425

ID No. : N/A

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

Relative Humidity : (50 ± 15) %

Date of Received : 05 February 2021

Date of Calibration : 11 February to 13 February 2021

Date of Issue : 13 February 2021

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 & 400036 SG-H-00041/64

12 Jul 2021

Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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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. : 64-410010-1

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) |
|------------------------------|---------------------|--------------------|-----------------------|
| 10.04 | 9.8 | 0.2 | 0.46 |
| 25.00 | 25.0 | 0.0 | 0.46 |
| 30.02 | 30.0 | 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.) |
|------------------------------|------------------------|-----------------------|--------------------------|
| 39.99 | 47.7 | -7.7 | 2.2 |
| 50.03 | 56.2 | -6.1 | 2.2 |
| 59.99 | 66.0 | -6.0 | 2.3 |

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 -



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0312

MTC No. EEL. BP. 57/0264

CALIBRATION CERTIFICATE

Submitted by : Envilab Co., Ltd.

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

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1 C, 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 ± 1.500) kPa

- Standards used :**
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Keithley 2015-P S/N 4106495.
 7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

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

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

Date of Receipt : 10 Feb. 2021

Date of Calibration : 18 Feb. 2021

1 / 2

The results relate only to the items tested or calibrated.

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FM.BL.MTC.002 Rev.3

Head Office

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

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax: (66) 0 2323 1655
E-mail : msc@tistr.or.th

Office

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



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0312

MTC No. EEL. BP. 57/0264

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 HzAcoustic 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 | 93.78 | -0.22 | ± 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 | 998.3 | -1.7 | ± 1.5 | $\pm 1.0\%$ |

3. Total Distortion

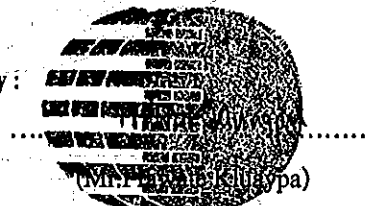
| Standard Microphone Type | Measured Total Distortion (%) | Uncertainty (%) | Tolerance limit IEC60942:2003 Class 1 |
|---------------------------|-------------------------------|-----------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 0.68 | ± 0.50 | $\pm 3.0\%$ |

- Note: 1. No adjustment.
2. The calibrator pressure correction was not included.
3. The microphone volume correction was not included.

Calibrated by:

.....
(Mr. Tawikiat Iamsamran)

Approved by:


(Mr. P. P. Kulkarni)

TISTR

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 18 Feb. 2021

Date of Issue : 19 Feb. 2021

Ref : 2011264021000592001

2 / 2

End of Certificate

The results relate only to the items tested or calibrated.

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FM.BL.MTC.002 Rev.3

Head Office

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

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2623 1000 ext. 115, 116
Fax. (66) 0 2623 1001
E-mail : mtc@tistr.or.th

Office

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

Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A00V3 Reference Number: 160-402021734-1
Cylinder Number: EB0140762 Cylinder Volume: 144.4 Cubic Feet
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12021 Valve Outlet: 660
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Feb 19, 2021

Expiration Date: Feb 19, 2024

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.

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 | 44.68 PPM | G1 | +/- 1.4% NIST Traceable | 02/12/2021, 02/19/2021 |
| NITRIC OXIDE | 45.00 PPM | 44.62 PPM | G1 | +/- 1.4% NIST Traceable | 02/12/2021, 02/19/2021 |
| SULFUR DIOXIDE | 45.00 PPM | 45.34 PPM | G1 | +/- 1.1% NIST Traceable | 02/12/2021, 02/19/2021 |
| CARBON MONOXIDE | 4500 PPM | 4500 PPM | G1 | +/- 1.0% NIST Traceable | 02/15/2021 |
| NITROGEN | Balance | | | | |

| CALIBRATION STANDARDS | | | | | |
|-----------------------|-----------|-------------|-------------------------------------|-------------|-----------------|
| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
| NTRM | 200611-04 | CC707968 | 49.82 PPM NITRIC OXIDE/NITROGEN | +/-1.0% | Feb 02, 2025 |
| PRM | 12386 | D685025 | 9.91 PPM AIR/NITROGEN DIOXIDE | 2.0% | Feb 20, 2020 |
| GMIS | 124206889 | CC323707 | 4.028 PPM NITROGEN DIOXIDE/NITROGEN | 2.1% | Aug 15, 2021 |
| NTRM | 0141709 | KAL003190 | 49.67 PPM SULFUR DIOXIDE/NITROGEN | +/- 1.0% | Jun 20, 2022 |
| NTRM | 08012341 | KAL004716 | 4857 PPM CARBON MONOXIDE/NITROGEN | +/- 0.6% | Jun 07, 2024 |

The SRM, 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 | Jan 27, 2021 |
| Nicolet IS50 FTIR AUP2010245 NO | FTIR | Feb 11, 2021 |
| Nicolet IS50 FTIR AUP2010245 NO2 | FTIR | Jan 21, 2021 |
| Nicolet IS50 FTIR AUP2010245 SO2 | FTIR | Jan 21, 2021 |

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.4 Kg
Net Weight: 4.5 Kg
PO# 5221000405



Michael A. Parker
Approved for Release



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM18218

Calibration Date: MAR 24 2021

Calibration Reference Equipment: 714J7402

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard.

Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: 

Xiaoming Yang



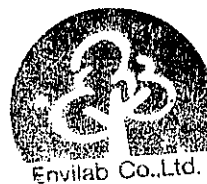
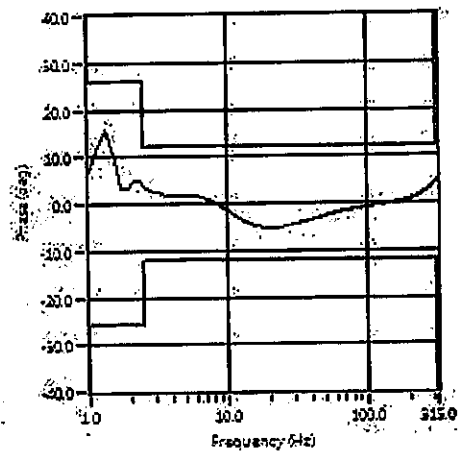
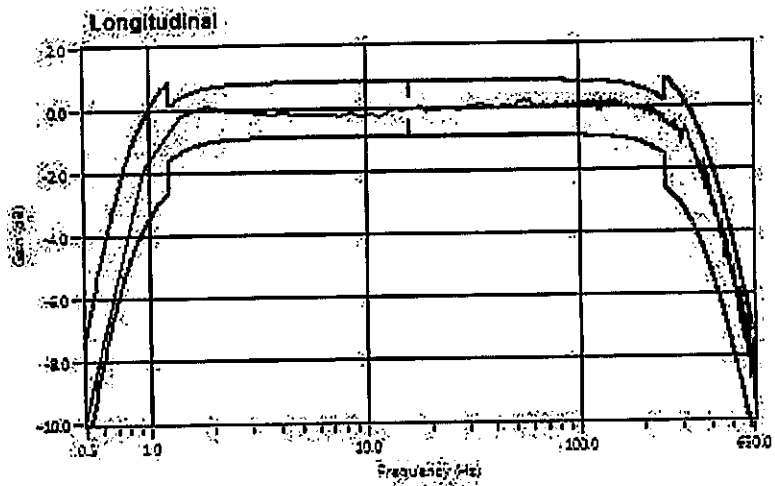
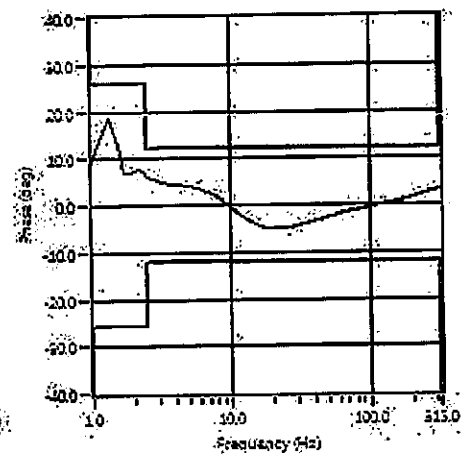
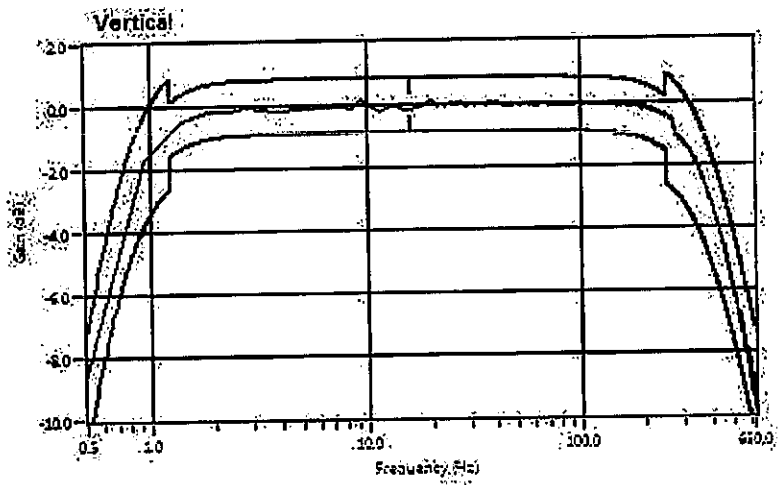
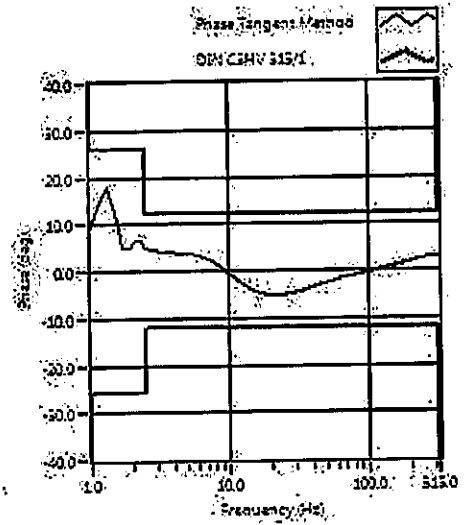
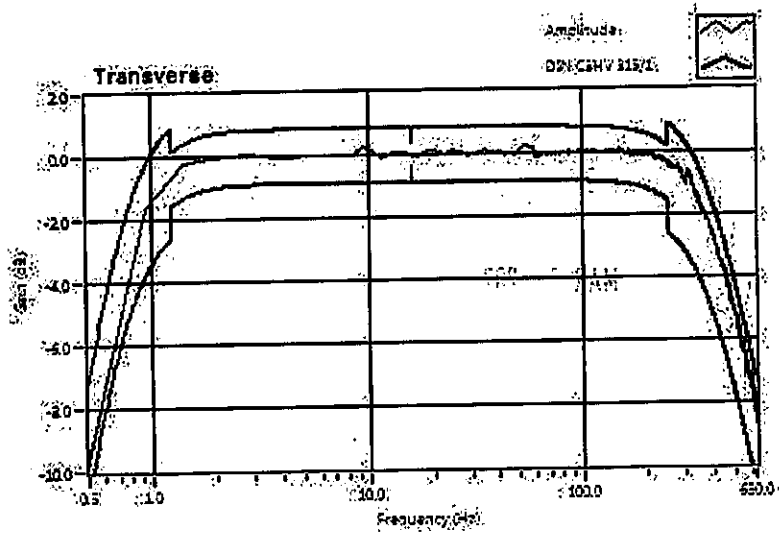
Instantel

309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Frequency Response of UM18218



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-200049-1

Page : 1 of 2

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

Equipment : Electronic Balance
Manufacturer : Sartorius Model : SECURA125-1S
Serial No. : 0034606552 ID No. : ELABBALANCEN05
Capacity : 120 g Resolution : 0.00001 g

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

Ambient Temperature : (23.1 to 24.0) °C

Relative Humidity : (56.7 to 61.9) %

Air Pressure : 1013.0 mbar

Date of Received : 02 March 2021

Date of Calibration : 02 March 2021

Date of Issue : 06 March 2021

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-----------|-------------|--|
| E261-E2624 | C02204101 | 17 Nov 2021 | National Institute of Metrology (Thailand), (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-200049-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

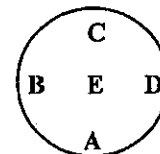
Departure of indication from nominal value

| Nominal Value (g) | Correction (g) | Uncertainty \pm (g) |
|----------------------|-------------------|--------------------------|
| 0.1 | 0.00000 | 0.000017 |
| 0.5 | -0.00001 | 0.000022 |
| 1 | 0.00001 | 0.000026 |
| 2 | 0.00000 | 0.000034 |
| 5 | -0.00001 | 0.000043 |
| 10 | 0.00000 | 0.000053 |
| 20 | -0.00002 | 0.000071 |
| 50 | -0.00003 | 0.00011 |
| 100 | -0.00005 | 0.00020 |
| 120 | -0.00006 | 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 $k = 2.11$, providing a level of confidence of approximately 95%

Eccentric error Load test : 20 g
A B C D E
0.00003 0.00003 -0.00001 0.00001 0.00000 g



Repeatability Load test : 100 g
Stdev. : 0.000014 g



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Certificate of Calibration

Certificate No. : 64-410010-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Digital Thermo-Hygrometer

Manufacturer : ebro

Model : EBI 20-TH1

Range Temperature : -30 °C to 60 °C

Resolution : 0.1 °C

Range Humidity : 0 %R.H. to 100 %R.H.

Resolution : 0.1 %R.H.

Serial No. : 62227425

ID No. : N/A

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

Relative Humidity : (50 ± 15) %

Date of Received : 05 February 2021

Date of Calibration : 11 February to 13 February 2021

Date of Issue : 13 February 2021

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 & 400036 SG-H-00041/64

12 Jul 2021

Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-410010-1

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) |
|------------------------------|---------------------|--------------------|-----------------------|
| 10.04 | 9.8 | 0.2 | 0.46 |
| 25.00 | 25.0 | 0.0 | 0.46 |
| 30.02 | 30.0 | 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.) |
|------------------------------|------------------------|-----------------------|--------------------------|
| 39.99 | 47.7 | -7.7 | 2.2 |
| 50.03 | 56.2 | -6.1 | 2.2 |
| 59.99 | 66.0 | -6.0 | 2.3 |

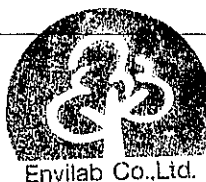
Remark

UUC : Unit Under Calibration

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

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

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NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-420055-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : pH Meter (Pocket)

pH meter

Manufacturer : Eutech

Model : pHTestr 30

Range : -1.00 to 15.00 pH

Resolution : 0.01 pH

Serial No. : 2856418

ID No. : ELABPHTEST3016

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

Ambient Temperature : (24.5 to 25.0) °C

Relative Humidity : (50 to 54) %

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 24 March 2021

Calibrated by : Bunjerd Masri

Calibration Method : In-house method CAL-M4201 direct measurement by using certified reference material (CRM)

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

Standard Buffer Solution

| pH | Cert. No. | Lot No. | Exp. Date | Traceability |
|-------|-----------|---------|-------------|--------------|
| 4.004 | 61208711 | 684575 | 01 Sep 2021 | CPA chem |
| 6.985 | 61191143 | 684576 | 01 Sep 2021 | CPA chem |
| 9.963 | 61208865 | 684577 | 01 Sep 2021 | CPA chem |



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Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%.

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Certificate of Calibration

Certificate No. : 64-420055-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

| Adjustment Curve at nominal pH | Standard Buffer (pH) | UUC Reading (pH) | Correction (pH) | Uncertainty (± pH) |
|-----------------------------------|---------------------------|-----------------------|----------------------|-------------------------|
| 4, 7, 10 | 4.004 | 4.00 | 0.01 | 0.011 |
| | 6.985 | 7.00 | -0.01 | 0.020 |
| | 9.963 | 10.00 | -0.04 | 0.053 |

Remark

1 UUC : Unit Under Calibration

2 pH meter does not have voltage mode because the plug can not BNC socket

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

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

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Envilab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 21TW57

Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : Hanna
Model : HI 9146
Serial No. : G0007931
ID No. : EDOHI914607931
Received Date : 16 March 2021
Test Date : 19 March 2021
Reference : 2103-0669DN-1
Submitted by : Envilab Co.,Ltd (Head office)
540, 540/1 Soi Bangkhuae 7, Bangkhuae,
Bangkhuae, Bangkok 10160
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Calibrated by : Walalak Sirithean

Approved by :

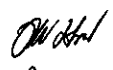

Approved Signatory

(☒) Malee Butkruea
(☐) Saithip Meangmai
(☐) Warakorn Lerngagtrakul

Issue Date :

23 March 2021




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B 0257191



Cert.No.: 21TW57

Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: KC1A01TAF

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|---|-------------------------------|------------------------------|
| 8.00 | 8.17 | 0.00 |

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400569-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Refrigerator)

Manufacturer : M-LAB

Model : BIC-140

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 1011

ID No. : ELABBODC140N03

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

Ambient Temperature : (23.0 to 23.8) °C

Relative Humidity : (55 to 60) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 12 November 2021

Date of Calibration : 12 November 2021

Date of Issue : 18 November 2021

Calibrated by : Bunjerd Masri

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No.

Cert. No.

Due Date

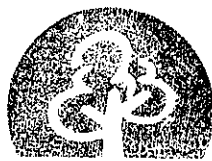
Traceability

400046 & 400023

64-400443-1

29 Mar 2022

National Institute of Metrology Thailand (NIMT)



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400569-1

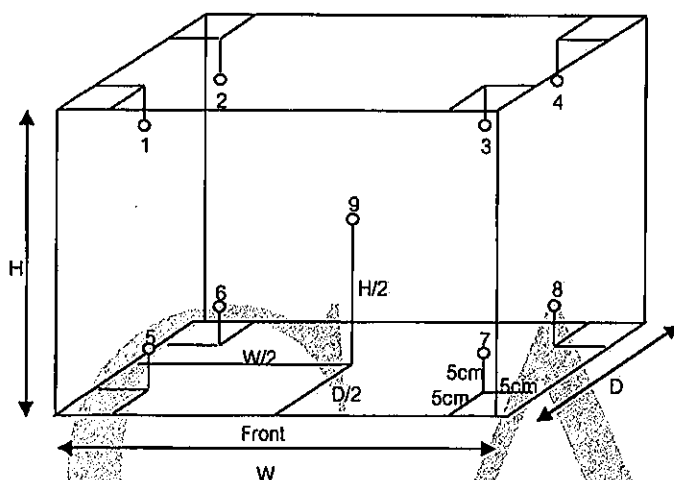
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.38 m

D = 0.35 m

H = 1.15 m

Capacity = 0.15 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (±°C) |
|--------------------|-----------------------------|--------------------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|----------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 4.0 | 4.0 | 4.0 | 3.3 | 3.2 | 3.4 | 3.4 | 3.9 | 3.9 | 4.0 | 3.4 | 4.2 | 0.57 |

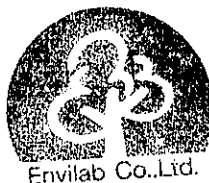
| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 4.0 | 4.0 | 4.0 | 1.0 | 0.1 | 1.0 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

- ooo -



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



NSC-TISI-TIS17025
CALIBRATION 0109

CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

Customer Envilab Co.,Ltd.

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

Place of Calibration MICRO ROOM (B302)

Description Incubator

Model IF75

Serial No. D319.0066

ID.No. -

Date of Receipt Feb 12, 2021

Date of Calibration Feb 12, 2021

Environment

| | | | | | | |
|-------------------|-------|------|-----|-------|------|-----|
| Temperature | (Min) | 25.1 | °C | (Max) | 26.1 | °C |
| Relative Humidity | (Min) | 67.2 | %RH | (Max) | 69.3 | %RH |

Calibration Method

WI-17 : The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.

The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY49007789, Certificate No. QR20-2119, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292.

This certificate is traceable to SI unit.

Page 1 of 3

O.Mi

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.



Onth
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ผู้จัดการฝ่ายควบคุมคุณภาพ



Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



NSC-TISI-TIS17025
CALIBRATION 0109

CALIBRATION CERTIFICATE

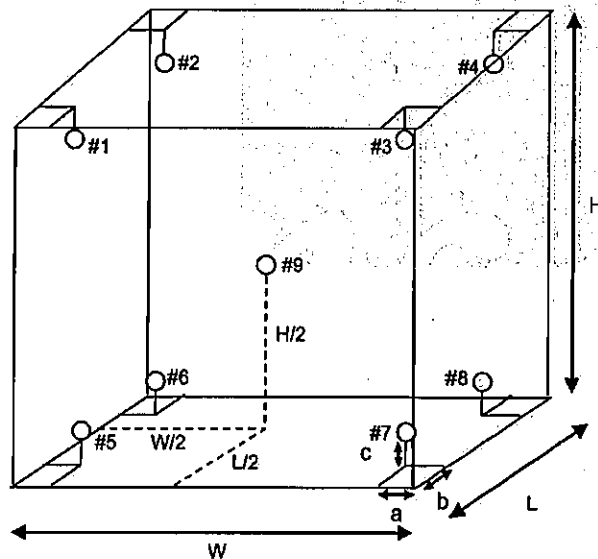
Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

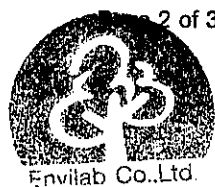
Results (without adjustment)



Position of reference thermometers were placed

Note.

- 1). Dimension (W x L x H) is 40 x 33 x 56 cm.
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

D.Mi



Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

Results (without adjustment)

| UUC Setting (°C) | UUC Reading (°C) | Reference Thermometer (°C) | | Stability \pm (°C) | Uniformity (°C) | Uncertainty \pm (°C) |
|------------------------|------------------------|----------------------------------|--------|-------------------------|--------------------|---------------------------|
| 44.5 | 44.5 | Position 1 | 44.536 | 0.048 | 0.448 | 0.31 |
| | | Position 2 | 44.593 | | | |
| | | Position 3 | 44.601 | | | |
| | | Position 4 | 44.570 | | | |
| | | Position 5 | 44.532 | | | |
| | | Position 6 | 44.386 | | | |
| | | Position 7 | 44.131 | | | |
| | | Position 8 | 44.523 | | | |
| | | Position 9 | 44.536 | | | |

The stability and uniformity was taken into account in the measurement uncertainty stated.

The above results are valid exclusively for calibration samples as mentioned in the report.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :

(MR. DAMRONG MULSING)

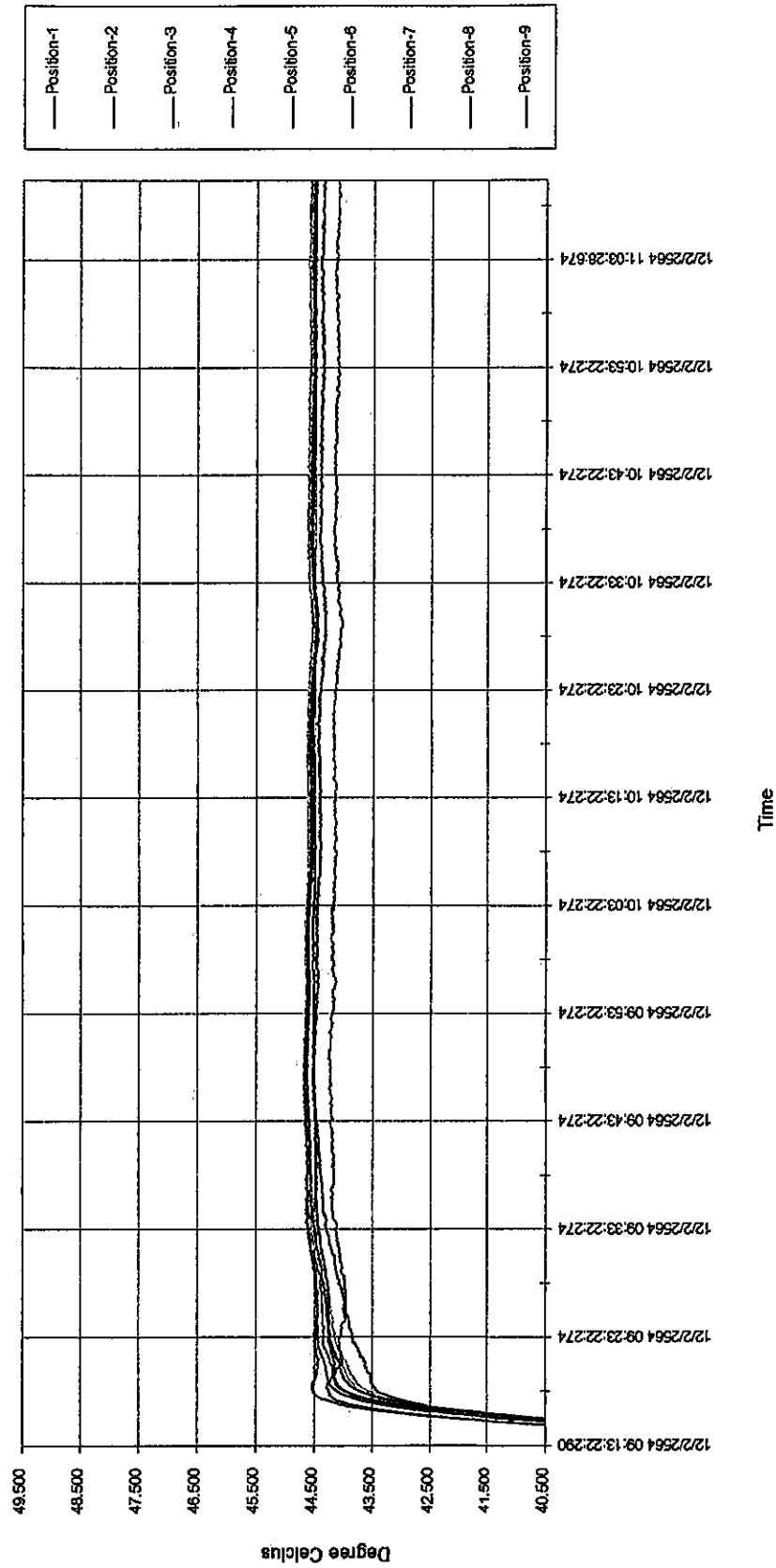
Page 3 of 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Cert.No. 21/0323

Incubator
Model IF75 S/N. D319.0066 ID.No. -



Envitab Co., Ltd.
ผู้จัดการฝ่ายควบคุมคุณภาพ
รณรงค์สำเนาถูกต้อง

CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400163-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Oven)

Manufacturer : Memmert

Model : UF 75

Range : N/A °C

Resolution : 0.1 °C

Serial No. : B319.0600

ID No. : N/A

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

Ambient Temperature : (30.0 to 31.5) °C

Relative Humidity : (50 to 55) %

Line Voltage : (224.2 to 225.2) V

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 25 March 2021

Calibrated by : Permpon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

ID No.

Cert. No.

Due Date

Traceability

400029 & 400032

63-400450-1

30 Mar 2021

National Institute of Metrology Thailand (NIMT)



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400163-2

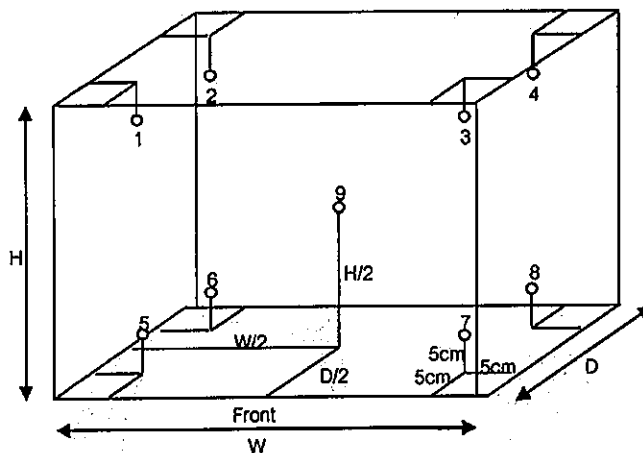
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.56 m

Capacity = 0.07 m³

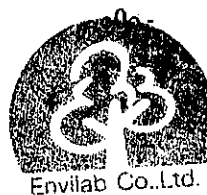
| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|-----------------|--------------------------|-----------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 104.0 | 103.5 | 103.5 | 104.0 | 104.3 | 104.3 | 104.2 | 104.2 | 103.9 | 103.7 | 104.2 | 104.1 | 0.69 |
| 110.0 | 109.5 | 109.5 | 110.0 | 110.4 | 110.4 | 110.2 | 110.2 | 109.9 | 109.6 | 110.2 | 110.1 | 0.69 |
| 180.0 | 179.0 | 179.0 | 179.0 | 180.3 | 180.2 | 180.2 | 180.3 | 180.0 | 179.0 | 180.4 | 180.3 | 0.95 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|-----------------|--------------------------|-----------------------------|--------------------------|-------------------------|------------------------|
| 104.0 | 103.5 | 103.5 | 0.5 | 0.1 | 0.8 |
| 110.0 | 109.5 | 109.5 | 0.7 | 0.1 | 1.0 |
| 180.0 | 179.0 | 179.0 | 1.5 | 0.2 | 1.7 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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



Envilab Co.,Ltd.

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Signature



CAL

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NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400049-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhac7, Bangkhac, Bangkok 10160

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB29

Range : N/A °C

Resolution : 0.1 °C

Serial No. : L617.0156

ID No. : ELABWBWNB29N01

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

Ambient Temperature : (26.0 to 26.5) °C

Relative Humidity : (45 to 50) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 05 February 2021

Date of Calibration : 05 February 2021

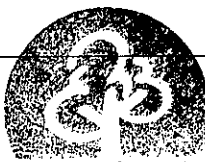
Date of Issue : 06 February 2021

Calibrated by : Permpon Chanpu

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

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

| <u>ID No.</u> | <u>Cert. No.</u> | <u>Due Date</u> | <u>Traceability</u> |
|-----------------|------------------|-----------------|---|
| 400029 & 400031 | 63-400449-1 | 28 Mar 2021 | National Institute of Metrology Thailand (NIMT) |



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

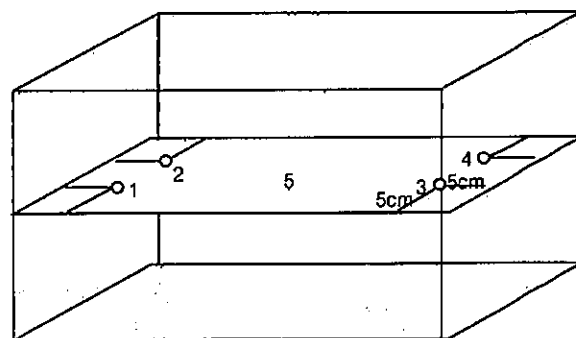
Certificate No. : 64-400049-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Front

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | Uncertainty (±°C) | Measured Uniformity (°C) | Measured Stability (°C) |
|--------------------|-----------------------------|--------------------------------|---|-------|-------|-------|-------|----------------------|-----------------------------|----------------------------|
| | | | 1 | 2 | 3 | 4 | 5 | | | |
| 95.0 | 95.0 | 95.0 | 95.35 | 95.44 | 95.53 | 95.38 | 95.46 | 0.20 | 0.19 | 0.09 |

Remark The uncertainty is not combine uniformity of the water bath

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

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

- o0o -



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NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-300152-2

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : PYREX

Class : A

Capacity : 50 ml

Graduation : 1 ml

ID No. : C-WW-002/21

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Wipa Tovadec)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%.

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

Certificate of Calibration

Certificate No. : 64-300152-2

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

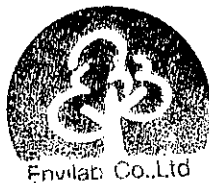
| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 30 | 29.93 |
| 50 | 50.01 |

Uncertainty of measurement with in \pm 0.054 ml

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%

- o0o -



Envilab Co.,Ltd

DM dkm
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ผู้จัดการฝ่ายควบคุมคุณภาพ

D.



CAL

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Certificate of Calibration

Certificate No. : 64-300152-6

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : Witeg

Class : A

Capacity : 1000 ml

Graduation : 10 ml

ID No. : C-WW-029/18

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Wipa Tovadee)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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

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

Certificate of Calibration

Certificate No. : 64-300152-6

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 500 | 502.85 |
| 1000 | 1001.86 |

Uncertainty of measurement with in \pm 0.17 ml

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%

- o O o -

D.



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ

ฉบับที่ ๒๑ (พ.ศ. ๒๕๔๔)

ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ

พ.ศ. ๒๕๓๕

เรื่อง กำหนดมาตรฐานค่าก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศโดยทั่วไป

ในเวลา ๑ ชั่วโมง

อาศัยอำนาจตามความในมาตรา ๓๒ และมาตรา ๓๔ แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ คณะกรรมการสิ่งแวดล้อมแห่งชาติ จึงปรับปรุงแก้ไขมาตรฐานค่าก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศโดยทั่วไปในเวลา ๑ ชั่วโมงไว้ดังต่อไปนี้

(๑) ให้ยกเลิกข้อ ๒ แห่งประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ ๑๒ (พ.ศ. ๒๕๓๗) ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ เรื่อง กำหนดมาตรฐานค่าก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศโดยทั่วไปในเวลา ๑ ชั่วโมง

(๒) ให้ยกเลิกความในข้อ ๓ และข้อ ๕ แห่งประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ ๑๒ (พ.ศ. ๒๕๓๗) ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ เรื่อง กำหนดมาตรฐานค่าก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศโดยทั่วไปในเวลา ๑ ชั่วโมง และให้ความต่อไปนี้แทน

“ข้อ ๓ ค่าเฉลี่ยความเข้มข้นของก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศโดยทั่วไปในเวลา ๑ ชั่วโมง จะต้องไม่เกิน ๐.๓๐ ส่วนในล้านส่วน (ppm) หรือไม่เกิน ๑๕๐ ไมโครกรัมต่อลูกบาศก์เมตร”

“ข้อ ๕ การวัดหาค่าเฉลี่ยความเข้มข้นของก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศโดยทั่วไปในเวลา ๑ ชั่วโมง ตามข้อ ๓ ให้ใช้เครื่องวัดระบบ ยูวี ฟลูออเรสเซน หรือระบบอื่นที่กรมควบคุมมลพิษประกาศในราชกิจจานุเบกษา”

ประกาศ ณ วันที่ ๕ เมษายน พ.ศ. ๒๕๔๔

(นายเดช บุญ-หลง)

รองนายกรัฐมนตรี ปฏิบัติหน้าที่

ประธานคณะกรรมการสิ่งแวดล้อมแห่งชาติ

(ประกาศในราชกิจจานุเบกษา เล่ม ๑๑๙ ตอนพิเศษ ๓๕ ง ลงวันที่ ๓๐ เมษายน ๒๕๔๔)

ประจำเดือนมีนาคม พ.ศ. 2565



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 Bangkok 10160
Tel : 02-802-3577-9 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.

HO2100150-D002 -TSP 01

☐ PM ☒ Onsite

Site: โครงการก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย

UTM : 47P 1532758 N 673757 E

Date: 1 Dec 21

Sampler: NTSP#14

Technical: Hasan S.

Recorder: ECRANG15314321

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1010.0

Corrected Pressure (mm Hg): 757.6

Temperature (deg C): 30.0

Temperature (deg K): 303.0

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: 2.05054

Model: TE-5025A

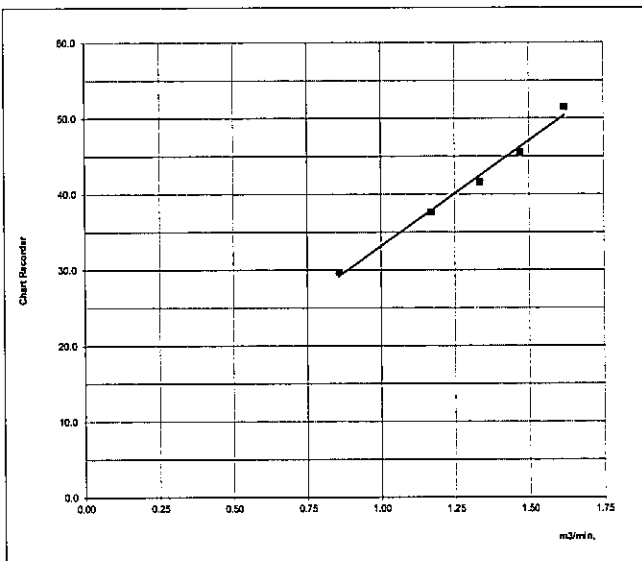
Qstd Intercept: -0.00430

Serial#: 2067

Date Certified: 11 Jan 21

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|---|
| 1 | 11.21 | 1.619 | 52.0 | 51.49 | |
| 2 | 9.24 | 1.470 | 46.0 | 45.55 | Slope = 27.8599 Intercept = 5.2480 Corr. coeff.= 0.9948 # of Observations: 5 Range of Chart 37 at 1.1 - 1.7 m3/min. 53 |
| 3 | 7.62 | 1.335 | 42.0 | 41.59 | |
| 4 | 5.84 | 1.169 | 38.0 | 37.62 | |
| 5 | 3.14 | 0.858 | 30.0 | 29.70 | |



Calibrated by :

Hasan Seng

(Hasan Seng)
1 December 2021

Approved by :

Sarawut Keawsrinual
(Sarawut Keawsrinual)
1 December 2021

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www.evltesting.com

Environmental responsibility with accuracy measurement



บริษัท เอ็นวิเทล จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envikab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkok Bangkok Bangkok 10160
Tel : 02-602-3577-8 Fax: 02-602-3775 E-mail : info@evltesting.com



Envikab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkok Bangkok Bangkok 10160

PM10 High Volume Sampler Calibration

Verification Report No.

HO2100150-D002 -PM 01

L PM ☒ Onsite

Site: โครงการก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย
UTM : 47P 1532758 N 673757 E Date: 1 Dec 21
Sampler: EPM#38 Technical: Hasan S.
Recorder: ECRDS01618025857 Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1010.0
Temperature (deg C): 30.0
Average Press. (hPa): 1013.0
Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.6
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#: 2067

Slope: 1.28401
Intercept: -0.00265
Date Certified: 11 Jan 21

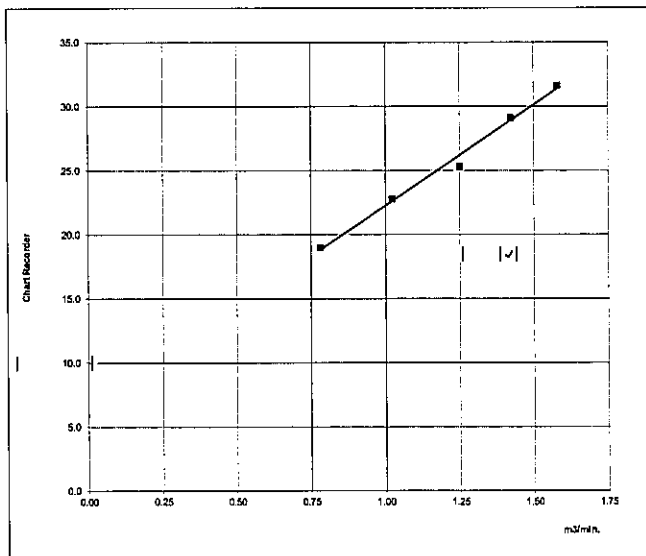
CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) |
|-----------------|----------|-------------|-----------|----------------|
| 1 | 10.26 | 1.580 | 50.0 | 31.62 |
| 2 | 8.32 | 1.423 | 46.0 | 29.09 |
| 3 | 6.41 | 1.249 | 40.0 | 25.30 |
| 4 | 4.29 | 1.022 | 36.0 | 22.77 |
| 5 | 2.51 | 0.782 | 30.0 | 18.97 |

LINEAR REGRESSION

Slope = 15.7456
Intercept = 6.4783
Corr. coeff = 0.9955
SFR = 1.133
SSP = 38.46
of Observations: 5

Range of Chart at SFR $\pm 10\%$
36
40



Calibrated by :

(Hasan Seng)

1 December 2021

Approved by :

(Sarawut Keawsrinual)

1 December 2021

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Environmental responsibility with accuracy measurement

FE-AMT-29 Rev.00-01/08/03



neediss

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

536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E:info@neediss.com



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6412002

Page:1/1

Calibrated Date: 1-Dec-21

☒ PM ☐ Onsite

Instruments Information

| | |
|---|--|
| Analyzer Type: SO2 Analyzer Model: THERMO.,43C | Manufacturer THERMO S/N: ESOTE43C668327 |
|---|--|

Calibration System

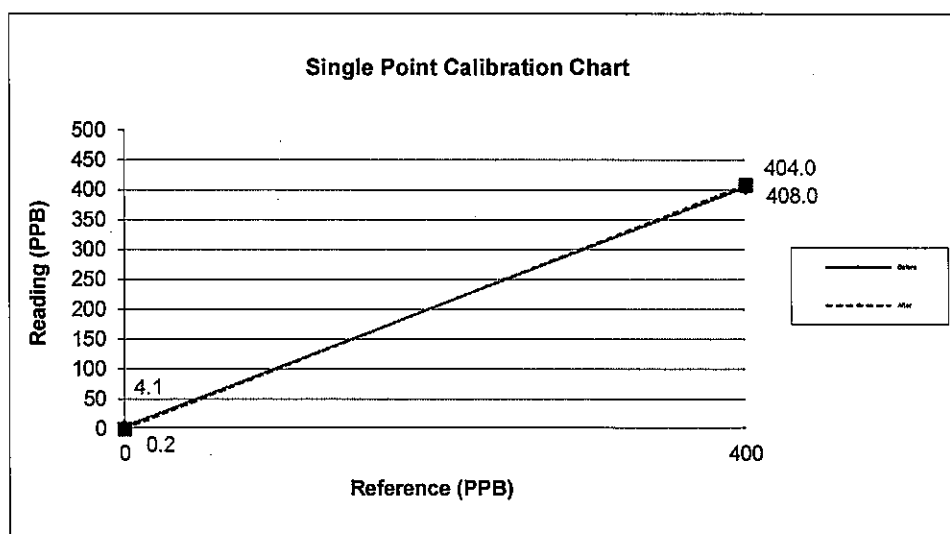
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 25.4 °C

Humidity: 60 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0 | 4.1 | 4.1 | 400.0 | 404 | 1.0 |
| After | 0.0 | 0.2 | 0.2 | 400.0 | 408 | 2.0 |



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12/21/2021



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-12-2021

S/N : ESOTE43C668327

| Test Function Value | Before | After |
|---------------------------------|--------|-------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -650 | -653 |
| LAMP VOLTAGE 950 - 1,200 (V) | 990 | 985 |
| LAMP INTENSITY 20000 - 50000 Hz | 32568 | 32577 |
| INTER TEMP 15 - 45 DEG C | 37 | 37 |
| CHAMBER TEMP 47 - 51 C | 49 | 49 |
| COOLER TEMP -5 - (-2) DEG C | -2.5 | -2.5 |
| PRESSURE 400 - 1000.0 mm Hg | 764 | 765 |
| FLOW 0.350 - 0.650 LPM | 0.42 | 0.4 |
| | | |
| | | |
| | | |

Calibrate By :

Sirir Poonlak

Approve By :

Sarawut Keawsrinual

Sirirat Poonlak

Sarawut Keawsrinual

Date:

1-Dec-21

Date:

1-Dec-21

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Neediss Supply Instrument Co., Ltd.536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E:info@neediss.com

NOx Analyzer Verification Test Report

Calibration Report No.: 6412007
Calibrated Date: 1-Dec-21

Page:1/2

☒ PM ☐ Onsite

Instruments Information

| | |
|--|--|
| Analyzer Type: NO/NO2/NOx Analyzer Model: 42C | Manufacturer THERMO S/N: ENOTE42C497375 |
|--|--|

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 SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

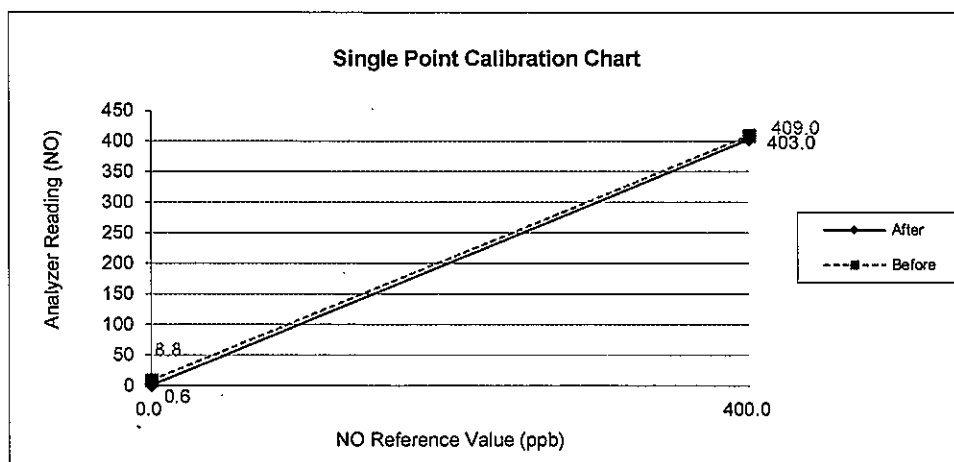
Environment: Temperature 25.4 °CHumidity: 62 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 8.8 | 0.0 | 8.8 | 409 | 400.0 | 1.1 |
| NO ₂ | 1.4 | 0.0 | 1.4 | 4.0 | 0.0 | 0.5 |
| NOx | 10.2 | 0.0 | 10.2 | 413 | 400.0 | 1.6 |

Calibration Check (After adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.6 | 0.0 | 0.6 | 403 | 400.0 | 0.4 |
| NO ₂ | -0.2 | 0.0 | -0.2 | 3.0 | 0.0 | 0.4 |
| NOx | 0.4 | 0.0 | 0.4 | 406 | 400.0 | 0.7 |



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Tel. 02-802-3980-2 Fax. 02-802-3988 E: info@neediss.com

MODEL : NOx ANALYZER Model 42C THERMO

DATE : 1-12-2021

S/N : ENOTE42C497375

Page:2/2

| Test Function Value | Before | After |
|----------------------------------|---------|---------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -675 | -678 |
| LAMP VOLTAGE 950 - 1,200 (V) | | |
| INTER TEMP 15 - 45 DEG C | 43 | 43 |
| CHAMBER TEMP 47 - 51 C | 49 | 50 |
| COOLER TEMP -5 - (-2) DEG C | -2 | -2 |
| PRESSURE 400 - 1000.0 mm Hg | 350 | 380 |
| SAMPLE FLOW 0.350 - 0.900 LPM | 0.45 | 0.46 |
| OZONEATOR FLOW 0.035 - 0.075 LPM | 0.05 | 0.05 |
| No/Nox BKG | 12/9.0 | 12/9.1 |
| No/Nox Slope | 1.0/0.8 | 0.9/0.8 |
| | | |

Calibrate By :

Sirirat Poonlak

Date:

1-Dec-21


Approve By :

Sarawut Keawsrinal

Date:

1-Dec-21

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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 & Neediss Supply Instrument

Verification Test Report

Report No.:

HO2100150-D002 -SLM 01

☐ PM

☒ Onsite UTM :

47 P 1532744 N 673776 E

Calibrated Date: 1 December 2021

Site : โครงการ ก่อสร้างอาคารพักข้าราชการกองบัญชาการกองทัพไทย พื้นที่ศูนย์รักษาความปลอดภัย

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 8007

Environment: Temperature 28 °C Humidity 56 %RH

Reference Standard: Sound Calibrator Class 1 Model 4230,Brue&Kjaer

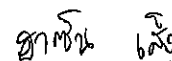
Serial No. 1351075

Date of Calibration : Feb.18, 2021

Result of Test

| Reference Standard (dB) | Instrument reading (dB) | Error (dB) | Adjust (dB) |
|----------------------------|----------------------------|---------------|----------------|
| 93.8 | 39.9 | -53.9 | 93.8 |

Calibrated By:



(Hasan Seng)

Date:

1 December 2021

Approve By:



(Sarawut Keawsrinual)

Date:

1 December 2021

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Certificate of Calibration

Calibration Certification Information

Cal. Date: January 11, 2021 Rootsmeter S/N: 438320 Ta: 293 °K
 Operator: Jim Tisch Pa: 757.9 mm Hg
 Calibration Model #: TE-5025A Calibrator S/N: 2067

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.4470 | 3.3 | 2.00 |
| 2 | 3 | 4 | 1 | 1.0260 | 6.4 | 4.00 |
| 3 | 5 | 6 | 1 | 0.9120 | 8.0 | 5.00 |
| 4 | 7 | 8 | 1 | 0.8660 | 8.9 | 5.50 |
| 5 | 9 | 10 | 1 | 0.7170 | 12.9 | 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) |
|-----------|---------------|--|--------|-------------|---|
| 1.0099 | 0.6979 | 1.4243 | 0.9956 | 0.6881 | 0.8793 |
| 1.0057 | 0.9803 | 2.0143 | 0.9916 | 0.9664 | 1.2435 |
| 1.0036 | 1.1004 | 2.2520 | 0.9894 | 1.0849 | 1.3903 |
| 1.0024 | 1.1575 | 2.3619 | 0.9883 | 1.1412 | 1.4581 |
| 0.9970 | 1.3906 | 2.8486 | 0.9830 | 1.3710 | 1.7586 |
| QSTD | m= | 2.05054 | QA | m= | 1.28401 |
| | b= | -0.00430 | | b= | -0.00265 |
| | r= | 0.99994 | | r= | 0.99994 |

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



รับรองสำเนาถูกต้อง
 ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-200011-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.
536 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Electronic Balance
Manufacturer : Sartorius Model : SECURA224-1S
Serial No. : 0034803270 ID No. : ELABBALANCEN04
Capacity : 220 g Resolution : 0.0001 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.
Ambient Temperature : (22.2 to 22.9) °C
Relative Humidity : (55.9 to 62.2) %
Air Pressure : (1014.0 to 1015.0) mbar

Date of Received : 05 February 2021

Date of Calibration : 05 February 2021

Date of Issue : 08 February 2021

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-----------|-------------|--|
| E261-E2624 | C02204101 | 17 Nov 2021 | National Institute of Metrology (Thailand), (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%.

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7/106-7 Moo 2, Sukhaphrasan 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. : 64-200011-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

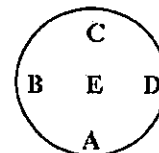
Departure of indication from nominal value

| Nominal Value (g) | Correction (g) | Uncertainty \pm (g) |
|----------------------|-------------------|--------------------------|
| 0.01 | 0.0001 | 0.00011 |
| 0.1 | 0.0001 | 0.00011 |
| 1 | 0.0000 | 0.00011 |
| 2 | 0.0001 | 0.00011 |
| 5 | 0.0000 | 0.00011 |
| 10 | 0.0000 | 0.00011 |
| 20 | -0.0001 | 0.00012 |
| 50 | -0.0001 | 0.00014 |
| 100 | -0.0001 | 0.00020 |
| 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
 0.0001 0.0000 0.0000 0.0000 0.0000 g



Repeatability Load test : 200 g
 Stdev. : 0.00005 g



- 000 -

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



CAL

Calibratech Co., Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpoo, 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. : 64-410010-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Digital Thermo-Hygrometer

Manufacturer : ebro

Model : EBI 20-TH1

Range Temperature : -30 °C to 60 °C

Resolution : 0.1 °C

Range Humidity : 0 %R.H. to 100 %R.H.

Resolution : 0.1 %R.H.

Serial No. : 62227425

ID No. : N/A

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

Relative Humidity : (50 ± 15) %

Date of Received : 05 February 2021

Date of Calibration : 11 February to 13 February 2021

Date of Issue : 13 February 2021

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 & 400036 SG-H-00041/64

12 Jul 2021

Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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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. : 64-410010-1

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) |
|------------------------------|---------------------|--------------------|-----------------------|
| 10.04 | 9.8 | 0.2 | 0.46 |
| 25.00 | 25.0 | 0.0 | 0.46 |
| 30.02 | 30.0 | 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.) |
|------------------------------|------------------------|-----------------------|--------------------------|
| 39.99 | 47.7 | -7.7 | 2.2 |
| 50.03 | 56.2 | -6.1 | 2.2 |
| 59.99 | 66.0 | -6.0 | 2.3 |

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 -



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0312

MTC No. EEL. BP. 57/0264

CALIBRATION CERTIFICATE

Submitted by : Envilab Co., Ltd.

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

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1 C, 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 ± 1.500) kPa

- Standards used :**
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Keithley 2015-P S/N 4106495.
 7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

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

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

Date of Receipt : 10 Feb. 2021

Date of Calibration : 18 Feb. 2021

1 / 2

The results relate only to the items tested or calibrated.

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.3

Head Office

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

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax: (66) 0 2323 1655
E-mail : msc@tistr.or.th

Office

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



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0312

MTC No. EEL. BP. 57/0264

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 HzAcoustic 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 | 93.78 | -0.22 | ± 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 | 998.3 | -1.7 | ± 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 | 0.68 | ± 0.50 | $\pm 3.0\%$ |

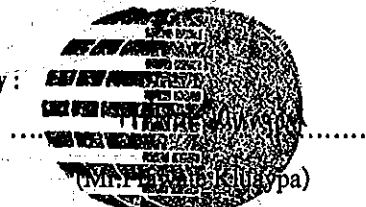
- Note: 1. No adjustment.
2. The calibrator pressure correction was not included.
3. The microphone volume correction was not included.

Calibrated by:

.....*Tawikiat Iamsamran*.....

(Mr. Tawikiat Iamsamran)

Approved by:

.....*Mr. P. P. Kulkarni*.....
Acting Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 18 Feb. 2021

Date of Issue : 19 Feb. 2021

Ref : 2011264021000592001

2 / 2

End of Certificate

The results relate only to the items tested or calibrated.

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.3

Head Office

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

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2623 1000 ext. 115, 116
Fax. (66) 0 2623 1001
E-mail : mtc@tistr.or.th

Office

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

Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A00V3 Reference Number: 160-402021734-1
Cylinder Number: EB0140762 Cylinder Volume: 144.4 Cubic Feet
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12021 Valve Outlet: 660
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Feb 19, 2021

Expiration Date: Feb 19, 2024

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.

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 | 44.68 PPM | G1 | +/- 1.4% NIST Traceable | 02/12/2021, 02/19/2021 |
| NITRIC OXIDE | 45.00 PPM | 44.62 PPM | G1 | +/- 1.4% NIST Traceable | 02/12/2021, 02/19/2021 |
| SULFUR DIOXIDE | 45.00 PPM | 45.34 PPM | G1 | +/- 1.1% NIST Traceable | 02/12/2021, 02/19/2021 |
| CARBON MONOXIDE | 4500 PPM | 4500 PPM | G1 | +/- 1.0% NIST Traceable | 02/15/2021 |
| NITROGEN | Balance | | | | |

| CALIBRATION STANDARDS | | | | | |
|-----------------------|-----------|-------------|-------------------------------------|-------------|-----------------|
| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
| NTRM | 200611-04 | CC707968 | 49.82 PPM NITRIC OXIDE/NITROGEN | +/-1.0% | Feb 02, 2025 |
| PRM | 12386 | D685025 | 9.91 PPM AIR/NITROGEN DIOXIDE | 2.0% | Feb 20, 2020 |
| GMIS | 124206889 | CC323707 | 4.028 PPM NITROGEN DIOXIDE/NITROGEN | 2.1% | Aug 15, 2021 |
| NTRM | 0141709 | KAL003190 | 49.67 PPM SULFUR DIOXIDE/NITROGEN | +/- 1.0% | Jun 20, 2022 |
| NTRM | 08012341 | KAL004716 | 4857 PPM CARBON MONOXIDE/NITROGEN | +/- 0.6% | Jun 07, 2024 |

The SRM, 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 | Jan 27, 2021 |
| Nicolet IS50 FTIR AUP2010245 NO | FTIR | Feb 11, 2021 |
| Nicolet IS50 FTIR AUP2010245 NO2 | FTIR | Jan 21, 2021 |
| Nicolet IS50 FTIR AUP2010245 SO2 | FTIR | Jan 21, 2021 |

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.4 Kg
Net Weight: 4.5 Kg
PO# 5221000405



Michael A. Parker
Approved for Release



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM18218

Calibration Date: MAR 24 2021

Calibration Reference Equipment: 714J7402

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard.

Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: 

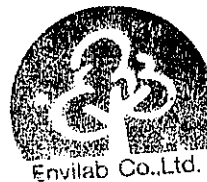
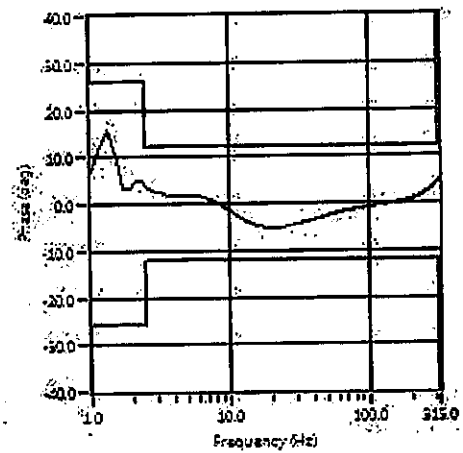
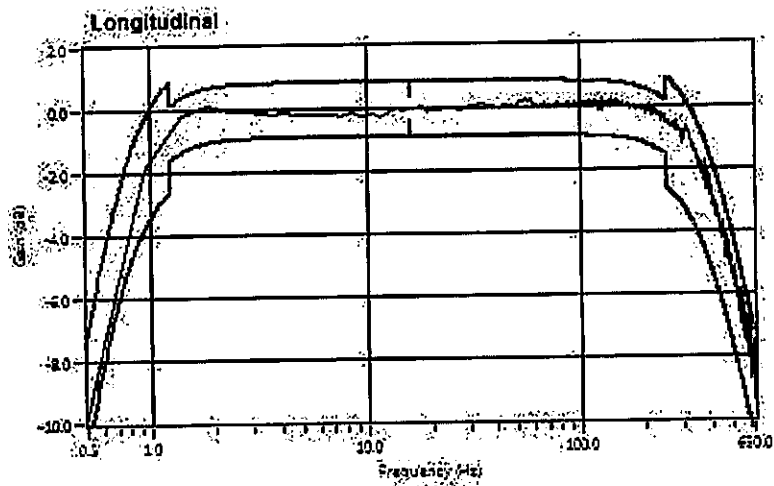
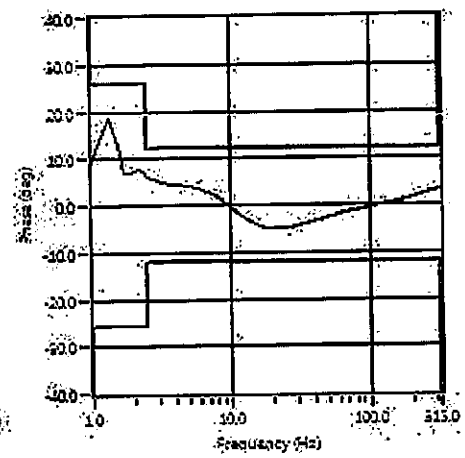
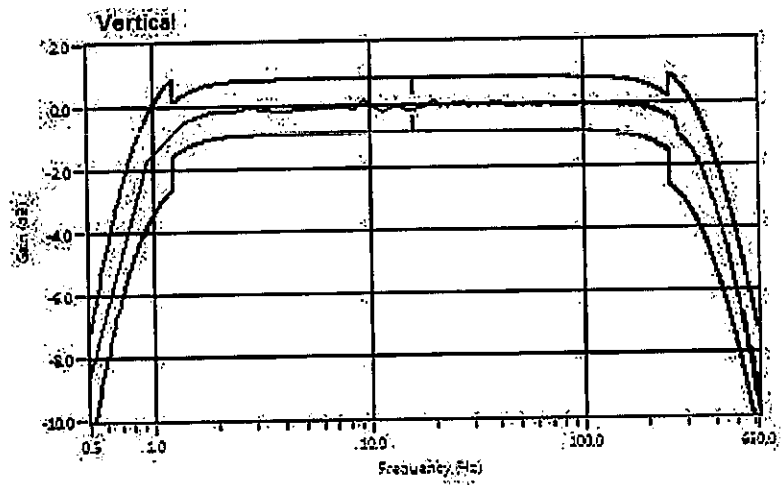
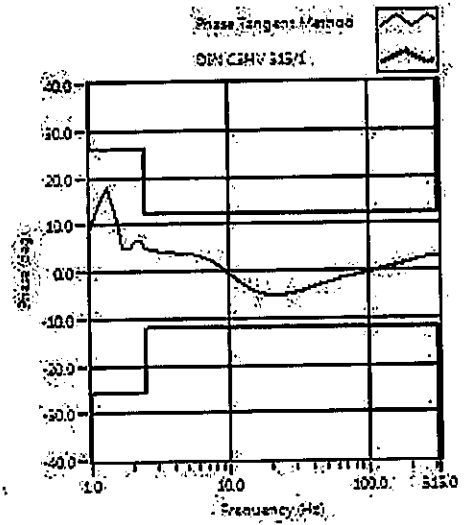
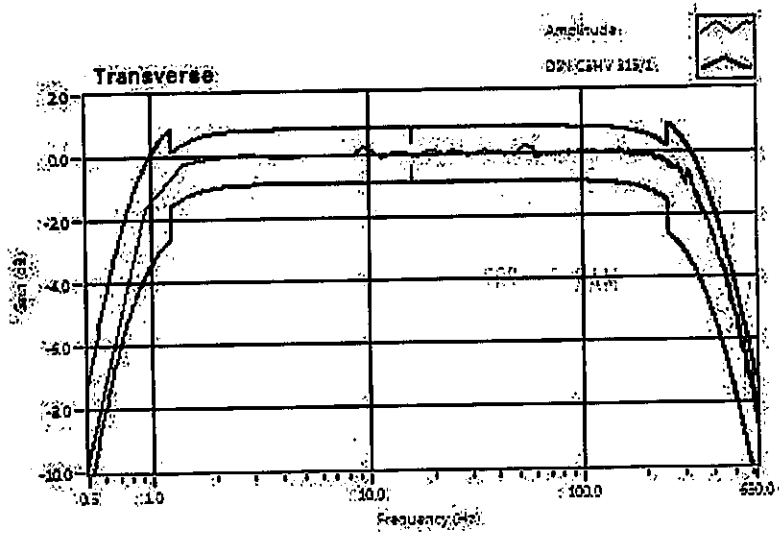
Xiaoming Yang



309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642



Frequency Response of UM18218



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-200049-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540, 540/1 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA125-1S

Serial No. : 0034606552

ID No. : ELABBALANCEN05

Capacity : 120 g

Resolution : 0.00001 g

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

Ambient Temperature : (23.1 to 24.0) °C

Relative Humidity : (56.7 to 61.9) %

Air Pressure : 1013.0 mbar

Date of Received : 02 March 2021

Date of Calibration : 02 March 2021

Date of Issue : 06 March 2021

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| <u>ID No.</u> | <u>Cert. No.</u> | <u>Due Date</u> | <u>Traceability</u> |
|---------------|------------------|-----------------|--|
| E261-E2624 | C02204101 | 17 Nov 2021 | National Institute of Metrology (Thailand), (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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7/106-7 Moo 2, Sukhaphrasan 3 Rd., Bangpoo, 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. : 64-200049-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

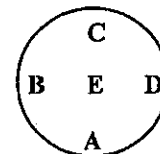
Departure of indication from nominal value

| Nominal Value (g) | Correction (g) | Uncertainty \pm (g) |
|----------------------|-------------------|--------------------------|
| 0.1 | 0.00000 | 0.000017 |
| 0.5 | -0.00001 | 0.000022 |
| 1 | 0.00001 | 0.000026 |
| 2 | 0.00000 | 0.000034 |
| 5 | -0.00001 | 0.000043 |
| 10 | 0.00000 | 0.000053 |
| 20 | -0.00002 | 0.000071 |
| 50 | -0.00003 | 0.00011 |
| 100 | -0.00005 | 0.00020 |
| 120 | -0.00006 | 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 $k = 2.11$, providing a level of confidence of approximately 95%

Eccentric error Load test : 20 g
A B C D E
0.00003 0.00003 -0.00001 0.00001 0.00000 g



Repeatability Load test : 100 g
Stdev. : 0.000014 g



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ผู้จัดการฝ่ายควบคุมคุณภาพ



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7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpoo, 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. : 64-410010-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhae7, Bangkhae, Bangkok 10160

Equipment : Digital Thermo-Hygrometer

Manufacturer : ebro

Model : EBI 20-TH1

Range Temperature : -30 °C to 60 °C

Resolution : 0.1 °C

Range Humidity : 0 %R.H. to 100 %R.H.

Resolution : 0.1 %R.H.

Serial No. : 62227425

ID No. : N/A

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

Relative Humidity : (50 ± 15) %

Date of Received : 05 February 2021

Date of Calibration : 11 February to 13 February 2021

Date of Issue : 13 February 2021

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 & 400036 | SG-H-00041/64 | 12 Jul 2021 | Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268 |
|-----------------|---------------|-------------|---|



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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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. : 64-410010-1

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) |
|------------------------------|---------------------|--------------------|-----------------------|
| 10.04 | 9.8 | 0.2 | 0.46 |
| 25.00 | 25.0 | 0.0 | 0.46 |
| 30.02 | 30.0 | 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.) |
|------------------------------|------------------------|-----------------------|--------------------------|
| 39.99 | 47.7 | -7.7 | 2.2 |
| 50.03 | 56.2 | -6.1 | 2.2 |
| 59.99 | 66.0 | -6.0 | 2.3 |

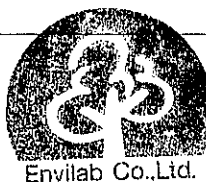
Remark

UUC : Unit Under Calibration

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

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

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Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



CAL

Calibratech Co.,Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-420055-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : pH Meter (Pocket)

pH meter

Manufacturer : Eutech

Model : pHTestr 30

Range : -1.00 to 15.00 pH

Resolution : 0.01 pH

Serial No. : 2856418

ID No. : ELABPHTEST3016

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

Ambient Temperature : (24.5 to 25.0) °C

Relative Humidity : (50 to 54) %

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 24 March 2021

Calibrated by : Bunjerd Masri

Calibration Method : In-house method CAL-M4201 direct measurement by using certified reference material (CRM)

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

Standard Buffer Solution

| pH | Cert. No. | Lot No. | Exp. Date | Traceability |
|-------|-----------|---------|-------------|--------------|
| 4.004 | 61208711 | 684575 | 01 Sep 2021 | CPA chem |
| 6.985 | 61191143 | 684576 | 01 Sep 2021 | CPA chem |
| 9.963 | 61208865 | 684577 | 01 Sep 2021 | CPA chem |



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%.

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

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

Certificate of Calibration

Certificate No. : 64-420055-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

| Adjustment Curve at nominal pH | Standard Buffer (pH) | UUC Reading (pH) | Correction (pH) | Uncertainty (± pH) |
|-----------------------------------|---------------------------|-----------------------|----------------------|-------------------------|
| 4, 7, 10 | 4.004 | 4.00 | 0.01 | 0.011 |
| | 6.985 | 7.00 | -0.01 | 0.020 |
| | 9.963 | 10.00 | -0.04 | 0.053 |

Remark

1 UUC : Unit Under Calibration

2 pH meter does not have voltage mode because the plug can not BNC socket

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

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

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Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 21TW57

Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : Hanna
Model : HI 9146
Serial No. : G0007931
ID No. : EDOHI914607931
Received Date : 16 March 2021
Test Date : 19 March 2021
Reference : 2103-0669DN-1
Submitted by : Envilab Co.,Ltd (Head office)
540, 540/1 Sol Bangkhae 7, Bangkhae,
Bangkhae, Bangkok 10160
Laboratory Condition : Temperature (25 \pm 5) °C
Humidity (50 \pm 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Calibrated by : Walalak Sirithean

Approved by :

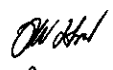

Approved Signatory

(☒) Malee Butkruea
(☐) Saithip Meangmai
(☐) Warakorn Lerngagtrakul

Issue Date :

23 March 2021




รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

B 0257191



Cert.No.: 21TW57

Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: KC1A01TAF

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|---|-------------------------------|------------------------------|
| 8.00 | 8.17 | 0.00 |

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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ผู้จัดการฝ่ายควบคุมคุณภาพ

Malee

a 1047872

CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400569-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Refrigerator)

Manufacturer : M-LAB

Model : BIC-140

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 1011

ID No. : ELABBODC140N03

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

Ambient Temperature : (23.0 to 23.8) °C

Relative Humidity : (55 to 60) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 12 November 2021

Date of Calibration : 12 November 2021

Date of Issue : 18 November 2021

Calibrated by : Bunjerd Masri

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No.

Cert. No.

Due Date

Traceability

400046 & 400023

64-400443-1

29 Mar 2022

National Institute of Metrology Thailand (NIMT)



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhaphrasan 3 Rd., Bangpoo, 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. : 64-400569-1

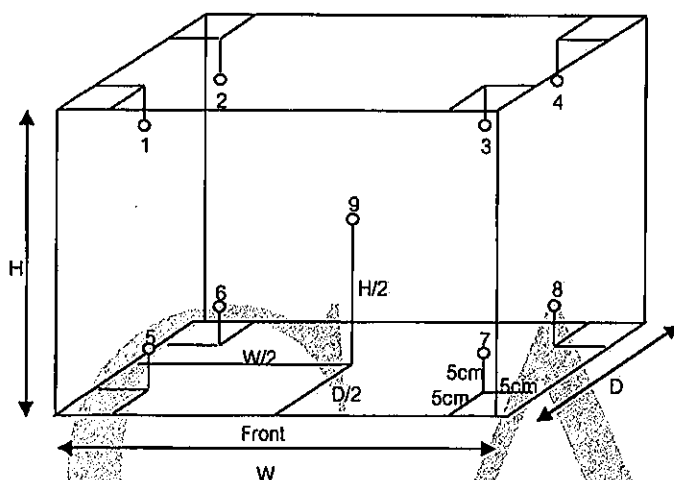
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.38 m

D = 0.35 m

H = 1.15 m

Capacity = 0.15 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (±°C) |
|--------------------|-----------------------------|--------------------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|----------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 4.0 | 4.0 | 4.0 | 3.3 | 3.2 | 3.4 | 3.4 | 3.9 | 3.9 | 4.0 | 3.4 | 4.2 | 0.57 |

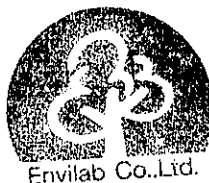
| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 4.0 | 4.0 | 4.0 | 1.0 | 0.1 | 1.0 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

- ooo -



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

Customer Envilab Co.,Ltd.

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

Place of Calibration MICRO ROOM (B302)

Description Incubator

Model IF75

Serial No. D319.0066

ID.No. -

Date of Receipt Feb 12, 2021

Date of Calibration Feb 12, 2021

Environment

| | | | | | | |
|-------------------|-------|------|-----|-------|------|-----|
| Temperature | (Min) | 25.1 | °C | (Max) | 26.1 | °C |
| Relative Humidity | (Min) | 67.2 | %RH | (Max) | 69.3 | %RH |

Calibration Method

WI-17 : The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.

The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY49007789, Certificate No. QR20-2119, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292.

This certificate is traceable to SI unit.

Page 1 of 3

O.Mi

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.



Onth
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ผู้จัดการฝ่ายควบคุมคุณภาพ



Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



NSC-TISI-TIS17025
CALIBRATION 0109

CALIBRATION CERTIFICATE

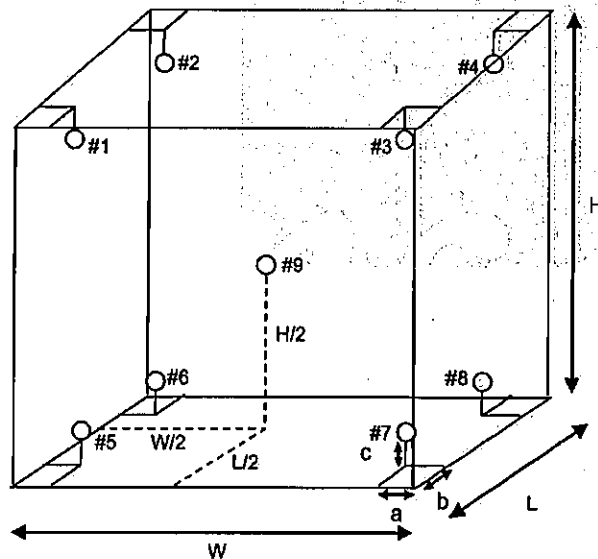
Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

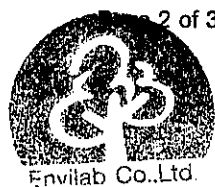
Results (without adjustment)



Position of reference thermometers were placed

Note.

- 1). Dimension (W x L x H) is 40 x 33 x 56 cm.
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

D.Mi



Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbuathong, Nonthaburi 11110
Tel : 0 2191 6479 Fax : 0 2191 6480 website : www.thermology.co.th



CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

Results (without adjustment)

| UUC Setting (°C) | UUC Reading (°C) | Reference Thermometer (°C) | | Stability \pm (°C) | Uniformity (°C) | Uncertainty \pm (°C) |
|------------------------|------------------------|----------------------------------|--------|-------------------------|--------------------|---------------------------|
| 44.5 | 44.5 | Position 1 | 44.536 | 0.048 | 0.448 | 0.31 |
| | | Position 2 | 44.593 | | | |
| | | Position 3 | 44.601 | | | |
| | | Position 4 | 44.570 | | | |
| | | Position 5 | 44.532 | | | |
| | | Position 6 | 44.386 | | | |
| | | Position 7 | 44.131 | | | |
| | | Position 8 | 44.523 | | | |
| | | Position 9 | 44.536 | | | |

The stability and uniformity was taken into account in the measurement uncertainty stated.

The above results are valid exclusively for calibration samples as mentioned in the report.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :

(MR. DAMRONG MULSING)

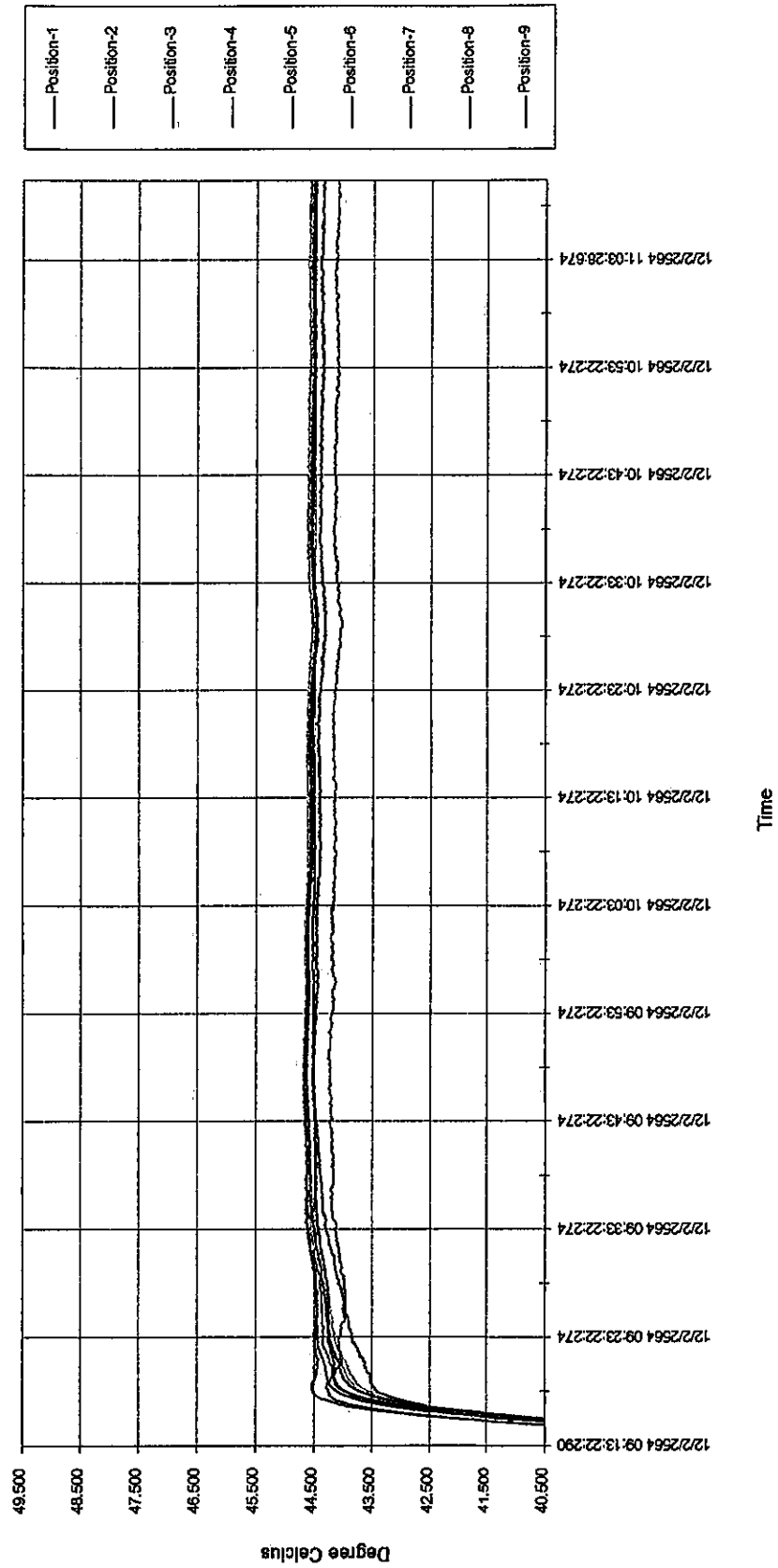
Page 3 of 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Cert.No. 21/0323

Incubator
Model IF75 S/N. D319.0066 ID.No. -



Envitab Co., Ltd.
ผู้จัดการฝ่ายควบคุมคุณภาพ
รณรงค์สำเนาถูกต้อง

CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400163-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Oven)

Manufacturer : Memmert

Model : UF 75

Range : N/A °C

Resolution : 0.1 °C

Serial No. : B319.0600

ID No. : N/A

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

Ambient Temperature : (30.0 to 31.5) °C

Relative Humidity : (50 to 55) %

Line Voltage : (224.2 to 225.2) V

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 25 March 2021

Calibrated by : Permpon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

ID No.

Cert. No.

Due Date

Traceability

400029 & 400032

63-400450-1

30 Mar 2021

National Institute of Metrology Thailand (NIMT)



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 64-400163-2

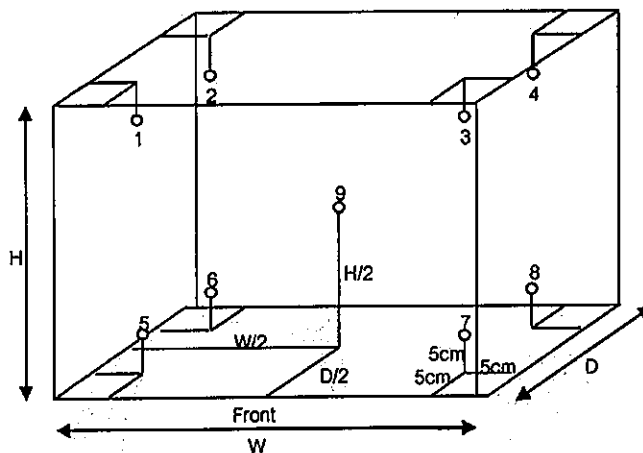
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.56 m

Capacity = 0.07 m³

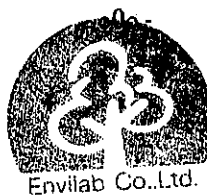
| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|-----------------|--------------------------|-----------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 104.0 | 103.5 | 103.5 | 104.0 | 104.3 | 104.3 | 104.2 | 104.2 | 103.9 | 103.7 | 104.2 | 104.1 | 0.69 |
| 110.0 | 109.5 | 109.5 | 110.0 | 110.4 | 110.4 | 110.2 | 110.2 | 109.9 | 109.6 | 110.2 | 110.1 | 0.69 |
| 180.0 | 179.0 | 179.0 | 179.0 | 180.3 | 180.2 | 180.2 | 180.3 | 180.0 | 179.0 | 180.4 | 180.3 | 0.95 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|-----------------|--------------------------|-----------------------------|--------------------------|-------------------------|------------------------|
| 104.0 | 103.5 | 103.5 | 0.5 | 0.1 | 0.8 |
| 110.0 | 109.5 | 109.5 | 0.7 | 0.1 | 1.0 |
| 180.0 | 179.0 | 179.0 | 1.5 | 0.2 | 1.7 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Signature



CAL

Calibratech Co., Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400049-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhac7, Bangkhac, Bangkok 10160

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB29

Range : N/A °C

Resolution : 0.1 °C

Serial No. : L617.0156

ID No. : ELABWBWNB29N01

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

Ambient Temperature : (26.0 to 26.5) °C

Relative Humidity : (45 to 50) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 05 February 2021

Date of Calibration : 05 February 2021

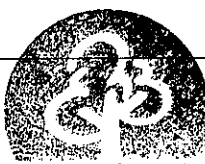
Date of Issue : 06 February 2021

Calibrated by : Permpon Chanpu

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

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

| <u>ID No.</u> | <u>Cert. No.</u> | <u>Due Date</u> | <u>Traceability</u> |
|-----------------|------------------|-----------------|---|
| 400029 & 400031 | 63-400449-1 | 28 Mar 2021 | National Institute of Metrology Thailand (NIMT) |



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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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

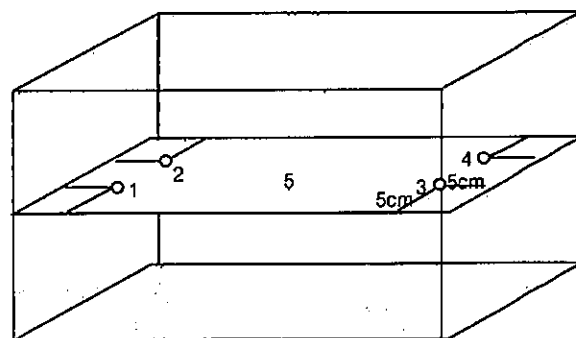
Certificate No. : 64-400049-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Front

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | Uncertainty (±°C) | Measured Uniformity (°C) | Measured Stability (°C) |
|--------------------|-----------------------------|--------------------------------|---|-------|-------|-------|-------|----------------------|-----------------------------|----------------------------|
| | | | 1 | 2 | 3 | 4 | 5 | | | |
| 95.0 | 95.0 | 95.0 | 95.35 | 95.44 | 95.53 | 95.38 | 95.46 | 0.20 | 0.19 | 0.09 |

Remark The uncertainty is not combine uniformity of the water bath

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

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

- o0o -



Envilab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ



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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-300152-2

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : PYREX

Class : A

Capacity : 50 ml

Graduation : 1 ml

ID No. : C-WW-002/21

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Wipa Tovadec)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%.

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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. : 64-300152-2

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

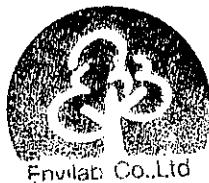
| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 30 | 29.93 |
| 50 | 50.01 |

Uncertainty of measurement with in \pm 0.054 ml

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%

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Envilab Co.,Ltd

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ผู้จัดการฝ่ายควบคุมคุณภาพ

D.



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. : 64-300152-6

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : Witeg

Class : A

Capacity : 1000 ml

Graduation : 10 ml

ID No. : C-WW-029/18

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Wipa Tovadee)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 64-300152-6

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 500 | 502.85 |
| 1000 | 1001.86 |

Uncertainty of measurement with in \pm 0.17 ml

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%

- o O o -

D.



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



ประจำเดือนเมษายน พ.ศ. 2565



TSP High Volume Sampler Calibration

Verification Report No.

A6503 -TSP 02

☒ PM ☐ Onsite

Site: บริษัท เอ็นไวแล็บ จำกัด

UTM : 47P N1514475 E654269

Sampler: ETSP#06

Recorder: ECRANG15315224

Date: 4 Mar 22

Technical: Surakit D.

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1009.7

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.3

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-5028A

Serial#: 1328

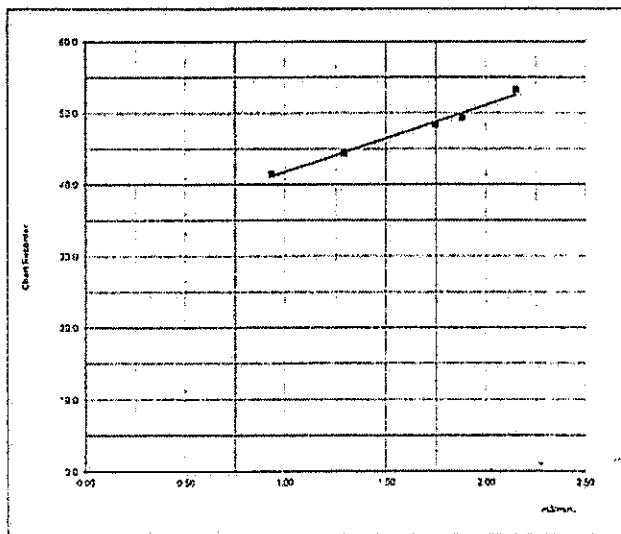
Qstd Slope: 1.63957

Qstd Intercept: -0.01202

Date Certified: 19 Jan 22

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|-------------------------|
| 1 | 12.71 | 2.153 | 54.0 | 53.28 | Slope = 9.3795 |
| 2 | 9.72 | 1.884 | 50.0 | 49.34 | Intercept = 32.3791 |
| 3 | 6.35 | 1.524 | 47.0 | 46.38 | Corr. coeff = 0.9926 |
| 4 | 4.52 | 1.287 | 45.0 | 44.40 | # of Observations: 5 |
| 5 | 2.35 | 0.930 | 42.0 | 41.44 | Range of Chart 44 |
| | | | | | at 1.1 - 1.7 m3/min. 48 |



Calibrated by :

(Surakit Darncholwichit)

4 March 2022

Approved by :

(Sarawut Keawsrinual)

4 March 2022

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www.evtesting.com

TE-MNT-23 Rev.00 01/08/21



EnviLab Co., Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ



Environmental Engineering Laboratory Co., Ltd.
Environmental Engineering Laboratory Co., Ltd.
Tel: 02-602-5577-8 Fax: 02-602-5577-9 E-mail: info@evltesting.com



PM10 High Volume Sampler Calibration

Verification Report No.

C6503 -PM 02

| | |
|----------------------------------|--------|
| L PM | Onsite |
| Site: บริษัท เอ็นไวรอนแล็บ จำกัด | |
| UTM: 47P N1514475 E654269 | |
| Sampler: EPM#21 | |
| Recorder: ECRDS01618124 | |
| Date: 4 Mar 22 | |
| Technical: Surakit D. | |
| Approval: Sarawut K. | |

CONDITIONS

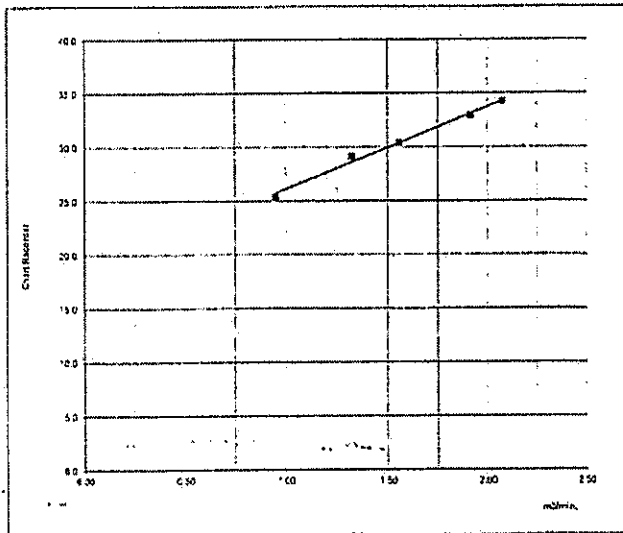
| | |
|---------------------------------|--------------------------------------|
| Barometric Press. (hPa): 1009.8 | Corrected Pressure (mm Hg): 757.4 |
| Temperature (deg C): 30.0 | Temperature (deg K): 303.0 |
| Average Press. (hPa): 1013.0 | Corrected Avg. Press. (mm Hg): 759.8 |
| Average Temp. (deg C): 30.0 | Average Temp. (deg K): 303.0 |

CALIBRATION ORIFICE

| | |
|---------------------------------|---------------------------|
| Brand: Tisch Environmental, Inc | Slope: 1.02667 |
| Model: TE-5028A | Intercept: -0.00753 |
| Serial#: 1328 | Date Certified: 19 Jan 22 |

CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|-------------|-----------|----------------|----------------------------------|
| 1 | 12.37 | 2.174 | 54.0 | 34.15 | Slope = 8.9772 |
| 2 | 9.29 | 1.885 | 50.0 | 31.82 | Intercept = 14.5944 |
| 3 | 6.69 | 1.601 | 46.0 | 29.09 | Corr. coeff. = 0.9936 |
| 4 | 4.27 | 1.280 | 40.0 | 25.30 | SFR = 1.134 |
| 5 | 2.57 | 0.995 | 36.0 | 24.03 | SSP = 39.16 |
| | | | | | # of Observations: 5 |
| | | | | | Range of Chart at SFR $\pm 10\%$ |
| | | | | | 38 |
| | | | | | 40 |



Calibrated by :
(Surakit Darncholwichit)
4 March 2022

Approved by :
(Sarawut Keawsrinual)
4 March 2022

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PM10 Cal. Rev 07 / 1st Date: Mar 17, 2020

Environmental Engineering Laboratory Co., Ltd. 11/11/2020

FF-ANLT-23 Rev.00 01/02/23



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ผู้จัดการฝ่ายควบคุมคุณภาพ

**neediss**บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.509 หมู่ 7 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10150 536 Soi Bangkhoe 7 Bangkok Bangkok Bangkok
Tel: 02-502-1986 Fax: 02-502-5933 Email: neediss@neediss.com

SO₂ Analyzer Verification Test Report

Calibration Report No.: 6503001

Page:1/1

Calibrated Date: 3-Mar-22

☒ PM ☐ Onsite

Instruments Information

| | |
|---|--|
| Analyzer Type: SO ₂ Analyzer Model: THERMO.,43C | Manufacturer THERMO S/N: ESOTE43C102362 |
|---|--|

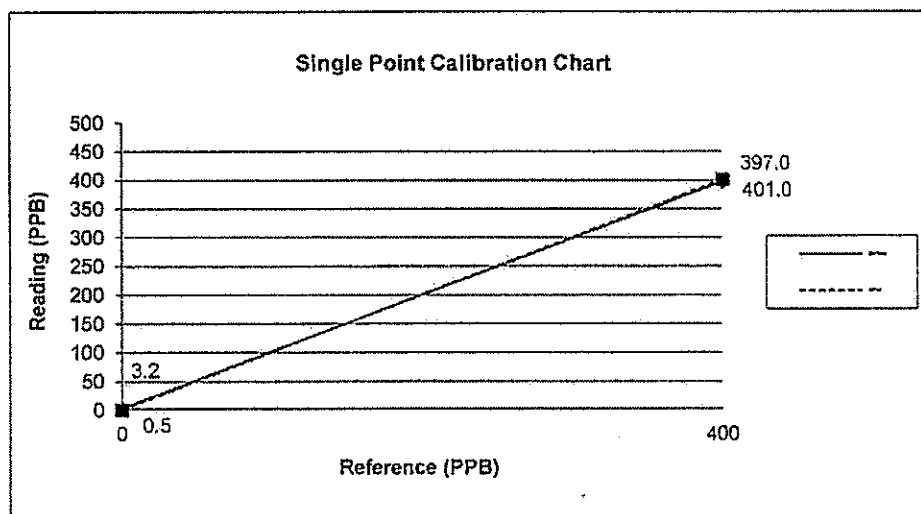
Calibration System

| 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 25.5 °CHumidity: 55 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0 | 3.2 | 3.2 | 400.0 | 397 | -0.8 |
| After | 0.0 | 0.5 | 0.5 | 400.0 | 401 | 0.3 |
| | | | | | | |



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Neediss Supply Instrument Co., Ltd.

536 ซอยบางเขน 7 แขวงบางเขน เขตบางเขน กรุงเทพฯ 10160 536 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel. 02-842-8780 Fax. 02-850-12788 E-mail: neediss@neediss.com



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 3-03-2022

S/N : ESOTE43C102362

| Test Function Value | Before | After |
|---------------------------------|--------|-------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -650 | -653 |
| LAMP VOLTAGE 950 - 1,200 (V) | 990 | 985 |
| LAMP INTENSITY 20000 - 50000 Hz | 32568 | 32577 |
| INTER TEMP 15 - 45 DEG C | 37 | 37 |
| CHAMBER TEMP 47 - 51 C | 49 | 49 |
| COOLER TEMP -5 - (-2) DEG C | -2.5 | -2.5 |
| PRESSURE 400 - 1000.0 mm Hg | 764 | 765 |
| FLOW 0.350 - 0.650 LPM | 0.42 | 0.4 |
| | | |
| | | |
| | | |

Calibrate By : Sirirat Poonlak

Approve By : Sarawut Keawsrinual

Sirirat Poonlak

Sarawut Keawsrinual

Date: 3-Mar-22

Date: 3-Mar-22

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133 ซอยบางนา 7 แขวงบางนา เขตบางนา กรุงเทพฯ 10760 335 Rue Bangkok 7 Bangkok Bangkok Bangkok
Tel 02 601 7760 Fax 02 601 7733 Email: info@neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: 6503002

Page:1/2

Calibrated Date: 3-Mar-22

☒ PM ☐ Onsite

Instruments Information

| | |
|--|--|
| Analyzer Type: NO/NO2/NOx Analyzer Model: 42C | Manufacturer THERMO S/N: ENOTE42C704365 |
|--|--|

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 SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 26.7 °C

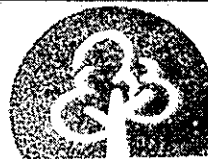
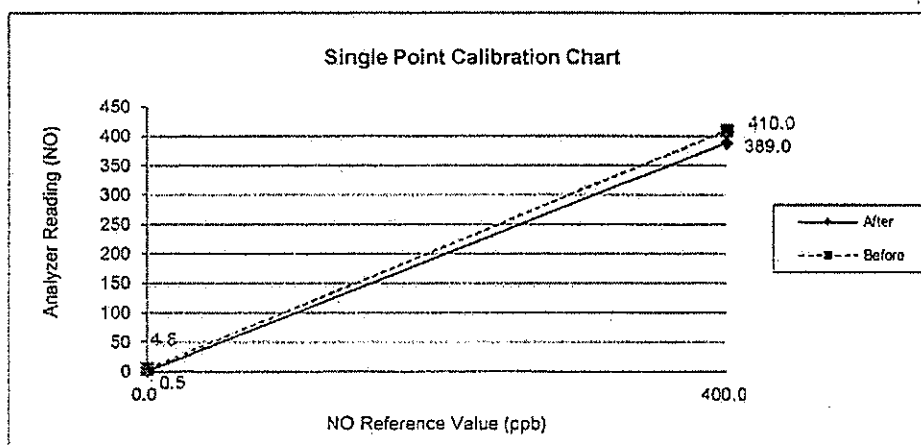
Humidity: 48 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 4.8 | 0.0 | 4.8 | 410 | 400.0 | 1.2 |
| NO ₂ | 4.8 | 0.0 | 4.8 | 5.0 | 0.0 | 0.6 |
| NOx | 9.6 | 0.0 | 9.6 | 415 | 400.0 | 1.8 |

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 | 389 | 400.0 | -1.4 |
| NO ₂ | 0.5 | 0.0 | 0.5 | 13.0 | 0.0 | 1.6 |
| NOx | 1.0 | 0.0 | 1.0 | 402 | 400.0 | 0.2 |



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Tel 02-802-1250-2 Fax 02-802-3253 E-mail:neediss@neediss.com



MODEL : NOx ANALYZER Model 42C THERMO

DATE :3-03-2022

S/N : ENOTE42C704365

Page:2/2

| Test Function Value | Before | After |
|----------------------------------|---------|---------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -675 | -678 |
| LAMP VOLTAGE 950 - 1,200 (V) | | |
| INTER TEMP 15 - 45 DEG C | 44 | 43 |
| CHAMBER TEMP 47 - 51 C | 50 | 50 |
| COOLER TEMP -5 - (-2) DEG C | -3 | -2 |
| PRESSURE 400 - 1000.0 mm Hg | 350 | 380 |
| SAMPLE FLOW 0.350 - 0.900 LPM | 0.45 | 0.46 |
| OZONEATOR FLOW 0.035 - 0.075 LPM | 0.05 | 0.05 |
| No/Nox BKG | 12/9.0 | 12/9.1 |
| No/Nox Slope | 1.0/0.8 | 0.9/0.8 |
| | | |

Calibrate By : Sirirat Poonlak

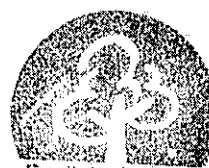
Approve By : Sarawut Keawsrinual

Sirirat Poonlak

Sarawut Keawsrinual

Date: 3-Mar-22

Date: 3-Mar-22



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EVL Co., Ltd. 101/101, Vibhavadi Rangsit Road, Bangkok 10130
Tel : 02-302-3577-2 Fax : 02-302-3773 E-mail : info@evltesting.com



Verification Test Report

Report No.:

D6503 -SLM 01

☒ PM

☐ Onsite UTM :

47P N 1514462 E 654258

Calibrated Date: 4 March 2022

Site : บริษัทเอ็นวีแอล จำกัด

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 565011

Environment: Temperature 25 °C Humidity 45 %RH

Reference Standard: Sound Calibrator Class 1 Model 4230,Brue&Kjaer

Serial No.87098

Date of Calibration : March.12, 2021

Result of Test

| Reference Standard (dB) | Instrument reading (dB) | Error (dB) | Adjust (dB) |
|----------------------------|----------------------------|---------------|----------------|
| 94.0 | 94.1 | 0.1 | 94.0 |

Calibrated By:

(Surakit Darncholvichit)

Date:

4 March 2022

Approve By:

(Sarawut Keawsrinual)

4 March 2022

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FE-MNT-27 Rev.00:01/08/63



TSP High Volume Sampler Calibration

Verification Report No.

E6503 -TSP 02

☒ PM ☐ Onsite

Site: บริษัท เอนไวแล้น จำกัด

UTM : 47P N1514475 E654269

Sampler: NTSP#11

Recorder: ECRANG15315224

Date: 4 Mar 22

Technical: Surakit D.

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1010.0

Temperature (deg C): 31.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.6

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-5028A

Serial#: 1328

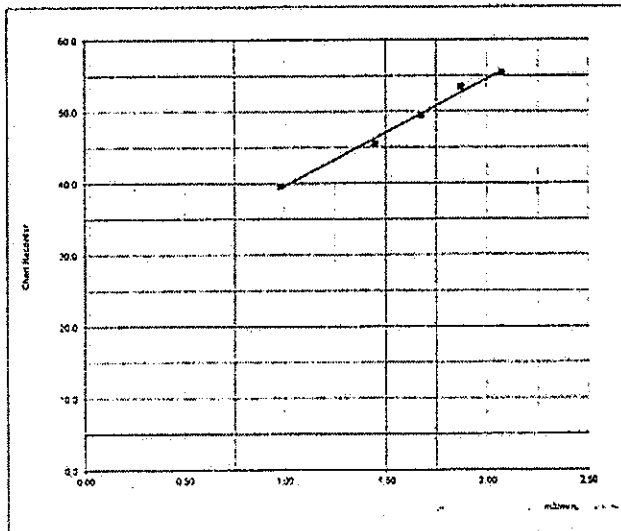
Qstd Slope: 1.63957

Qstd Intercept: -0.01202

Date Certified: 19 Jan 22

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|---|
| 1 | 12.31 | 2.123 | 56.0 | 55.36 | Slope = 12.8500 |
| 2 | 10.56 | 1.967 | 54.0 | 53.38 | Intercept = 28.1148 |
| 3 | 6.48 | 1.542 | 48.0 | 47.45 | Corr. coeff. = 0.9955 |
| 4 | 4.41 | 1.273 | 46.0 | 45.47 | # of Observations: 5 |
| 5 | 2.32 | 0.926 | 40.0 | 39.54 | Range of Chart at 1.1 - 1.7 m3/min. 43 50 |



Calibrated by :

(Surakit Darncholwichit)
4 March 2022

Approved by :

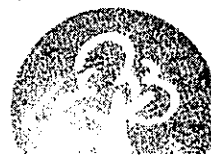
(Sarawut Keawsinual)
4 March 2022

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PL-MNT-23 Rev.0001/06/21



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บริษัท เอ็นวิล เทสติ้ง จำกัด
Envilab Co., Ltd. 17/244/19, Bldg. 10, Tambon Bang Khen, Bangkok 10140
Tel: (02)-812-3577-5 Fax: (02)-812-1173 E-mail: info@envilab.co.th



PM10 High Volume Sampler Calibration

Verification Report No.

D6503 -PM 02

☒ PM

☐ Onsite

Site: บริษัท เอ็นวิล เทสติ้ง จำกัด

UTM: 47P N1514475 E654269

Sampler: NPM#04

Recorder: ECRDS01618124

Date: 4 Mar 22

Technical: Surakit D.

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1009.6

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.3

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-5028A

Serial#: 1328

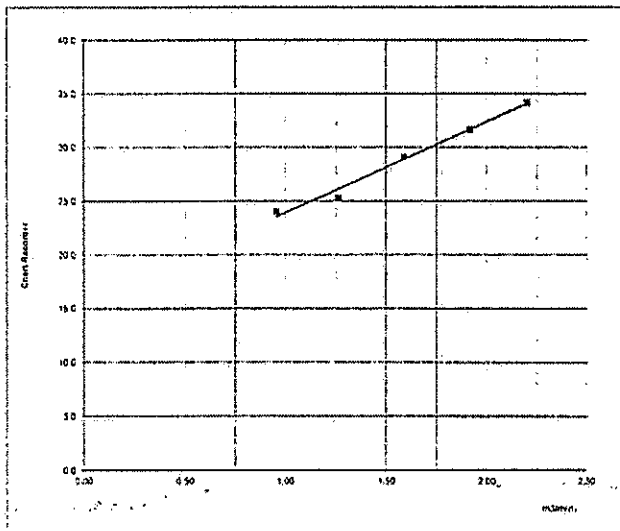
Slope: 1.02667

Intercept: -0.00753

Date Certified: 19 Jan 22

CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|-------------|-----------|----------------|-------------------------------|
| 1 | 12.34 | 2.179 | 54.0 | 34.27 | Slope = 8.6512 |
| 2 | 9.32 | 1.894 | 50.0 | 31.73 | Intercept = 15.6272 |
| 3 | 6.74 | 1.612 | 48.0 | 30.46 | Corr. coeff. = 0.9924 |
| 4 | 4.32 | 1.292 | 42.0 | 26.65 | SFR = 1.141 |
| 5 | 2.63 | 1.010 | 38.0 | 24.12 | SSP = 40.18 |
| | | | | | # of Observations: 5 |
| | | | | | Range of Chart at SFR ±10% 39 |
| | | | | | 41 |



Calibrated by :

(Surakit Darncholwicht)
4 March 2022

Approved by :

(Sarawut Keawsrinual)
4 March 2022

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

TE-MNH-23 Rev. 001/02/21



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Neediss Supply Instrument Co., Ltd.
528/5001 หมู่ 7 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10560 536 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel: 02-602-7240-2 Fax: 02-602-7168 E-mail: info@neediss.com



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6503006

Page:1/1

Calibrated Date: 3-Mar-22

☒ PM ☐ Onsite

Instruments Information

| | |
|--|--|
| Analyzer Type: SO2 Analyzer Model: THERMO.43C | Manufacturer THERMO S/N: ESOTE43C071944 |
|--|--|

Calibration System

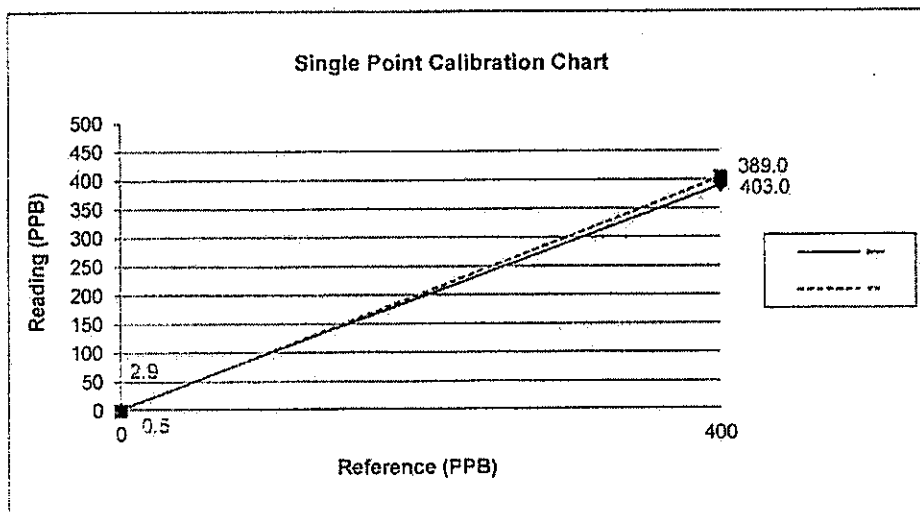
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 26.5 °C

Humidity: 50 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0 | 2.9 | 2.9 | 400.0 | 389 | -2.8 |
| After | 0.0 | 0.5 | 0.5 | 400.0 | 403 | 0.8 |



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2022/03/03



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Neediss Supply Instrument Co., Ltd.
535 ซอยบางนา 7 แขวงบางนา เขตบางนา กรุงเทพฯ 10760 535 Soi Bangna 7 Bangnae Bangkok Bangkok
Tel 02-802-3760 Fax 02-802-0045 E-mail: info@neediss.com



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 3-03-2022

S/N : ESOTE43C071944

| Test Function Value | Before | After |
|---------------------------------|--------|-------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -650 | -653 |
| LAMP VOLTAGE 950 - 1,200 (V) | 990 | 985 |
| LAMP INTENSITY 20000 - 50000 Hz | 32568 | 32577 |
| INTER TEMP 15 - 45 DEG C | 37 | 37 |
| CHAMBER TEMP 47 - 51 C | 49 | 49 |
| COOLER TEMP -5 - (-2) DEG C | -2.5 | -2.5 |
| PRESSURE 400 - 1000.0 mm Hg | 764 | 765 |
| FLOW 0.350 - 0.650 LPM | 0.42 | 0.4 |
| | | |
| | | |
| | | |

Calibrate By : Sirirat Poonlak

Approve By : Sarawut Keawsrinal

Sirirat Poonlak

Sarawut Keawsrinal

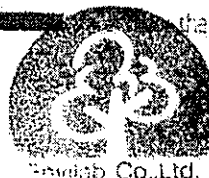
Date: 3-Mar-22

Date: 3-Mar-22

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Tel 02-802-1980 Fax 02-802-2994 Email: info@neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: 6503003

Page:1/2

Calibrated Date: 3-Mar-22

☒ PM ☐ Onsite

Instruments Information

| | |
|--|--|
| Analyzer Type: NO/NO2/NOx Analyzer Model: 42C | Manufacturer THERMO S/N: ENOTE42C768384 |
|--|--|

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 SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 26.7 °C

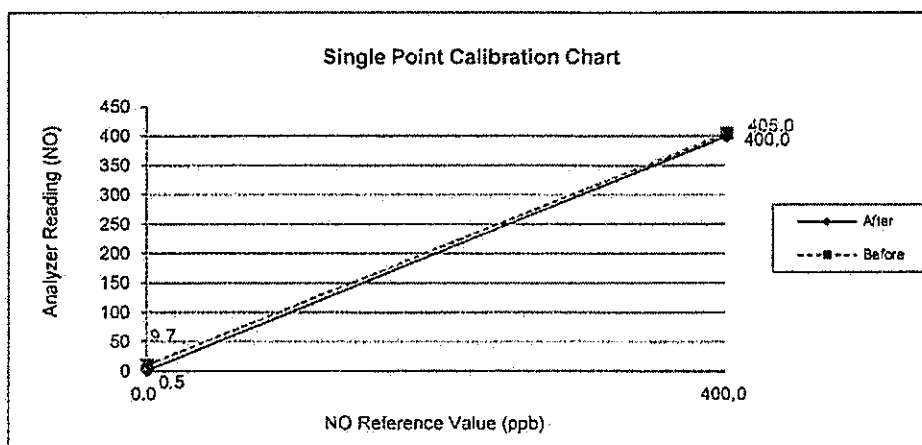
Humidity: 48 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 9.7 | 0.0 | 9.7 | 405 | 400.0 | 0.6 |
| NO ₂ | 3.4 | 0.0 | 3.4 | 4.0 | 0.0 | 0.5 |
| NOx | 13.1 | 0.0 | 13.1 | 409 | 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 | 400.0 | 0.0 |
| NO ₂ | 0.2 | 0.0 | 0.2 | 1.0 | 0.0 | 0.1 |
| NOx | 0.7 | 0.0 | 0.7 | 401 | 400.0 | 0.1 |



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ผู้จัดการฝ่ายควบคุมคุณภาพ

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MODEL : NOx ANALYZER Model 42C THERMO

DATE : 3-03-2022

S/N : ENOTE42C768384

Page:2/2

| Test Function Value | Before | After |
|----------------------------------|---------|---------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -675 | -678 |
| LAMP VOLTAGE 950 - 1,200 (V) | | |
| INTER TEMP 15 - 45 DEG C | 43 | 43 |
| CHAMBER TEMP 47 - 51 C | 49 | 50 |
| COOLER TEMP -5 - (-2) DEG C | -2 | -2 |
| PRESSURE 400 - 1000.0 mm Hg | 350 | 380 |
| SAMPLE FLOW 0.350 - 0.900 LPM | 0.45 | 0.46 |
| OZONEATOR FLOW 0.035 - 0.075 LPM | 0.05 | 0.05 |
| No/Nox BKG | 12/9.0 | 12/9.1 |
| No/Nox Slope | 1.0/0.8 | 0.9/0.8 |
| | | |

Calibrate By: Sirish K. N.

Approve By : 

Sirirat Poonlak

Sarawut Keawsrinual

Date: 3-Mar-22

Date: 3-Mar-22

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**neediss**บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.536 ซอยบางโพธิ์ 7 แขวงบางโพธิ์ เขตบางโพธิ์ กรุงเทพมหานคร 10160 536 Soi Bangkhoe 7 Bangkhoe Bangkok
Tel. 02-802-3980-2 Fax 02-802-3988 E: info@neediss.com

Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6504005

Instrument :

PM-2.5 Sampler SINGLE

Validation Date:

1-Apr-22

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0478

Environment :

Humidity(%RH) : 54

Temperature (°C) : 27.9

Pressure (mmHg) : 744

Reference Standard:

Temperature Calibrator : DIGICON, model: CC-VTR-SH, Serial No.091109269

Flow Calibrator: Mesalabs Defender, model : 520-H , Serial No.164578

Leak Test : Pass

Diagnostic Check:

| PM-10 Inlet | PM-2.5 Size Selective | Filter Cassette | Fan | Valve | Pump % |
|-------------|-----------------------|-----------------|------|-------|--------|
| Pass | Pass | Pass | Pass | Pass | Pass |

Result of Instrument Validation :

| Calibrator Simulator | | | | | Temperature Measurement | |
|---|-------|-----|------|------|-------------------------|------------|
| Temperature Audit and Adjust with Calibrator (°C) | | | | | Instrument | Reference |
| Set point | -10.0 | 0.0 | 20.0 | 45.0 | Reading(Avg.) | TC Reading |
| ambient | -10.0 | 0.0 | 20.0 | 45.0 | 27.9 | 27.9 |
| Filter | -10.0 | 0.0 | 20.0 | 45.0 | 27.9 | 27.9 |

Flow Control :

Calibration mode : AMB Flow Device

Flow set : 16.67 LPM

Avg. Pressure at Ref. : 746 mmHg.

| Flow Measure (Avg.) | Flow Calibrator(Avg.10) | Flow Difference |
|---------------------|-------------------------|-----------------|
| 16.67 LPM | 16.67 LPM | 0 LPM |

Engineer :

Phanuwat Suanbubpha

Approve By:

Sarawut Keawsrinal

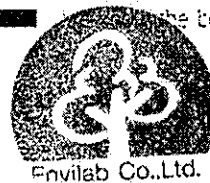
Issu Date:

1-Apr-22

Date:

1-Apr-22

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Neediss Supply Instrument Co., Ltd.536 ถนนพหลโยธิน 7 แขวงพญาไท เขตพญาไท กรุงเทพมหานคร 10160 536 Soi Phloklay 7, Bangkok Bangkok Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E: info@neediss.com

Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6504015

Instrument :

PM-2.5 Sample Single

Validation Date:

1-Apr-22

Manufacturer :

Rupprecht, Patashnick

Model :

200-H

Serial/ID No. :

EP2RP200029702

Environment :

Humidity(%RH) :

51

Temperature (°C) :

27

Pressure (mmHg) :

756

Reference Standard:

Temperature Calibrator : DIGICON, model: CC-VTR-SH, Serial No.091109269

Flow Calibrator: Mesalabs Defender, model : 520-H , Serial No.164578

Leak Test :

Pass

Diagnostic Check:

| PM-10 Inlet | PM-2.5 Size Selective | Filter Cassette | Fan | Valve | Pump % |
|-------------|-----------------------|-----------------|------|-------|--------|
| Pass | Pass | Pass | Pass | Pass | Pass |

Result of Instrument Validation :

| Calibrator Simulator | | | | | Temperature Measurement | |
|---|-------|-----|------|------|-------------------------|------------|
| Temperature Audit and Adjust with Calibrator (°C) | | | | | Instrument | Reference |
| Set point | -10.0 | 0.0 | 20.0 | 45.0 | Reading(Avg.) | TC Reading |
| ambient | -10.0 | 0.0 | 20.0 | 45.0 | 26.8 | 27.0 |

Flow Control :

Calibration mode : AM8 Flow Device

Flow set : 16.67 LPM

Avg. Pressure at Ref. : 746 mmHg.

| Flow Measure (Avg.) | Flow Calibrator(Avg.10) | Flow Difference |
|---------------------|-------------------------|-----------------|
| 16.67 LPM | 16.66 LPM | 0.01 LPM |

Engineer :

Phanuwat Suanbubpha

Approve By:

Sarawut Keawsriniul

Issu Date:

1-Apr-22

Date:

1-Apr-22

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รับรองสำเนาถูกต้อง

Envilab Co., Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ

Certificate of Calibration

Calibration Certification Information

Cal. Date: January 19, 2022 Roots-meter S/N: 438320 Ta: 294 °K
Operator: Jim Tisch Pa: 749.05 mm Hg
Calibration Model #: TE-5028A Calibrator S/N: 1328

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.3190 | 3.7 | 1.50 |
| 2 | 3 | 4 | 1 | 1.0220 | 6.2 | 2.50 |
| 3 | 5 | 6 | 1 | 0.9290 | 7.5 | 3.00 |
| 4 | 7 | 8 | 1 | 0.8590 | 8.7 | 3.50 |
| 5 | 9 | 10 | 1 | 0.6530 | 14.8 | 6.00 |

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) |
|-----------|---------------|--|--------|-------------|---|
| 0.9941 | 0.7536 | 1.2241 | 0.9951 | 0.7544 | 0.7673 |
| 0.9907 | 0.9694 | 1.5803 | 0.9917 | 0.9704 | 0.9906 |
| 0.9890 | 1.0646 | 1.7312 | 0.9900 | 1.0656 | 1.0851 |
| 0.9874 | 1.1495 | 1.8699 | 0.9884 | 1.1506 | 1.1721 |
| 0.9793 | 1.4996 | 2.4483 | 0.9802 | 1.5011 | 1.5346 |
| QSTD | m= | 1.63957 | QA | m= | 1.02667 |
| | b= | -0.01202 | | b= | -0.00753 |
| | r= | 0.99999 | | r= | 0.99999 |

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: | roots-meter 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.

Certificate of Calibration

Certificate No. : 65-200022-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA224-1S

Serial No. : 0034803270

ID No. : ELABBALANCEN04

Capacity : 220 g

Resolution : 0.0001 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.

Ambient Temperature : (23.7 to 23.8) °C

Relative Humidity : (57.1 to 58.0) %

Air Pressure : 1012.0 mbar

Date of Received : 02 February 2022

Date of Calibration : 02 February 2022

Date of Issue : 09 February 2022

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-----------|-------------|--|
| E261-E2624 | C02213103 | 18 Nov 2022 | National Institute of Metrology (Thailand), (NIMT) |

Approved by :

(Sorachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 65-200022-1

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) |
|----------------------|-------------------|--------------------------|
| 0.01 | 0.0001 | 0.00011 |
| 0.1 | 0.0001 | 0.00011 |
| 1 | 0.0000 | 0.00011 |
| 2 | 0.0001 | 0.00011 |
| 5 | 0.0000 | 0.00012 |
| 10 | 0.0001 | 0.00012 |
| 20 | -0.0001 | 0.00013 |
| 50 | 0.0000 | 0.00014 |
| 100 | -0.0002 | 0.00020 |
| 200 | -0.0004 | 0.00038 |

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

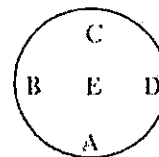
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.11$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g

A B C D E

-0.0001 -0.0002 -0.0002 -0.0001 0.0000 g



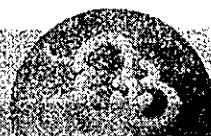
Repeatability

Load test : 200 g

Stdev. : 0.00005 g

- o0o -

Handwritten signature



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Calibratech Co., Ltd.

7/106-7 Moo 2, Sukhaphrachusan 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. : 65-200022-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA3102-1S

Serial No. : 0034409695

ID No. : ELABBALANCEN03

Capacity : 3100 g

Resolution : 0.01 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.

Ambient Temperature : (23.7 to 24.2) °C

Relative Humidity : (57.6 to 57.8) %

Air Pressure : 1012.0 mbar

Date of Received : 02 February 2022

Date of Calibration : 02 February 2022

Date of Issue : 09 February 2022

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-------------|-------------|--|
| F181-F1821 | 65-210044-1 | 31 Jul 2022 | National Institute of Metrology (Thailand), (NIMT) |

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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7/106-7 Moo 2, Sukhaprasathan 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. : 65-200022-2

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) |
|----------------------|-------------------|--------------------------|
| 10 | 0.00 | 0.0082 |
| 20 | 0.00 | 0.0082 |
| 50 | 0.00 | 0.0082 |
| 100 | 0.00 | 0.0082 |
| 200 | 0.00 | 0.0083 |
| 500 | -0.01 | 0.0085 |
| 1000 | -0.01 | 0.0093 |
| 1500 | -0.01 | 0.011 |
| 2000 | -0.01 | 0.012 |
| 3000 | -0.01 | 0.023 |

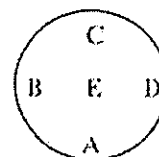
This result of calibration was found accurate as shown on date and place of calibration only.

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 : 1000 g

| | | | | | |
|------|------|------|------|------|---|
| A | B | C | D | E | |
| 0.00 | 0.01 | 0.02 | 0.00 | 0.00 | g |



Repeatability

Load test : 2000 g

Sidev. : 0.000 g

- o o o -



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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-200086-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Electronic Balance

Manufacturer : METTLER TOLEDO **Model :** XPR2

Serial No. : C011158261 **ID No. :** ELABBALANCEN07

Capacity : 2.1 g **Resolution :** 0.000001 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.

Ambient Temperature : (23.2 to 23.4) °C

Relative Humidity : (55.3 to 55.6) %

Air Pressure : 1010.0 mbar

Date of Received : 25 March 2021

Date of Calibration : 25 March 2021

Date of Issue : 27 March 2021

Calibrated by : Akaradath Thippichai

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

Edition 5, July 2015

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

Standard Weights

| <u>ID No.</u> | <u>Cert. No.</u> | <u>Due Date</u> | <u>Traceability</u> |
|---------------|------------------|-----------------|--|
| E261-E2624 | C02204101 | 17 Nov 2021 | National Institute of Metrology (Thailand), (NIMT) |

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%.

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CAL-00031-03



CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhaphruehasan 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. : 64-200086-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

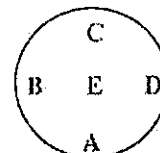
| Nominal Value (g) | Correction (g) | Uncertainty \pm (g) |
|----------------------|-------------------|--------------------------|
| 0.001 | -0.000001 | 0.0000053 |
| 0.005 | 0.000000 | 0.0000054 |
| 0.01 | -0.000001 | 0.0000071 |
| 0.02 | -0.000001 | 0.0000089 |
| 0.05 | -0.000001 | 0.000011 |
| 0.1 | 0.000001 | 0.000014 |
| 0.5 | -0.000005 | 0.000022 |
| 1 | 0.000000 | 0.000026 |
| 1.5 | -0.000005 | 0.000037 |
| 2 | 0.000000 | 0.000034 |

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 : 1 g
A B C D E
0.000000 0.000000 0.000000 0.000000 0.000000 g



Repeatability

Load test : 2 g
Stdev. : 0.0000005 g

- o O o -





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0406

MTC No. EEL. BP. 68/0364

CALIBRATION CERTIFICATE

Submitted by : Envilab Co., Ltd.

Address : 540, 540/1 Soi Bangkhuae 7, Bangkhuae, Bangkok 10160 Thailand.

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

Instrument Calibrated :

Description : Acoustic Calibrator

Manufacturer : Pulsar

Model : 106

Serial No. : 87098

Ambient Environment

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

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

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

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

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

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

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

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

Date of Receipt : 10 Mar. 2021

Date of Calibration : 12 Mar. 2021

1 / 2

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

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

FM.BL.MTC.002 Rev.4

Head Office

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

Office/Laboratory

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

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand
Tel. (66) 0 2519 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8692

Envilab Co., Ltd. ผู้จัดการฝ่ายควบคุมคุณภาพ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0406

MTC No. EEL. BP. 68/0364

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 HzAcoustic 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 2 |
|---------------------------|------------------------------------|---------------------|------------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 94.13 | 0.13 | ± 0.10 | ± 0.75 dB |

2. Frequency

| Standard Microphone Type | Measured Frequency (Hz) | Deviated value (Hz) | Uncertainty (Hz) | Tolerance limit IEC60942:2003 Class 2 |
|---------------------------|-------------------------|---------------------|------------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 1000.3 | 0.3 | ± 1.5 | $\pm 2.0\%$ |

3. Total Distortion

| Standard Microphone Type | Measured Total Distortion (%) | Uncertainty (%) | Tolerance limit IEC60942:2003 Class 2 |
|---------------------------|-------------------------------|-----------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 0.72 | ± 0.50 | $\pm 4.0\%$ |

- Note : 1. No adjustment.
2. The calibrator pressure correction was not included.
3. The microphone volume correction was not included.

Calibrated by :

Tawikiat
.....
(Mr.Tawikiat Iamsamran)

Approved by :

(Signature)
.....
(Mr. Mawalee Klunypa)
Acting Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 12 Mar. 2021

Date of Issue : 16 Mar. 2021

Ref: 2011264031001119001

2 / 2

End of Certificate

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

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FM.BL.MTC.002 Rev.4

Head Office

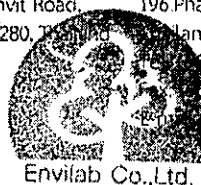
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : rumpai@tistr.or.th Website: www.tistr.or.th

Office/Laboratory

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

Office

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



EnviLab Co., Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD
Part Number: E05NI91E15A0003 Reference Number: 160-402305646-1
Cylinder Number: EB0146406 Cylinder Volume: 148.7 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12022 Valve Outlet: 660
Gas Code: CO,CO2,NO,NOX,SO2,BALN Certification Date: Jan 03, 2022
Expiration Date: Jan 03, 2030

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.

Do Not Use This Cylinder below 100 psig, 6.8 megapascals.

ANALYTICAL RESULTS

| Component | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates |
|-----------------|-------------------------|----------------------|-----------------|----------------------------|------------------------|
| NOX | 100.0 PPM | 100.2 PPM | G1 | +/- 0.9% NIST Traceable | 12/27/2021, 01/03/2022 |
| CARBON MONOXIDE | 100.0 PPM | 98.02 PPM | G1 | +/- 0.5% NIST Traceable | 12/27/2021 |
| NITRIC OXIDE | 100.0 PPM | 100.1 PPM | G1 | +/- 1.0% NIST Traceable | 12/27/2021, 01/03/2022 |
| SULFUR DIOXIDE | 100.0 PPM | 100.2 PPM | G1 | +/- 1.0% NIST Traceable | 12/27/2021, 01/03/2022 |
| CARBON DIOXIDE | 8.000 % | 7.962 % | G1 | +/- 0.9% NIST Traceable | 12/27/2021 |
| NITROGEN | Balance | | | | |

CALIBRATION STANDARDS

| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
|------|--------------|-------------|-------------------------------------|-------------|-----------------|
| NTRM | 09010241 | KAL004894 | 98.48 PPM CARBON MONOXIDE/NITROGEN | +/- 0.5% | Oct 16, 2024 |
| NTRM | 200610-56 | CC733475 | 98.61 PPM NITRIC OXIDE/NITROGEN | +/- 0.6% | Oct 06, 2026 |
| GMIS | 124206889119 | CC322885 | 4.294 PPM NITROGEN DIOXIDE/NITROGEN | +/- 2.0% | Sep 03, 2024 |
| NTRM | 11010419 | KAL004813 | 99.6 PPM SULFUR DIOXIDE/NITROGEN | +/- 0.8% | Jul 28, 2023 |
| NTRM | 08010636 | K019200 | 13.94 % CARBON DIOXIDE/NITROGEN | +/- 0.6% | Jan 30, 2024 |

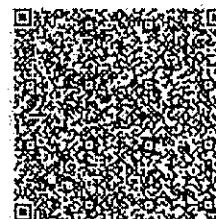
ANALYTICAL EQUIPMENT

| Instrument/Make/Model | Analytical Principle | Last Multipoint Calibration |
|----------------------------------|----------------------|-----------------------------|
| Nicolet iS50 FTIR AUP2010245 CO2 | FTIR | Dec 02, 2021 |
| SIEMENS ULTRAMAT6E N1-C8-180 | NDIR | Dec 09, 2021 |
| Nicolet iS50 FTIR AUP2010245 NO | FTIR | Dec 16, 2021 |
| Nicolet iS50 FTIR AUP2010245 NO2 | FTIR | Dec 29, 2021 |
| Nicolet iS50 FTIR AUP2010245 SO2 | FTIR | Dec 23, 2021 |

Triad Data Available Upon Request

NOTES: Gross Weight: 28.1 Kg, Net Weight: 5.1 Kg.

UF0X5CX



[Signature]
Approved for Release



[Signature]
รับรองสำเนาถูกต้อง
ผู้ตรวจการฝ่ายควบคุมคุณภาพ

Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM18211

Calibration Date: **MAR 24 2021**

Calibration Reference Equipment: 714J7402

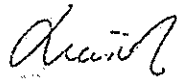
Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard.

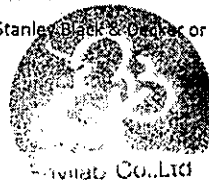
Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: 

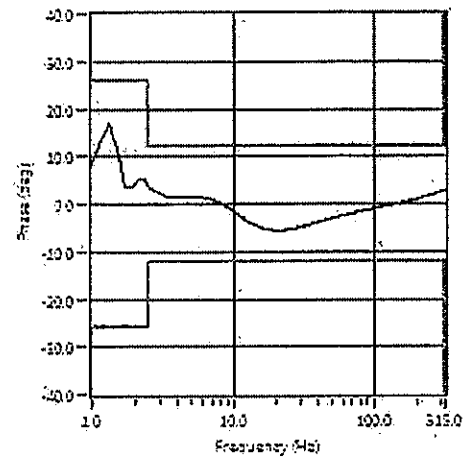
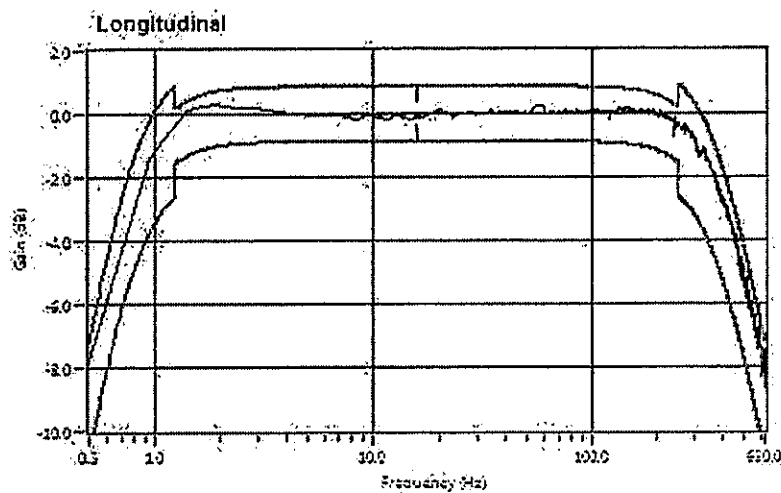
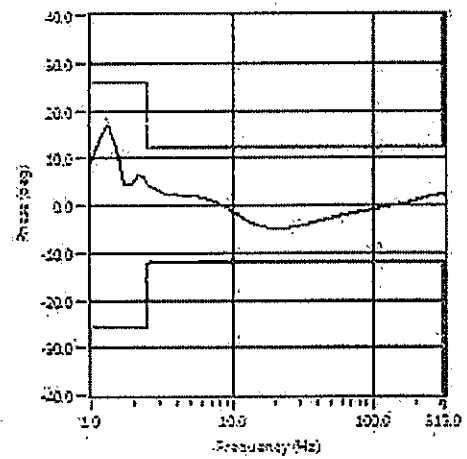
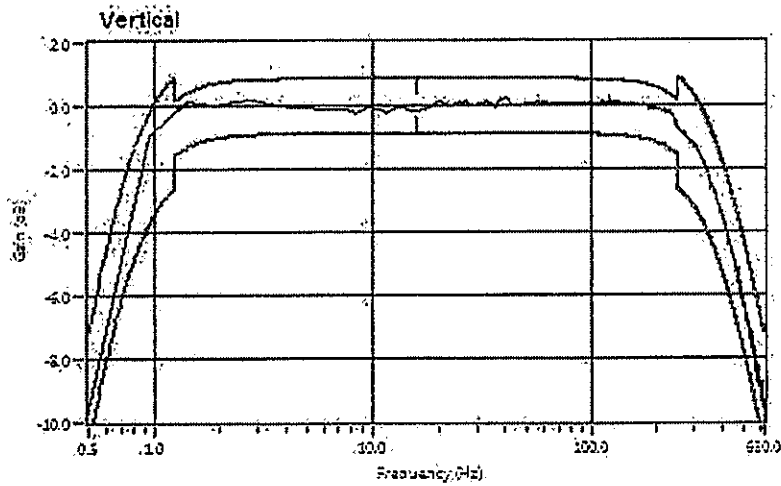
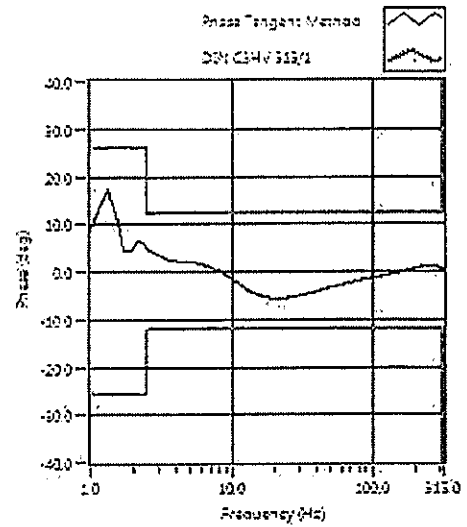
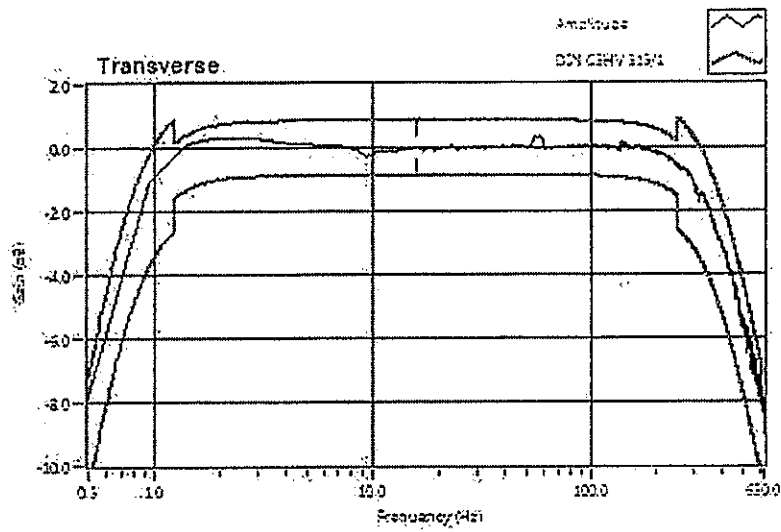
Xiaoming Yang



309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642



Frequency Response of UM18211



Envision Co., Ltd


รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Mettler-Toledo (Thailand) Ltd.
846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10260
+662 723 0382
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

Company: EnviLab Co., Ltd.
Address: 540, 540/1 Soi Bang Khae 7, Bang Khae
City: Bang Khae Contact: Ngarmthip Sampanpuang
Zip / Postal: 10160
State / Province: Bangkok
Order Number: 

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: XSR205DU Asset Number: N/A
Serial No.: B911363567 Terminal Model: SRAT
Building: N/A Terminal Serial No.: B911363567
Floor: 3 Terminal Asset No.: N/A
Room: B304

| Range | Max. Capacity | Readability (d) |
|-------|---------------|-----------------|
| 1 | 81 g | 0.00001 g |
| 2 | 220 g | 0.0001 g |

Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CPW002/20

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

| | Temperature | | Humidity | |
|----------|----------------|--------------|---------------|-------------|
| As Found | Start: 22.2 °C | End: 22.6 °C | Start: 58.3 % | End: 59.7 % |

As Found Calibration Date: 02-Mar-2022
As Left Calibration Date: N/A
Issue Date: 03-Mar-2022

Calibrator:

Naruephon C.

Naruephon Chonprasertsuk

Approved Signatory:

Kassakorn

- ☒ Kassakorn Tassanachaisakul
☐ Santi Jitniyom
☐ Surachet Sukkate



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Measurement Results

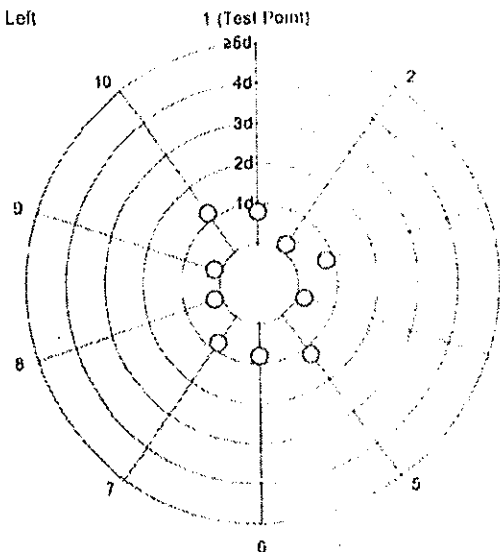
Repeatability

Test Load: 70 g

| | As Found | As Left |
|----|------------|---------|
| 1 | 70.00001 g | N/A |
| 2 | 70.00002 g | N/A |
| 3 | 70.00001 g | N/A |
| 4 | 70.00002 g | N/A |
| 5 | 70.00003 g | N/A |
| 6 | 70.00001 g | N/A |
| 7 | 70.00001 g | N/A |
| 8 | 70.00002 g | N/A |
| 9 | 70.00002 g | N/A |
| 10 | 70.00003 g | N/A |

| | | |
|--------------------|------------|-----|
| Standard Deviation | 0.000008 g | N/A |
|--------------------|------------|-----|

○ As Found
◆ As Left



The "d" in the graph represents the readability of the range/interval in which the test was performed.

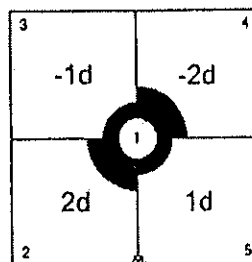
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

| Position | As Found | As Left |
|----------|------------|---------|
| 1 | 100.0000 g | N/A |
| 2 | 100.0002 g | N/A |
| 3 | 99.9999 g | N/A |
| 4 | 99.9998 g | N/A |
| 5 | 100.0001 g | N/A |

| | | |
|-------------------|----------|-----|
| Maximum Deviation | 0.0002 g | N/A |
|-------------------|----------|-----|



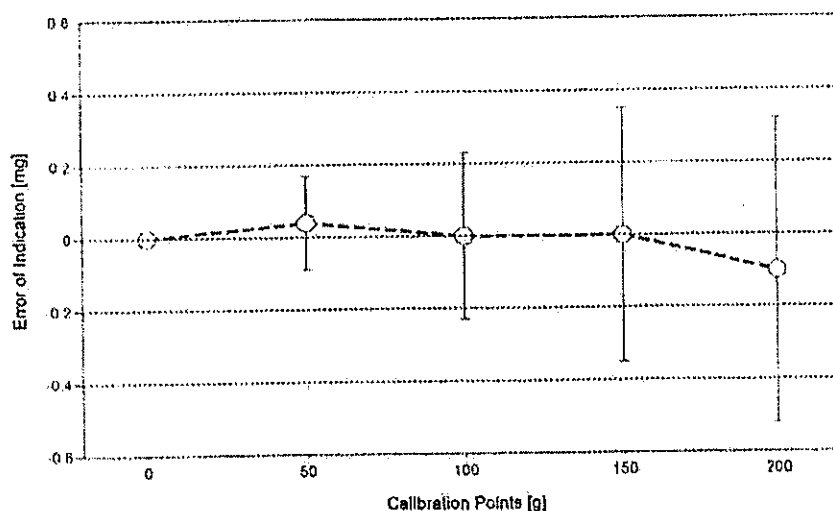
As Found

The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

As Found

| | Reference Value | Indication | Error of Indication | Expanded Uncertainty | k |
|----|-----------------|------------|---------------------|----------------------|---|
| 1 | 0.00000 g | 0.00000 g | 0.00000 g | 0.017 mg | 2 |
| 2 | 0.10000 g | 0.10000 g | 0.00000 g | 0.023 mg | 2 |
| 3 | 0.50000 g | 0.50001 g | 0.00001 g | 0.028 mg | 2 |
| 4 | 0.99999 g | 0.99999 g | 0.00000 g | 0.032 mg | 2 |
| 5 | 1.99999 g | 2.00000 g | 0.00001 g | 0.040 mg | 2 |
| 6 | 5.00001 g | 5.00001 g | 0.00000 g | 0.048 mg | 2 |
| 7 | 10.00001 g | 10.00002 g | 0.00001 g | 0.062 mg | 2 |
| 8 | 49.99998 g | 50.00002 g | 0.00004 g | 0.13 mg | 2 |
| 9 | 100.0000 g | 100.0000 g | 0.0000 g | 0.23 mg | 2 |
| 10 | 150.0000 g | 150.0000 g | 0.0000 g | 0.35 mg | 2 |
| 11 | 199.9999 g | 199.9998 g | -0.0001 g | 0.42 mg | 2 |



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

| | | | |
|---------------------|--------|-----------------------|-------------|
| Weight Set No.: | WS22 | Date of Issue: | 06-Jan-2022 |
| Certificate Number: | 177036 | Calibration Due Date: | 03-Jul-2023 |

Weight Set 2: OIML E2

| | | | |
|---------------------|------------|-----------------------|-------------|
| Weight Set No.: | WS76 | Date of Issue: | 31-Jan-2022 |
| Certificate Number: | C205470237 | Calibration Due Date: | 12-Jul-2023 |

Thermo Hygrometer

| | | | |
|---------------------|---------|-----------------------|-------------|
| Equipment No.: | IN193 | Date of Issue: | 14-Jun-2021 |
| Certificate Number: | 21H1221 | Calibration Due Date: | 01-Jun-2022 |

Remarks

FACT adjustment functionality activated

Equipment condition: Good

Next calibration according to customer's procedure

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.5 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: $3 K$

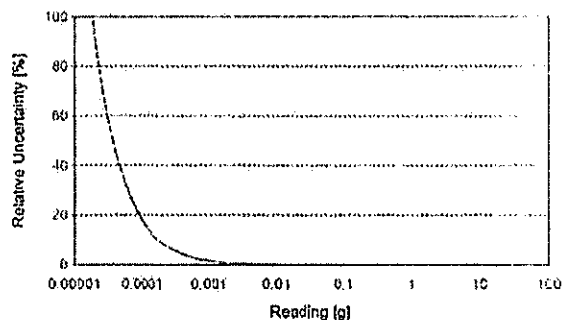
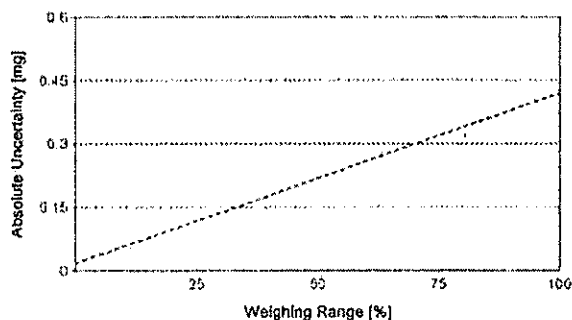
Linearization of Uncertainty Equation

| | Range | | As Found | As Left |
|---|-----------|-------|---|---------|
| | d | Max | | |
| 1 | 0.00001 g | 81 g | $U_1 = 0.018 \text{ mg} + 0.00497 \text{ mg/g} \cdot R$ | N/A |
| 2 | 0.0001 g | 220 g | $U_2 = 0.06 \text{ mg} + 0.00492 \text{ mg/g} \cdot R$ | N/A |

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty In Use for Various Net Indications (Examples)

| Net Indication | As Found | | As Left | |
|----------------|----------|----------|---------|-----|
| 0.00220 g | 0.018 mg | 0.82% | N/A | N/A |
| 0.02200 g | 0.018 mg | 0.082% | N/A | N/A |
| 0.22000 g | 0.019 mg | 0.0087% | N/A | N/A |
| 2.20000 g | 0.029 mg | 0.0013% | N/A | N/A |
| 220.0000 g | 1.1 mg | 0.00052% | N/A | N/A |



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.





S.K. SALES AND SERVICE CO. LTD.

194/56, 194/57 Thakham Rd. Samoe Dam
Bang Khun Thien, Bangkok 10160
Tel : 02-417-2144 Fax : 02-417-2155



Certificate of Calibration

Reference No. : 4182/2202-017 Certificate No. : L2203-290
Customer : Envilab Co., Ltd. (Head Office) Page 1 of 2
: 540, 540/1 Soi Bangkhae 7, Bangkhae,
: Bangkhae Bangkok 10160
Equipment : Digital Thermo-Hygrometer
Manufacturer : Testo
Model : 608-H1
Serial No. : 83353607
ID No. : -
Received Date : 7 March 2022
Calibrated Date : 9 March 2022
Issued Date : 15 March 2022

| Environment | Start Calibration | Stop Calibration |
|--------------------------|-------------------|------------------|
| Ambient Temperature (°C) | 24.7 | 25.5 |
| Relative Humidity (% RH) | 51 | 52 |

Calibrated by : Mr. Nattawut Reangdech

Calibration Method

In-house method : by comparison with standard hygrometer for humidity measurement function
and comparison with standard thermometer for temperature measurement function into humidity/temperature chamber

Condition of this result of calibration

1. Reference standard instrument

| Instrument | Model | Serial No. | Certificate No. | Due Date |
|-----------------------------------|----------|------------|-----------------|------------------|
| 1) Hygrometer | HL-NT2-D | 61468576 | QR21-0851 | 13 May 22 |
| 2) Digital Thermometer With Probe | GT11 | 08000089 | PSL-T 0072/65 | 14 November 2022 |

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

3. This certificate can be traceable to International System of Unit :

- Through Thailand Institute of Scientific And Technological Research (TISTR)
- Through Quality Reborn Co., Ltd.

Approved by :

☐ Mr. Suphachai Saksri

☐ Mr. Phayak Toolit

☒ Miss Tantaraporn Peltong

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

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รับรองสำเนาถูกต้อง

Result of Calibration

Function : Humidity Measurement Reference Temperature at 25 °C

| STD Reading (% RH) | UUC Reading (% RH) | UUC Error (% RH) | Measurement Uncertainty (±% RH) |
|-----------------------|-----------------------|---------------------|------------------------------------|
| 50.00 | 49.0 | -1.00 | 2.3 |

Function : Temperature Measurement

| STD Reading (°C) | UUC Reading (°C) | UUC Error (°C) | Measurement Uncertainty (±°C) |
|---------------------|---------------------|-------------------|----------------------------------|
| 25.012 | 25.0 | -0.012 | 0.35 |

Resolution : 0.1 (°C) , 0.1 % RH

STD= Standard

UUC= Unit Under Calibration

** End of Calibration Report **

*Th. W. W.**ep.*

รับรองสำหรับกวดัง

ศูนย์บริการลูกค้าสัมพันธ์

CAL

Calibratech Co.,Ltd.

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

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



NSG-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-420055-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : pH Meter (Pocket)

pH meter

Manufacturer : Eutech

Model : pHTestr 30

Range : -1.00 to 15.00 pH

Resolution : 0.01 pH

Serial No. : 2856418

ID No. : ELABPHTEST3016

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

Ambient Temperature : (24.5 to 25.0) °C

Relative Humidity : (50 to 54) %

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 24 March 2021

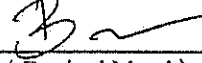
Calibrated by : Bunjerd Masri

Calibration Method : In-house method CAL-M4201 direct measurement by using certified reference material (CRM)

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

Standard Buffer Solution

| pH | Cert. No. | Lot No. | Exp. Date | Traceability |
|-------|-----------|---------|-------------|--------------|
| 4.004 | 61208711 | 684575 | 01 Sep 2021 | CPA chem |
| 6.985 | 61191143 | 684576 | 01 Sep 2021 | CPA chem |
| 9.963 | 61208865 | 684577 | 01 Sep 2021 | CPA chem |

Approved by : 
(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0091-03

รับรองสถานภาพถูกต้อง

ผลการสอบเทียบถูกต้อง



CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 64-420055-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

| Adjustment Curve at nominal pH | Standard Buffer (pH) | UUC Reading (pH) | Correction (pH) | Uncertainty (\pm pH) |
|-----------------------------------|---------------------------|-----------------------|----------------------|-----------------------------|
| 4, 7, 10 | 4.004 | 4.00 | 0.01 | 0.011 |
| | 6.985 | 7.00 | -0.01 | 0.020 |
| | 9.963 | 10.00 | -0.04 | 0.053 |

Remark

1 UUC : Unit Under Calibration

2 pH meter does not have voltage mode because the plug can not BNC socket

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

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

- ๐(๐) -





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 21TW57

Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : Hanna
Model : HI 9146
Serial No. : G0007931
ID No. : EDOHI914607931
Received Date : 16 March 2021
Test Date : 19 March 2021
Reference : 2103-0669DN-1
Submitted by : Envilab Co.,Ltd (Head office)
540, 540/1 Soi Bangkhuae 7, Bangkhuae,
Bangkhuae, Bangkok 10160
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Calibrated by : Walalak Sirithean

Approved by :

Malee

Approved Signatory

- (✓) Malee Bulkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date :

23 March 2021



รับรองสำเนาถูกต้อง

Envilab Co. Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ

B 0257191



Cert.No.: 21TW57

Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: KC1A01TAF

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|---|-------------------------------|------------------------------|
| 8.00 | 8.17 | 0.00 |

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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Malee



Envilab Co., Ltd.

Om

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รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co., Ltd.

7/106-7 Moo 2, Sukhaphrachasan 3 Rd., Bangpood, Pakkret, 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. : 64-400527-3

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Incubator)

Manufacturer : M-LAB

Model : BIC-140

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 100613-0

ID No. : ELABREFRIG140L

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

Ambient Temperature : (24.5 to 25.0) °C

Relative Humidity : (55 to 58) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 15 October 2021

Date of Calibration : 15 October 2021

Date of Issue : 16 October 2021

Calibrated by : Bunjerd Masri

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

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No.

Cert. No.

Due Date

Traceability

400046 & 400023 64-400443-1

29 Mar 2022

National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-00031-03



รับรองสำเนาถูกต้อง

ผู้จัดทำฝ่ายควบคุมคุณภาพ



Certificate of Calibration

Certificate No. : 64-400527-3

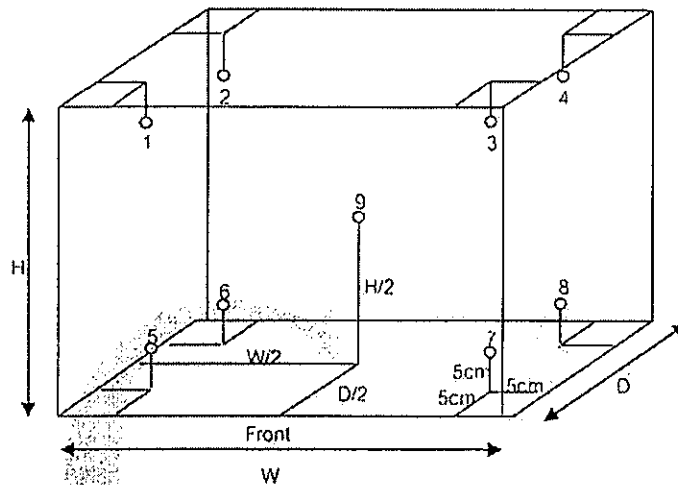
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.38 m

D = 0.35 m

H = 1.15 m

Capacity = 0.15 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|--------------------|-----------------------------|--------------------------------|--|------|------|------|------|------|------|------|------|-----------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 20.0 | 20.0 | 20.0 | 19.9 | 19.8 | 19.8 | 19.9 | 19.9 | 19.9 | 20.0 | 19.8 | 20.1 | 0.53 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 20.0 | 20.0 | 20.0 | 0.4 | 0.1 | 0.4 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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รับรองสำเนาถูกต้อง
Calibratech Co., Ltd. ผู้จัดการฝ่ายควบคุมคุณภาพ



CAL

Calibratech Co.,Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400569-1

Page : 1 of 2

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

Equipment : Air Chamber (Refrigerator)
Manufacturer : M-LAB Model : BIC-140
Range : N/A °C Resolution : 0.1 °C
Serial No. : 1011 ID No. : ELABBODCI40N03

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

Ambient Temperature : (23.0 to 23.8) °C

Relative Humidity : (55 to 60) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 12 November 2021

Date of Calibration : 12 November 2021

Date of Issue : 18 November 2021

Calibrated by : Bunjerd Masri

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

The temperature scale used was based on ITS-90

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

| ID No. | Cert. No. | Due Date | Traceability |
|-----------------|-------------|-------------|---|
| 400046 & 400023 | 64-400443-1 | 29 Mar 2022 | National Institute of Metrology Thailand (NIMT) |

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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รับรองผลการวัด

ผู้ตรวจวัด : Bunjerd Masri



Certificate of Calibration

Certificate No. : 64-400569-1

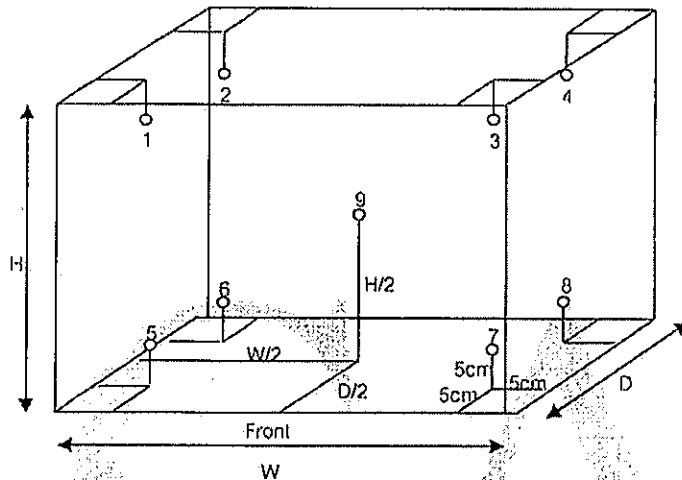
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.38 m

D = 0.35 m

H = 1.15 m

Capacity = 0.15 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|--------------------|-----------------------------|--------------------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 4.0 | 4.0 | 4.0 | 3.3 | 3.2 | 3.4 | 3.4 | 3.9 | 3.9 | 4.0 | 3.4 | 4.2 | 0.57 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 4.0 | 4.0 | 4.0 | 1.0 | 0.1 | 1.0 |

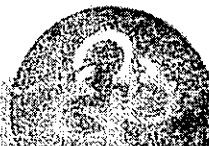
Remark The uncertainty is not combine uniformity of the air chamber

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

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

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[Signature]



รับรองสำเนาถูกต้อง



CAL

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400163-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Oven)

Manufacturer : Memmert

Model : UF 75

Range : N/A °C

Resolution : 0.1 °C

Serial No. : B319.0600

ID No. : N/A

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

Ambient Temperature : (30.0 to 31.5) °C

Relative Humidity : (50 to 55) %

Line Voltage : (224.2 to 225.2) V

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 25 March 2021

Calibrated by : Permpoon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

| ID No. | Cert. No. | Due Date | Traceability |
|-----------------|-------------|-------------|---|
| 400029 & 400032 | 63-400450-1 | 30 Mar 2021 | National Institute of Metrology Thailand (NIMT) |

Approved by :

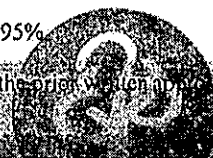
(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03



รับรองมาตรฐานผลิตภัณฑ์

มาตรฐาน ISO 9001:2015



Certificate of Calibration

Certificate No. : 64-400163-2

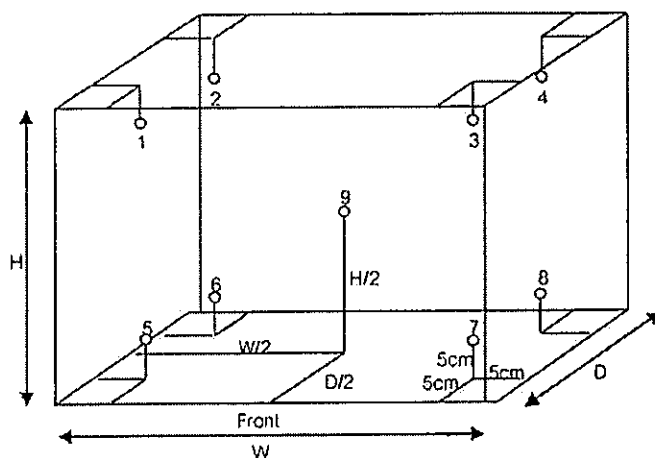
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.56 m

Capacity = 0.07 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|-----------------|--------------------------|-----------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 104.0 | 103.5 | 103.5 | 104.0 | 104.3 | 104.3 | 104.2 | 104.2 | 103.9 | 103.7 | 104.2 | 104.1 | 0.69 |
| 110.0 | 109.5 | 109.5 | 110.0 | 110.4 | 110.4 | 110.2 | 110.2 | 109.9 | 109.6 | 110.2 | 110.1 | 0.69 |
| 180.0 | 179.0 | 179.0 | 179.0 | 180.3 | 180.2 | 180.2 | 180.3 | 180.0 | 179.0 | 180.4 | 180.3 | 0.95 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|-----------------|--------------------------|-----------------------------|--------------------------|-------------------------|------------------------|
| 104.0 | 103.5 | 103.5 | 0.5 | 0.1 | 0.8 |
| 110.0 | 109.5 | 109.5 | 0.7 | 0.1 | 1.0 |
| 180.0 | 179.0 | 179.0 | 1.5 | 0.2 | 1.7 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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Calibratech Co.,Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 65-400053-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhac7, Bangkhac, Bangkok 10160

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB29

Range : N/A °C

Resolution : 0.1 °C

Serial No. : L617.0156

ID No. : ELABWBWNB29N01

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

Ambient Temperature : (22.7 to 23.5) °C

Relative Humidity : (45 to 50) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 02 February 2022

Date of Calibration : 02 February 2022

Date of Issue : 07 February 2022

Calibrated by : Permpon Chanpu

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

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

| ID No. | Cert. No. | Due Date | Traceability |
|-----------------|-------------|-------------|---|
| 400029 & 400031 | 64-400588-1 | 24 May 2022 | National Institute of Metrology Thailand (NIMT) |

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03



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Envilab Co., Ltd. ผู้ให้บริการสอบเทียบ



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

Certificate of Calibration

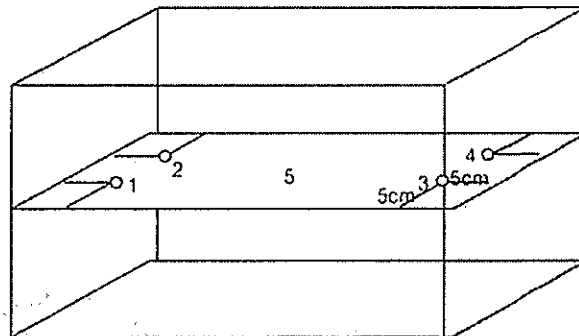
Certificate No. : 65-400053-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Front

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ | | | | | Uncertainty (± °C) | Measured Uniformity (°C) | Measured Stability (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|-------|-------|-------|-------|-----------------------|-----------------------------|----------------------------|
| | | | Sensor No. | | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | | | |
| 95.0 | 95.0 | 95.0 | 95.35 | 95.45 | 95.51 | 95.66 | 95.56 | 0.19 | 0.27 | 0.06 |

Remark The uncertainty is not combine uniformity of the water bath

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

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

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

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NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-300152-2

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : PYREX

Class : A

Capacity : 50 ml

Graduation : 1 ml

ID No. : C-WW-002/21

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |

Approved by :

(Wipa Tovadec)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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รับรองสำเนาถูกต้อง



CAL-R0031-03

Calibratech Co.,Ltd.

ผู้ตรวจการควบคุมคุณภาพ

CAL

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7/106-7 Moo 2, Sukhapiachasan 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. : 64-300152-2

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 30 | 29.93 |
| 50 | 50.01 |

Uncertainty of measurement with in \pm 0.054 ml

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%

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D.



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ผู้จัดการฝ่ายควบคุมคุณภาพ



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



Certificate of Calibration

Certificate No. : 64-300152-6

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : Wileg

Class : A

Capacity : 1000 ml

Graduation : 10 ml

ID No. : C-WW-029/18

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Arcerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |

Approved by :

(Wipa Tovadee)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Wipa



CAL-F0031-03

Envilab Co., Ltd.

Calibratech Co.,Ltd.

รับรองสถานภาพห้องปฏิบัติการ

ผลิตภัณฑ์และบริการ

CAL

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Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech_cal@ynhoo.com. calibratech_cal@hotmail.com

Certificate of Calibration

Certificate No. : 64-300152-6

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 500 | 502.85 |
| 1000 | 1001.86 |

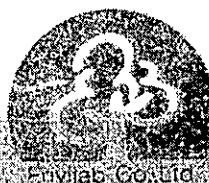
Uncertainty of measurement with in \pm 0.17 ml

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%

- o0o -

D.



Signature

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



ประจำเดือนพฤษภาคม พ.ศ. 2565



TSP High Volume Sampler Calibration

Verification Report No.

A6503 -TSP 02

☒ PM ☐ Onsite

Site: บริษัท เอ็นไวแล็บ จำกัด

UTM : 47P N1514475 E654269

Sampler: ETSP#06

Recorder: ECRANG15315224

Date: 4 Mar 22

Technical: Surakit D.

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1009.7

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.3

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-5028A

Serial#: 1328

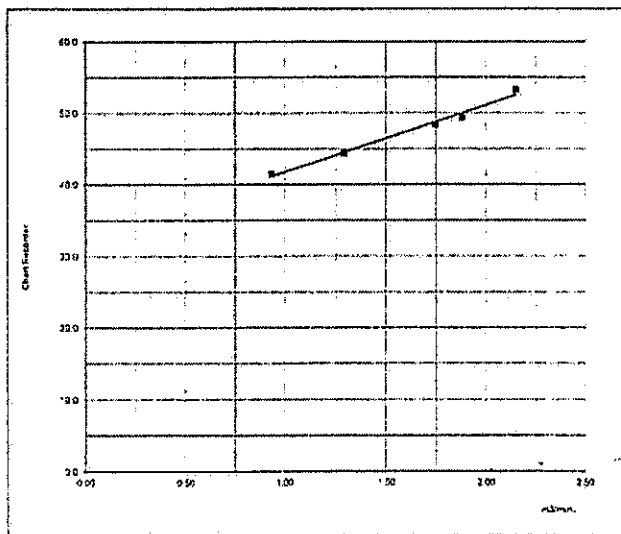
Qstd Slope: 1.63957

Qstd Intercept: -0.01202

Date Certified: 19 Jan 22

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|-------------------------|
| 1 | 12.71 | 2.153 | 54.0 | 53.28 | Slope = 9.3795 |
| 2 | 9.72 | 1.884 | 50.0 | 49.34 | Intercept = 32.3791 |
| 3 | 6.35 | 1.524 | 47.0 | 46.38 | Corr. coeff. = 0.9926 |
| 4 | 4.52 | 1.287 | 45.0 | 44.40 | # of Observations: 5 |
| 5 | 2.35 | 0.930 | 42.0 | 41.44 | Range of Chart 44 |
| | | | | | at 1.1 - 1.7 m3/min. 48 |



Calibrated by :

(Surakit Darncholwichit)

4 March 2022

Approved by :

(Sarawut Keawsrinual)

4 March 2022

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TE-MNT-23 Rev.00 01/08/11



EnviLab Co., Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ



Environmental Engineering Laboratory Co., Ltd.
Environmental Engineering Laboratory Co., Ltd.
Tel: 02-602-5574-8 Fax: 02-602-5574-9 E-mail: info@evltesting.com



PM10 High Volume Sampler Calibration

Verification Report No.

C6503 -PM 02

| | |
|----------------------------------|--------|
| L PM | Onsite |
| Site: บริษัท เอ็นไวรอนแล็บ จำกัด | |
| UTM: 47P N1514475 E654269 | |
| Sampler: EPM#21 | |
| Recorder: ECRDS01618124 | |
| Date: 4 Mar 22 | |
| Technical: Surakit D. | |
| Approval: Sarawut K. | |

CONDITIONS

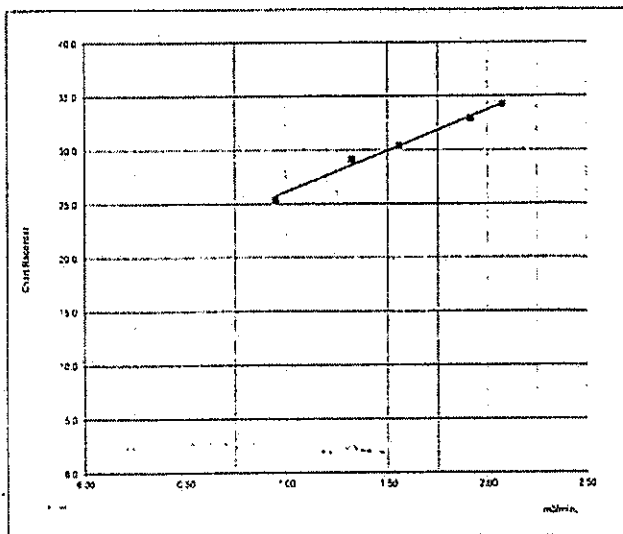
| | |
|---------------------------------|--------------------------------------|
| Barometric Press. (hPa): 1009.8 | Corrected Pressure (mm Hg): 757.4 |
| Temperature (deg C): 30.0 | Temperature (deg K): 303.0 |
| Average Press. (hPa): 1013.0 | Corrected Avg. Press. (mm Hg): 759.8 |
| Average Temp. (deg C): 30.0 | Average Temp. (deg K): 303.0 |

CALIBRATION ORIFICE

| | |
|---------------------------------|---------------------------|
| Brand: Tisch Environmental, Inc | Slope: 1.02667 |
| Model: TE-5028A | Intercept: -0.00753 |
| Serial#: 1328 | Date Certified: 19 Jan 22 |

CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|-------------|-----------|----------------|----------------------------------|
| 1 | 12.37 | 2.174 | 54.0 | 34.15 | Slope = 8.9772 |
| 2 | 9.29 | 1.885 | 50.0 | 31.62 | Intercept = 14.5944 |
| 3 | 6.69 | 1.601 | 46.0 | 29.09 | Corr. coeff. = 0.9936 |
| 4 | 4.27 | 1.280 | 40.0 | 25.30 | SFR = 1.134 |
| 5 | 2.57 | 0.995 | 36.0 | 24.03 | SSP = 39.16 |
| | | | | | # of Observations: 5 |
| | | | | | Range of Chart at SFR $\pm 10\%$ |
| | | | | | 38 |
| | | | | | 40 |



Calibrated by :
(Surakit Darncholwichit)
4 March 2022

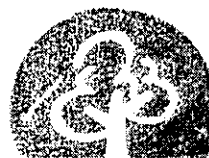
Approved by :
(Sarawut Keawsinual)
4 March 2022

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PM10 Cal. Rev 07 / 1st Date: Mar 17, 2020

FF-ANLT-23 Rev.00 01/02/23



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ผู้จัดการฝ่ายควบคุมคุณภาพ



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Neediss Supply Instrument Co., Ltd.

509 หมู่ 7 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10150 536 Soi Bangkhoe 7 Bangkok Bangkok Bangkok
Tel: 02-502-1986 Fax: 02-502-5933 Email: neediss@neediss.com



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6503001

Page:1/1

Calibrated Date: 3-Mar-22

☒ PM ☐ Onsite

Instruments Information

| | |
|---|--|
| Analyzer Type: SO2 Analyzer Model: THERMO.,43C | Manufacturer THERMO S/N: ESOTE43C102362 |
|---|--|

Calibration System

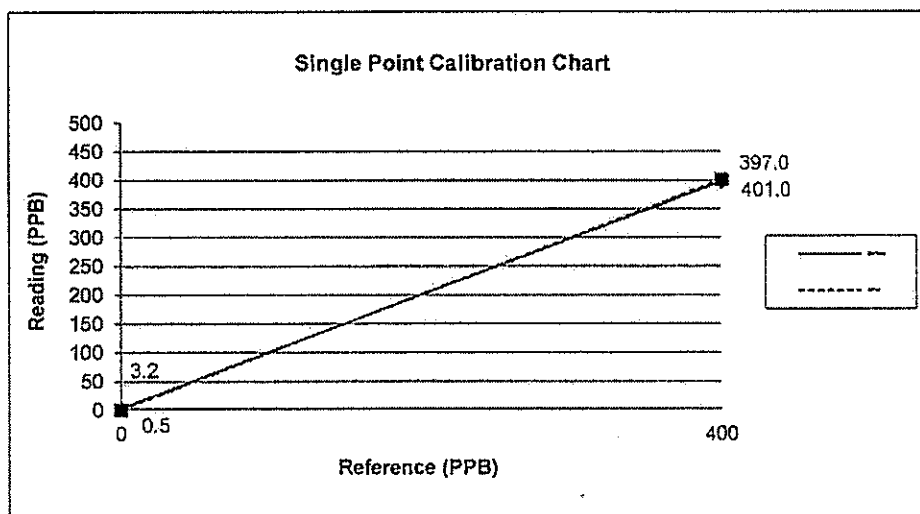
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 25.5 °C

Humidity: 55 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0 | 3.2 | 3.2 | 400.0 | 397 | -0.8 |
| After | 0.0 | 0.5 | 0.5 | 400.0 | 401 | 0.3 |



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Neediss Supply Instrument Co., Ltd.

536 ซอยบางเขน 7 แขวงบางเขน เขตบางเขน กรุงเทพฯ 10160 536 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel. 02-842-8780 Fax. 02-850-11988 E-mail: neediss@neediss.com



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 3-03-2022

S/N : ESOTE43C102362

| Test Function Value | Before | After |
|---------------------------------|--------|-------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -650 | -653 |
| LAMP VOLTAGE 950 - 1,200 (V) | 990 | 985 |
| LAMP INTENSITY 20000 - 50000 Hz | 32568 | 32577 |
| INTER TEMP 15 - 45 DEG C | 37 | 37 |
| CHAMBER TEMP 47 - 51 C | 49 | 49 |
| COOLER TEMP -5 - (-2) DEG C | -2.5 | -2.5 |
| PRESSURE 400 - 1000.0 mm Hg | 764 | 765 |
| FLOW 0.350 - 0.650 LPM | 0.42 | 0.4 |
| | | |
| | | |
| | | |

Calibrate By : Sirirat Poonlak

Approve By : Sarawut Keawsrinual

Sirirat Poonlak

Sarawut Keawsrinual

Date:

3-Mar-22

Date:

3-Mar-22

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335 ซอยบางลำพู 7 แขวงบางลำพู เขตป้อมปราบศัตรูพ่าย กรุงเทพมหานคร 10100
Tel: 02-601-7760 Fax: 02-601-7733 Email: info@neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: 6503002

Page:1/2

Calibrated Date: 3-Mar-22

☒ PM ☐ Onsite

Instruments Information

| | |
|--|--|
| Analyzer Type: NO/NO2/NOx Analyzer Model: 42C | Manufacturer THERMO S/N: ENOTE42C704365 |
|--|--|

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 SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 26.7 °C

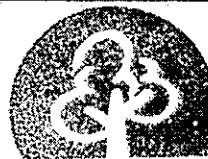
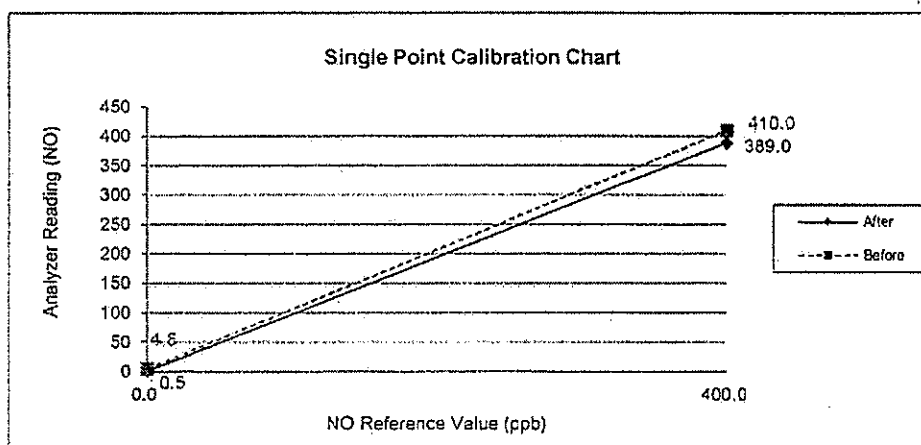
Humidity: 48 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 4.8 | 0.0 | 4.8 | 410 | 400.0 | 1.2 |
| NO ₂ | 4.8 | 0.0 | 4.8 | 5.0 | 0.0 | 0.6 |
| NOx | 9.6 | 0.0 | 9.6 | 415 | 400.0 | 1.8 |

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 | 389 | 400.0 | -1.4 |
| NO ₂ | 0.5 | 0.0 | 0.5 | 13.0 | 0.0 | 1.6 |
| NOx | 1.0 | 0.0 | 1.0 | 402 | 400.0 | 0.2 |



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538 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพมหานคร 10150 538 Soi Bangkhae 7 Bangkhae Bangkok Bangkok
Tel 02-802-1250-2 Fax 02-802-3253 E-mail:neediss@neediss.com



MODEL : NOx ANALYZER Model 42C THERMO

DATE :3-03-2022

S/N : ENOTE42C704365

Page:2/2

| Test Function Value | Before | After |
|----------------------------------|---------|---------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -675 | -678 |
| LAMP VOLTAGE 950 - 1,200 (V) | | |
| INTER TEMP 15 - 45 DEG C | 44 | 43 |
| CHAMBER TEMP 47 - 51 C | 50 | 50 |
| COOLER TEMP -5 - (-2) DEG C | -3 | -2 |
| PRESSURE 400 - 1000.0 mm Hg | 350 | 380 |
| SAMPLE FLOW 0.350 - 0.900 LPM | 0.45 | 0.46 |
| OZONEATOR FLOW 0.035 - 0.075 LPM | 0.05 | 0.05 |
| No/Nox BKG | 12/9.0 | 12/9.1 |
| No/Nox Slope | 1.0/0.8 | 0.9/0.8 |
| | | |

Calibrate By : Sirirat Poonlak

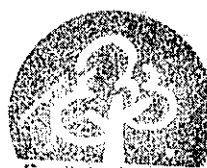
Approve By : Sarawut Keawsrinnual

Sirirat Poonlak

Sarawut Keawsrinnual

Date: 3-Mar-22

Date: 3-Mar-22



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EVL Lab Co., Ltd. 101/105 Sukhumvit Road, Klongtoey District, Klongtoey City, Bangkok 10110
Tel : 02-302-3577-2 Fax : 02-302-3773 E-mail : info@evltesting.com



Verification Test Report

Report No.:

D6503 -SLM 01

☒ PM

☐ Onsite UTM :

47P N 1514462 E 654258

Calibrated Date: 4 March 2022

Site : บริษัทเอ็นวีแอล จำกัด

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 565011

Environment: Temperature 25 °C Humidity 45 %RH

Reference Standard: Sound Calibrator Class 1 Model 4230,Brue&Kjaer

Serial No.87098

Date of Calibration : March.12, 2021

Result of Test

| Reference Standard (dB) | Instrument reading (dB) | Error (dB) | Adjust (dB) |
|----------------------------|----------------------------|---------------|----------------|
| 94.0 | 94.1 | 0.1 | 94.0 |

Calibrated By:

(Surakit Darncholvichit)

Date:

4 March 2022

Approve By:

(Sarawut Keawsrinual)

4 March 2022

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FE-MNT-27 Rev.00:01/08/63



TSP High Volume Sampler Calibration

Verification Report No.

E6503 -TSP 02

☒ PM ☐ Onsite

Site: บริษัท เอนไวแล้น จำกัด

UTM : 47P N1514475 E654269

Sampler: NTSP#11

Recorder: ECRANG15315224

Date: 4 Mar 22

Technical: Surakit D.

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1010.0

Temperature (deg C): 31.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.6

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-5028A

Serial#: 1328

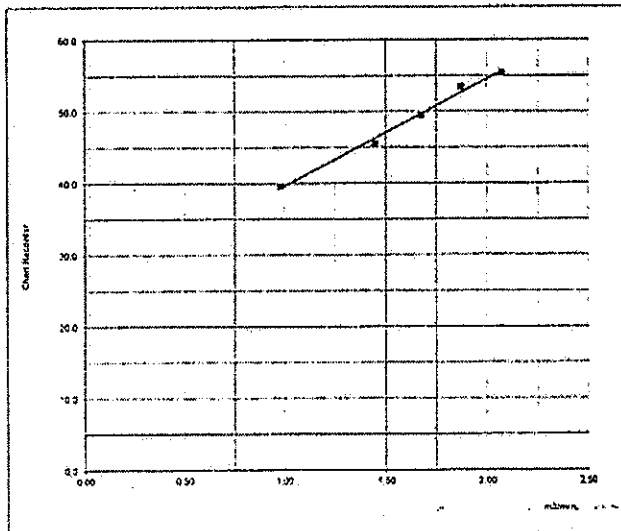
Qstd Slope: 1.63957

Qstd Intercept: -0.01202

Date Certified: 19 Jan 22

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|---|
| 1 | 12.31 | 2.123 | 56.0 | 55.36 | Slope = 12.8500 |
| 2 | 10.56 | 1.967 | 54.0 | 53.38 | Intercept = 28.1148 |
| 3 | 6.48 | 1.542 | 48.0 | 47.45 | Corr. coeff. = 0.9955 |
| 4 | 4.41 | 1.273 | 46.0 | 45.47 | # of Observations: 5 |
| 5 | 2.32 | 0.926 | 40.0 | 39.54 | Range of Chart at 1.1 - 1.7 m3/min. 43 50 |



Calibrated by :

(Surakit Darncholvichit)
4 March 2022

Approved by :

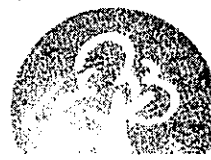
(Sarawut Keawsinual)
4 March 2022

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PL-MNT-23 Rev.0001/06/03



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บริษัท เอ็นวิล เทสติ้ง จำกัด
Envilab Co., Ltd. 17/244/19, Bldg. 10, Tambon Bang Khen, Bangkok 10150
Tel: (02)-812-3577-5 Fax: (02)-812-1173 E-mail: info@envilab.co.th



PM10 High Volume Sampler Calibration

Verification Report No.

D6503 -PM 02

☒ PM

☐ Onsite

Site: บริษัท เอ็นวิล เทสติ้ง จำกัด

UTM: 47P N1514475 E654269

Sampler: NPM#04

Recorder: ECRDS01618124

Date: 4 Mar 22

Technical: Surakit D.

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1009.6

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.3

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-5028A

Serial#: 1328

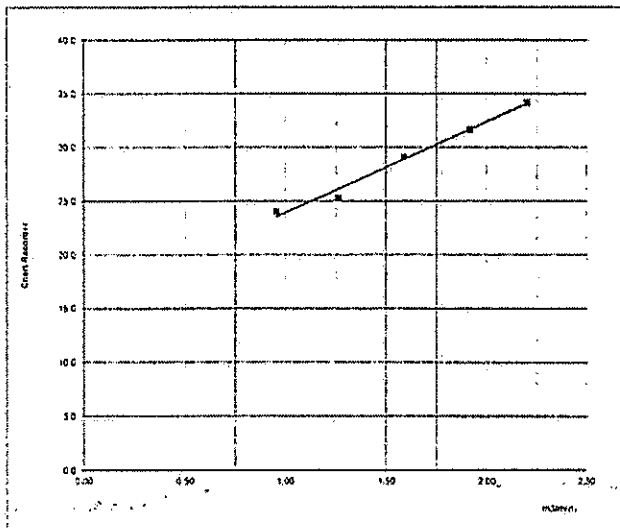
Slope: 1.02667

Intercept: -0.00753

Date Certified: 19 Jan 22

CALIBRATIONS

| Plate or Test # | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|-------------|-----------|----------------|-----------------------|
| 1 | 12.34 | 2.179 | 54.0 | 34.27 | Slope = 8.6512 |
| 2 | 9.32 | 1.894 | 50.0 | 31.73 | Intercept = 15.6272 |
| 3 | 6.74 | 1.612 | 48.0 | 30.46 | Corr. coeff. = 0.9924 |
| 4 | 4.32 | 1.292 | 42.0 | 26.65 | SFR = 1.141 |
| 5 | 2.63 | 1.010 | 38.0 | 24.12 | SSP = 40.18 |
| | | | | | # of Observations: 5 |
| | | | | | Range of Chart 39 |
| | | | | | at SFR $\pm 10\%$ 41 |



Calibrated by :

(Surakit Darncholwicht)
4 March 2022

Approved by :

(Sarawut Keawsrinual)
4 March 2022

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

TE-MNH-23 Rev. 0011/02/21



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Neediss Supply Instrument Co., Ltd.
528/5001 หมู่ 7 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10560 536 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel: 02-602-7240 Fax: 02-602-7168 E-mail: info@neediss.com



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6503006

Page:1/1

Calibrated Date: 3-Mar-22

☒ PM ☐ Onsite

Instruments Information

| | |
|--|--|
| Analyzer Type: SO2 Analyzer Model: THERMO.43C | Manufacturer THERMO S/N: ESOTE43C071944 |
|--|--|

Calibration System

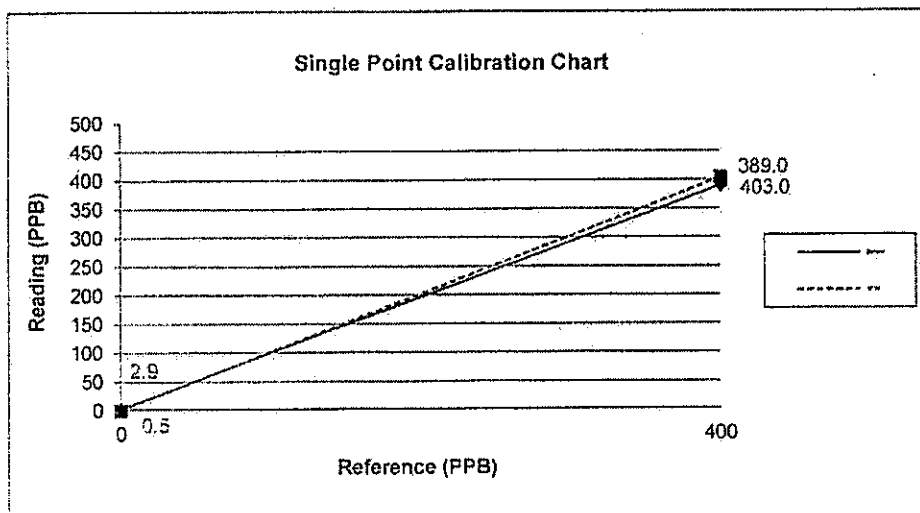
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 26.5 °C

Humidity: 50 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0 | 2.9 | 2.9 | 400.0 | 389 | -2.8 |
| After | 0.0 | 0.5 | 0.5 | 400.0 | 403 | 0.8 |



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Neediss Supply Instrument Co., Ltd.
535 ซอยบางนา 7 แขวงบางนา เขตบางนา กรุงเทพมหานคร 10760 535 Soi Bangna 7 Bangnae Bangkok Bangkok
Tel 02-802-3456 P Fax 02-802-3456 E info@neediss.com



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 3-03-2022

S/N : ESOTE43C071944

| Test Function Value | Before | After |
|---------------------------------|--------|-------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -650 | -653 |
| LAMP VOLTAGE 950 - 1,200 (V) | 990 | 985 |
| LAMP INTENSITY 20000 - 50000 Hz | 32568 | 32577 |
| INTER TEMP 15 - 45 DEG C | 37 | 37 |
| CHAMBER TEMP 47 - 51 C | 49 | 49 |
| COOLER TEMP -5 - (-2) DEG C | -2.5 | -2.5 |
| PRESSURE 400 - 1000.0 mm Hg | 764 | 765 |
| FLOW 0.350 - 0.650 LPM | 0.42 | 0.4 |
| | | |
| | | |
| | | |

Calibrate By : Sirirat Poonlak

Approve By : Sarawut Keawsrinal

Sirirat Poonlak

Sarawut Keawsrinal

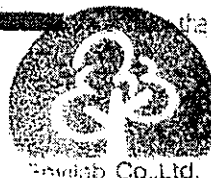
Date: 3-Mar-22

Date: 3-Mar-22

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535 ซอยบางพลี 7 แขวงบางพลี เขตตลิ่งชัน กรุงเทพฯ 10160 535 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel 02-802-1980 Fax 02-802-2994 Email: info@neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: 6503003

Page:1/2

Calibrated Date: 3-Mar-22

☒ PM ☐ Onsite

Instruments Information

| | |
|--|--|
| Analyzer Type: NO/NO2/NOx Analyzer Model: 42C | Manufacturer THERMO S/N: ENOTE42C768384 |
|--|--|

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 SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 26.7 °C

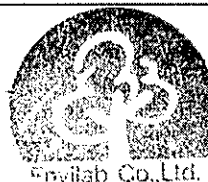
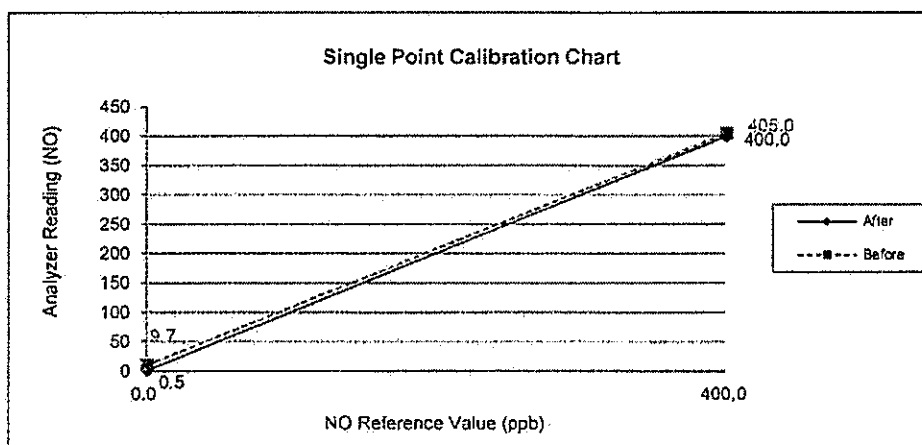
Humidity: 48 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 9.7 | 0.0 | 9.7 | 405 | 400.0 | 0.6 |
| NO ₂ | 3.4 | 0.0 | 3.4 | 4.0 | 0.0 | 0.5 |
| NOx | 13.1 | 0.0 | 13.1 | 409 | 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 | 400.0 | 0.0 |
| NO ₂ | 0.2 | 0.0 | 0.2 | 1.0 | 0.0 | 0.1 |
| NOx | 0.7 | 0.0 | 0.7 | 401 | 400.0 | 0.1 |



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Neediss Supply Instrument Co., Ltd.

538 หมู่บ้าน 7 แขวงบางพลัด เขตบางพลัด กรุงเทพมหานคร 10710
Tel. 02-802-5960 2 Fax. 02-802-5961 E-mail: neediss@neediss.com



MODEL : NOx ANALYZER Model 42C THERMO

DATE : 3-03-2022

S/N : ENOTE42C768384

Page:2/2

| Test Function Value | Before | After |
|----------------------------------|---------|---------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -675 | -678 |
| LAMP VOLTAGE 950 - 1,200 (V) | | |
| INTER TEMP 15 - 45 DEG C | 43 | 43 |
| CHAMBER TEMP 47 - 51 C | 49 | 50 |
| COOLER TEMP -5 - (-2) DEG C | -2 | -2 |
| PRESSURE 400 - 1000.0 mm Hg | 350 | 380 |
| SAMPLE FLOW 0.350 - 0.900 LPM | 0.45 | 0.46 |
| OZONEATOR FLOW 0.035 - 0.075 LPM | 0.05 | 0.05 |
| No/Nox BKG | 12/9.0 | 12/9.1 |
| No/Nox Slope | 1.0/0.8 | 0.9/0.8 |
| | | |

Calibrate By : Sirirat Poonlak

Approve By : Sarawut Keawsrinual

Sirirat Poonlak

Sarawut Keawsrinual

Date: 3-Mar-22

Date: 3-Mar-22

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ผู้จัดการฝ่ายควบคุมคุณภาพ

**neediss**บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.536 ซอยบางโพธิ์ 7 แขวงบางโพธิ์ เขตบางโพธิ์ กรุงเทพมหานคร 10160 536 Soi Bangkhoe 7 Bangkhoe Bangkok
Tel. 02-802-3980-2 Fax 02-802-3988 E: info@neediss.com

Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6504005

Instrument :

PM-2.5 Sampler SINGLE

Validation Date:

1-Apr-22

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0478

Environment :

Humidity(%RH) : 54

Temperature (°C) : 27.9

Pressure (mmHg) : 744

Reference Standard:

Temperature Calibrator : DIGICON, model: CC-VTR-SH, Serial No.091109269

Flow Calibrator: Mesalabs Defender, model : 520-H , Serial No.164578

Leak Test : Pass

Diagnostic Check:

| PM-10 Inlet | PM-2.5 Size Selective | Filter Cassette | Fan | Valve | Pump % |
|-------------|-----------------------|-----------------|------|-------|--------|
| Pass | Pass | Pass | Pass | Pass | Pass |

Result of Instrument Validation :

| Calibrator Simulator | | | | | Temperature Measurement | |
|---|-------|-----|------|------|-------------------------|------------|
| Temperature Audit and Adjust with Calibrator (°C) | | | | | Instrument | Reference |
| Set point | -10.0 | 0.0 | 20.0 | 45.0 | Reading(Avg.) | TC Reading |
| ambient | -10.0 | 0.0 | 20.0 | 45.0 | 27.9 | 27.9 |
| Filter | -10.0 | 0.0 | 20.0 | 45.0 | 27.9 | 27.9 |

Flow Control :

Calibration mode : AMB Flow Device

Flow set : 16.67 LPM

Avg. Pressure at Ref. : 746 mmHg.

| Flow Measure (Avg.) | Flow Calibrator(Avg.10) | Flow Difference |
|---------------------|-------------------------|-----------------|
| 16.67 LPM | 16.67 LPM | 0 LPM |

Engineer :

Phanuwat Suanbubpha

Approve By:

Sarawut Keawsrinal

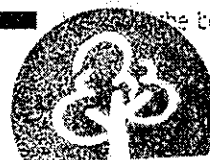
Issu Date:

1-Apr-22

Date:

1-Apr-22

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ผู้จัดการฝ่ายควบคุมคุณภาพ

**neediss**บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.536 ถนนพหลโยธิน 7 แขวงพญาไท เขตพญาไท กรุงเทพมหานคร 10160 536 Soi Phayathai 7, Bangkok Bangkok Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E: info@neediss.com

Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6504015

Instrument :

PM-2.5 Sample Single

Validation Date:

1-Apr-22

Manufacturer :

Rupprecht, Patashnick

Model :

200-H

Serial/ID No. :

EP2RP200029702

Environment :

Humidity(%RH) :

51

Temperature (°C) :

27

Pressure (mmHg) :

756

Reference Standard:

Temperature Calibrator : DIGICON, model: CC-VTR-SH, Serial No.091109269

Flow Calibrator: Mesalabs Defender, model : 520-H , Serial No.164578

Leak Test :

Pass

Diagnostic Check:

| PM-10 Inlet | PM-2.5 Size Selective | Filter Cassette | Fan | Valve | Pump % |
|-------------|-----------------------|-----------------|------|-------|--------|
| Pass | Pass | Pass | Pass | Pass | Pass |

Result of Instrument Validation :

| Calibrator Simulator | | | | | Temperature Measurement | |
|---|-------|-----|------|------|-------------------------|------------|
| Temperature Audit and Adjust with Calibrator (°C) | | | | | Instrument | Reference |
| Set point | -10.0 | 0.0 | 20.0 | 45.0 | Reading(Avg.) | TC Reading |
| ambient | -10.0 | 0.0 | 20.0 | 45.0 | 26.8 | 27.0 |

Flow Control :

Calibration mode : AM8 Flow Device

Flow set : 16.67 LPM

Avg. Pressure at Ref. : 746 mmHg.

| Flow Measure (Avg.) | Flow Calibrator(Avg.10) | Flow Difference |
|---------------------|-------------------------|-----------------|
| 16.67 LPM | 16.66 LPM | 0.01 LPM |

Engineer :

Phanuwat Suanbubpha

Approve By:

Sarawut Keawsriniul

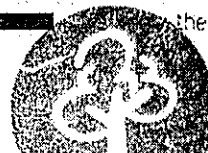
Issu Date:

1-Apr-22

Date:

1-Apr-22

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Certificate of Calibration

Calibration Certification Information

Cal. Date: January 19, 2022 Roots-meter S/N: 438320 Ta: 294 °K
Operator: Jim Tisch Pa: 749.05 mm Hg
Calibration Model #: TE-5028A Calibrator S/N: 1328

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|-------------------|--------------------|---------------|----------------|---------------|----------------|
| 1 | 1 | 2 | 1 | 1.3190 | 3.7 | 1.50 |
| 2 | 3 | 4 | 1 | 1.0220 | 6.2 | 2.50 |
| 3 | 5 | 6 | 1 | 0.9290 | 7.5 | 3.00 |
| 4 | 7 | 8 | 1 | 0.8590 | 8.7 | 3.50 |
| 5 | 9 | 10 | 1 | 0.6530 | 14.8 | 6.00 |

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) |
|--------------|------------------|---|--------|----------------|--|
| 0.9941 | 0.7536 | 1.2241 | 0.9951 | 0.7544 | 0.7673 |
| 0.9907 | 0.9694 | 1.5803 | 0.9917 | 0.9704 | 0.9906 |
| 0.9890 | 1.0646 | 1.7312 | 0.9900 | 1.0656 | 1.0851 |
| 0.9874 | 1.1495 | 1.8699 | 0.9884 | 1.1506 | 1.1721 |
| 0.9793 | 1.4996 | 2.4483 | 0.9802 | 1.5011 | 1.5346 |
| QSTD | m= | 1.63957 | QA | m= | 1.02667 |
| | b= | -0.01202 | | b= | -0.00753 |
| | r= | 0.99999 | | r= | 0.99999 |

Calculations

| | | | |
|--|---|-----|--|
| Vstd= | $\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$ | Va= | $\Delta Vol((Pa-\Delta P)/Pa)$ |
| 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: roots-meter 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.

Certificate of Calibration

Certificate No. : 65-200022-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA224-1S

Serial No. : 0034803270

ID No. : ELABBALANCEN04

Capacity : 220 g

Resolution : 0.0001 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.

Ambient Temperature : (23.7 to 23.8) °C

Relative Humidity : (57.1 to 58.0) %

Air Pressure : 1012.0 mbar

Date of Received : 02 February 2022

Date of Calibration : 02 February 2022

Date of Issue : 09 February 2022

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-----------|-------------|--|
| E261-E2624 | C02213103 | 18 Nov 2022 | National Institute of Metrology (Thailand), (NIMT) |

Approved by :

(Sorachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 65-200022-1

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) |
|----------------------|-------------------|--------------------------|
| 0.01 | 0.0001 | 0.00011 |
| 0.1 | 0.0001 | 0.00011 |
| 1 | 0.0000 | 0.00011 |
| 2 | 0.0001 | 0.00011 |
| 5 | 0.0000 | 0.00012 |
| 10 | 0.0001 | 0.00012 |
| 20 | -0.0001 | 0.00013 |
| 50 | 0.0000 | 0.00014 |
| 100 | -0.0002 | 0.00020 |
| 200 | -0.0004 | 0.00038 |

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

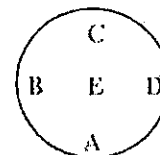
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.11$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g

A B C D E

-0.0001 -0.0002 -0.0002 -0.0001 0.0000 g



Repeatability

Load test : 200 g

Stdev. : 0.00005 g

- o0o -

Handwritten signature



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Calibratech Co., Ltd.

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



Certificate of Calibration

Certificate No. : 65-200022-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA3102-1S

Serial No. : 0034409695

ID No. : ELABBALANCEN03

Capacity : 3100 g

Resolution : 0.01 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.

Ambient Temperature : (23.7 to 24.2) °C

Relative Humidity : (57.6 to 57.8) %

Air Pressure : 1012.0 mbar

Date of Received : 02 February 2022

Date of Calibration : 02 February 2022

Date of Issue : 09 February 2022

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-------------|-------------|--|
| F181-F1821 | 65-210044-1 | 31 Jul 2022 | National Institute of Metrology (Thailand), (NIMT) |

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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7/106-7 Moo 2, Sukhaprasathan 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. : 65-200022-2

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) |
|----------------------|-------------------|--------------------------|
| 10 | 0.00 | 0.0082 |
| 20 | 0.00 | 0.0082 |
| 50 | 0.00 | 0.0082 |
| 100 | 0.00 | 0.0082 |
| 200 | 0.00 | 0.0083 |
| 500 | -0.01 | 0.0085 |
| 1000 | -0.01 | 0.0093 |
| 1500 | -0.01 | 0.011 |
| 2000 | -0.01 | 0.012 |
| 3000 | -0.01 | 0.023 |

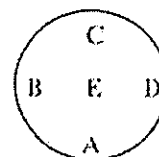
This result of calibration was found accurate as shown on date and place of calibration only.

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 : 1000 g

| | | | | | |
|------|------|------|------|------|---|
| A | B | C | D | E | |
| 0.00 | 0.01 | 0.02 | 0.00 | 0.00 | g |



Repeatability

Load test : 2000 g

Sidev. : 0.000 g

- o o o -

Handwritten signature



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Calibratech Co.,Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-200086-1

Page : 1 of 2

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

Equipment : Electronic Balance
Manufacturer : METTLER TOLEDO **Model :** XPR2
Serial No. : C011158261 **ID No. :** ELABBALANCEN07
Capacity : 2.1 g **Resolution :** 0.000001 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.
Ambient Temperature : (23.2 to 23.4) °C
Relative Humidity : (55.3 to 55.6) %
Air Pressure : 1010.0 mbar

Date of Received : 25 March 2021

Date of Calibration : 25 March 2021

Date of Issue : 27 March 2021

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| <u>ID No.</u> | <u>Cert. No.</u> | <u>Due Date</u> | <u>Traceability</u> |
|---------------|------------------|-----------------|--|
| E261-E2624 | C02204101 | 17 Nov 2021 | National Institute of Metrology (Thailand), (NIMT) |

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%.

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CAL-00031-03



CAL

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

Certificate of Calibration

Certificate No. : 64-200086-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

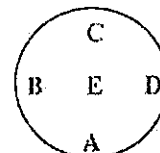
| Nominal Value (g) | Correction (g) | Uncertainty \pm (g) |
|----------------------|-------------------|--------------------------|
| 0.001 | -0.000001 | 0.0000053 |
| 0.005 | 0.000000 | 0.0000054 |
| 0.01 | -0.000001 | 0.0000071 |
| 0.02 | -0.000001 | 0.0000089 |
| 0.05 | -0.000001 | 0.000011 |
| 0.1 | 0.000001 | 0.000014 |
| 0.5 | -0.000005 | 0.000022 |
| 1 | 0.000000 | 0.000026 |
| 1.5 | -0.000005 | 0.000037 |
| 2 | 0.000000 | 0.000034 |

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 : 1 g
A B C D E
0.000000 0.000000 0.000000 0.000000 0.000000 g



Repeatability

Load test : 2 g
Stdev. : 0.0000005 g

- o O o -





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0406

MTC No. EEL. BP. 68/0364

CALIBRATION CERTIFICATE

Submitted by : Envilab Co., Ltd.

Address : 540, 540/1 Soi Bangkhuae 7, Bangkhuae, Bangkok 10160 Thailand.

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

Instrument Calibrated :

Description : Acoustic Calibrator

Manufacturer : Pulsar

Model : 106

Serial No. : 87098

Ambient Environment

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

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

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

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

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

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

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

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

Date of Receipt : 10 Mar. 2021

Date of Calibration : 12 Mar. 2021

1 / 2

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

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FM.BL.MTC.002 Rev.4

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

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

Office
196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand
Tel. (66) 0 2519 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8692
E-mail : sumate@tistr.or.th
Envilab Co., Ltd. ผู้จัดการฝ่ายควบคุมคุณภาพ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0406

MTC No. EEL. BP. 68/0364

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 HzAcoustic 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 2 |
|---------------------------|------------------------------------|---------------------|------------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 94.13 | 0.13 | ± 0.10 | ± 0.75 dB |

2. Frequency

| Standard Microphone Type | Measured Frequency (Hz) | Deviated value (Hz) | Uncertainty (Hz) | Tolerance limit IEC60942:2003 Class 2 |
|---------------------------|-------------------------|---------------------|------------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 1000.3 | 0.3 | ± 1.5 | $\pm 2.0\%$ |

3. Total Distortion

| Standard Microphone Type | Measured Total Distortion (%) | Uncertainty (%) | Tolerance limit IEC60942:2003 Class 2 |
|---------------------------|-------------------------------|-----------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 0.72 | ± 0.50 | $\pm 4.0\%$ |

- Note : 1. No adjustment.
2. The calibrator pressure correction was not included.
3. The microphone volume correction was not included.

Calibrated by :

Tawikiat
.....
(Mr.Tawikiat Iamsamran)

Approved by :

(Mr. Mawalee Klunypa)
.....
Acting Director
Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 12 Mar. 2021

Date of Issue : 16 Mar. 2021

Ref: 2011264031001119001

2 / 2

End of Certificate

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FM.BL.MTC.002 Rev.4

Head Office

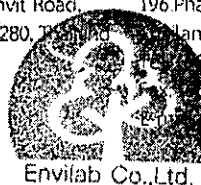
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : rumpai@tistr.or.th Website: www.tistr.or.th

Office/Laboratory

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

Office

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



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD
Part Number: E05NI91E15A0003 Reference Number: 160-402305646-1
Cylinder Number: EB0146406 Cylinder Volume: 148.7 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12022 Valve Outlet: 660
Gas Code: CO,CO2,NO,NOX,SO2,BALN Certification Date: Jan 03, 2022

Expiration Date: Jan 03, 2030

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.

Do Not Use This Cylinder below 100 psig, 6.8 megapascals.

ANALYTICAL RESULTS

| Component | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates |
|-----------------|-------------------------|----------------------|-----------------|----------------------------|------------------------|
| NOX | 100.0 PPM | 100.2 PPM | G1 | +/- 0.9% NIST Traceable | 12/27/2021, 01/03/2022 |
| CARBON MONOXIDE | 100.0 PPM | 98.02 PPM | G1 | +/- 0.5% NIST Traceable | 12/27/2021 |
| NITRIC OXIDE | 100.0 PPM | 100.1 PPM | G1 | +/- 1.0% NIST Traceable | 12/27/2021, 01/03/2022 |
| SULFUR DIOXIDE | 100.0 PPM | 100.2 PPM | G1 | +/- 1.0% NIST Traceable | 12/27/2021, 01/03/2022 |
| CARBON DIOXIDE | 8.000 % | 7.962 % | G1 | +/- 0.9% NIST Traceable | 12/27/2021 |
| NITROGEN | Balance | | | | |

CALIBRATION STANDARDS

| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
|------|--------------|-------------|-------------------------------------|-------------|-----------------|
| NTRM | 09010241 | KAL004894 | 98.48 PPM CARBON MONOXIDE/NITROGEN | +/- 0.5% | Oct 16, 2024 |
| NTRM | 200610-56 | CC733475 | 98.61 PPM NITRIC OXIDE/NITROGEN | +/- 0.6% | Oct 06, 2026 |
| GMIS | 124206889119 | CC322885 | 4.294 PPM NITROGEN DIOXIDE/NITROGEN | +/- 2.0% | Sep 03, 2024 |
| NTRM | 11010419 | KAL004813 | 99.6 PPM SULFUR DIOXIDE/NITROGEN | +/- 0.8% | Jul 28, 2023 |
| NTRM | 08010636 | K019200 | 13.94 % CARBON DIOXIDE/NITROGEN | +/- 0.6% | Jan 30, 2024 |

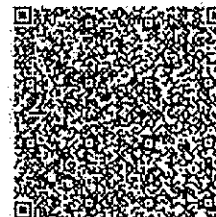
ANALYTICAL EQUIPMENT

| Instrument/Make/Model | Analytical Principle | Last Multipoint Calibration |
|----------------------------------|----------------------|-----------------------------|
| Nicolet iS50 FTIR AUP2010245 CO2 | FTIR | Dec 02, 2021 |
| SIEMENS ULTRAMAT6E N1-C8-180 | NDIR | Dec 09, 2021 |
| Nicolet iS50 FTIR AUP2010245 NO | FTIR | Dec 16, 2021 |
| Nicolet iS50 FTIR AUP2010245 NO2 | FTIR | Dec 29, 2021 |
| Nicolet iS50 FTIR AUP2010245 SO2 | FTIR | Dec 23, 2021 |

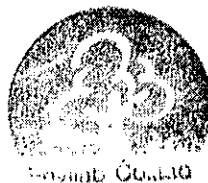
Triad Data Available Upon Request

NOTES: Gross Weight: 28.1 Kg, Net Weight: 5.1 Kg.

UF0X5CX



[Signature]
Approved for Release



[Signature]
รับรองสำเนาถูกต้อง
ผู้ตรวจการฝ่ายควบคุมคุณภาพ

Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM18211

Calibration Date: **MAR 24 2021**

Calibration Reference Equipment: 714J7402

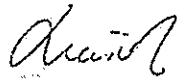
Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard.

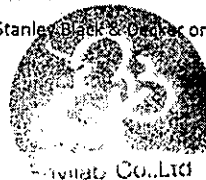
Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: 

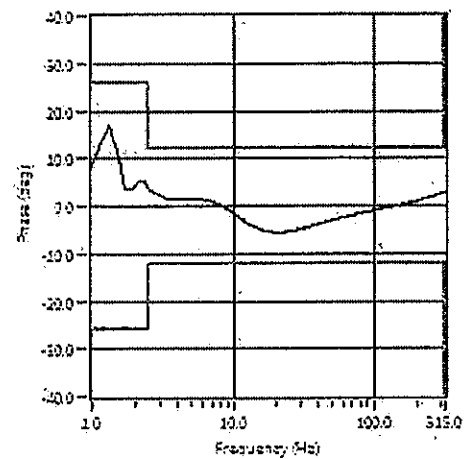
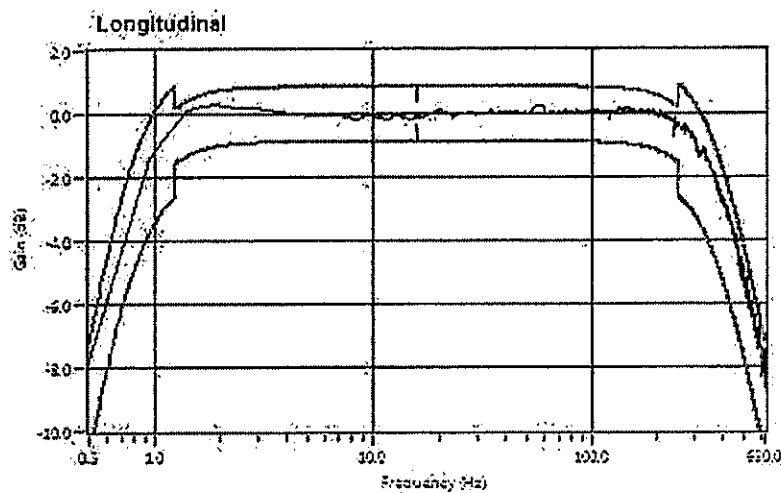
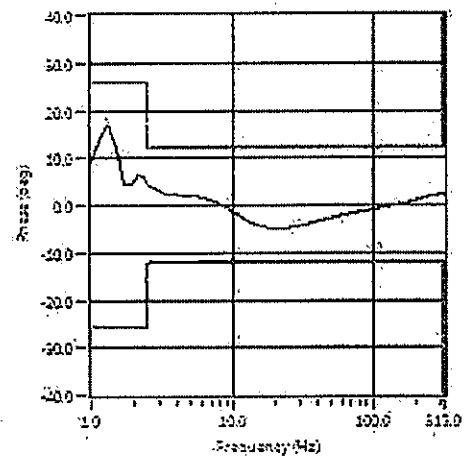
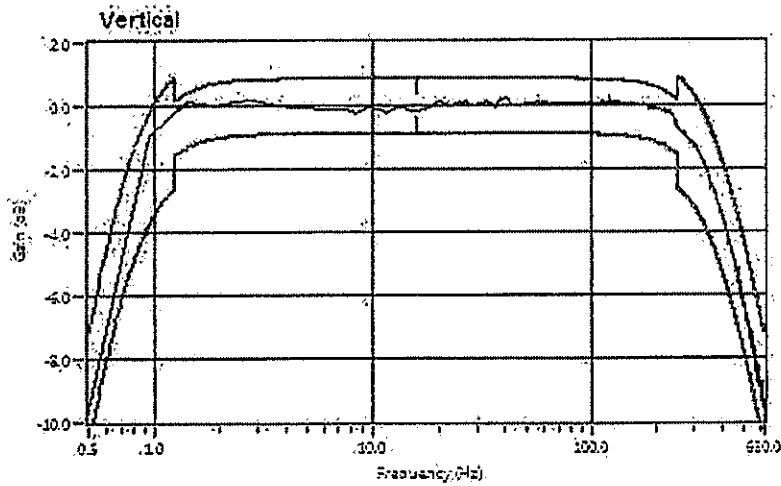
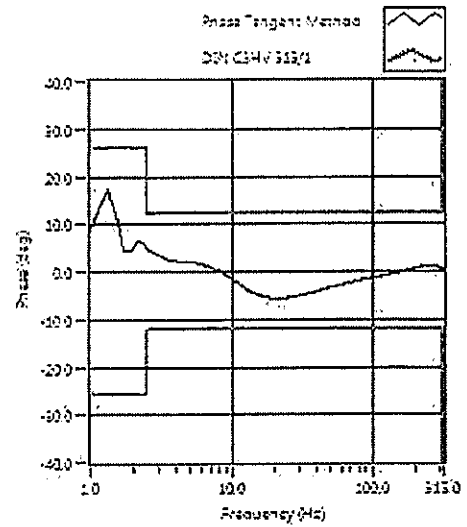
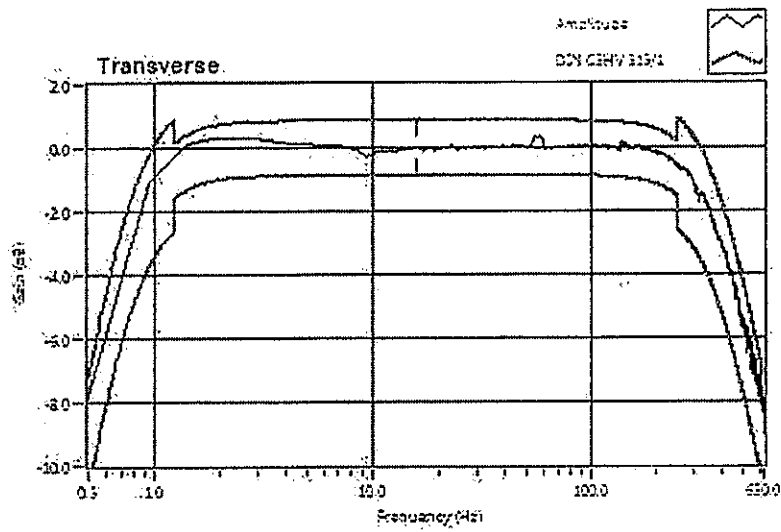
Xiaoming Yang



309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642



Frequency Response of UM18211



Envision Co., Ltd


รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Mettler-Toledo (Thailand) Ltd.
846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10260
+662 723 0382
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

Company: EnviLab Co., Ltd.
Address: 540, 540/1 Soi Bang Khae 7, Bang Khae
City: Bang Khae Contact: Ngarmthip Sampanpuang
Zip / Postal: 10160
State / Province: Bangkok
Order Number: 

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: XSR205DU Asset Number: N/A
Serial No.: B911363567 Terminal Model: SRAT
Building: N/A Terminal Serial No.: B911363567
Floor: 3 Terminal Asset No.: N/A
Room: B304

| Range | Max. Capacity | Readability (d) |
|-------|---------------|-----------------|
| 1 | 81 g | 0.00001 g |
| 2 | 220 g | 0.0001 g |

Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CPW002/20

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

| | Temperature | | Humidity | |
|----------|----------------|--------------|---------------|-------------|
| As Found | Start: 22.2 °C | End: 22.6 °C | Start: 58.3 % | End: 59.7 % |

As Found Calibration Date: 02-Mar-2022
As Left Calibration Date: N/A
Issue Date: 03-Mar-2022

Calibrator:

Naruephon C.

Naruephon Chonprasertsuk

Approved Signatory:

Kassakorn

- ☒ Kassakorn Tassanachaisakul
☐ Santi Jitniyom
☐ Surachet Sukkate



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Measurement Results

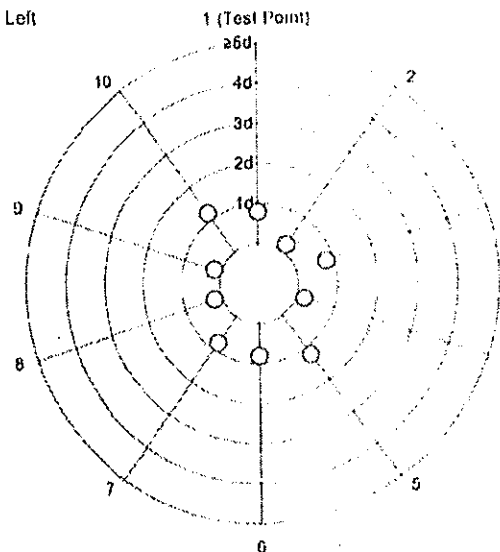
Repeatability

Test Load: 70 g

| | As Found | As Left |
|----|------------|---------|
| 1 | 70.00001 g | N/A |
| 2 | 70.00002 g | N/A |
| 3 | 70.00001 g | N/A |
| 4 | 70.00002 g | N/A |
| 5 | 70.00003 g | N/A |
| 6 | 70.00001 g | N/A |
| 7 | 70.00001 g | N/A |
| 8 | 70.00002 g | N/A |
| 9 | 70.00002 g | N/A |
| 10 | 70.00003 g | N/A |

| | | |
|--------------------|------------|-----|
| Standard Deviation | 0.000008 g | N/A |
|--------------------|------------|-----|

○ As Found
◆ As Left



The "d" in the graph represents the readability of the range/interval in which the test was performed.

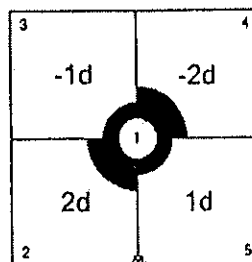
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

| Position | As Found | As Left |
|----------|------------|---------|
| 1 | 100.0000 g | N/A |
| 2 | 100.0002 g | N/A |
| 3 | 99.9999 g | N/A |
| 4 | 99.9998 g | N/A |
| 5 | 100.0001 g | N/A |

| | | |
|-------------------|----------|-----|
| Maximum Deviation | 0.0002 g | N/A |
|-------------------|----------|-----|



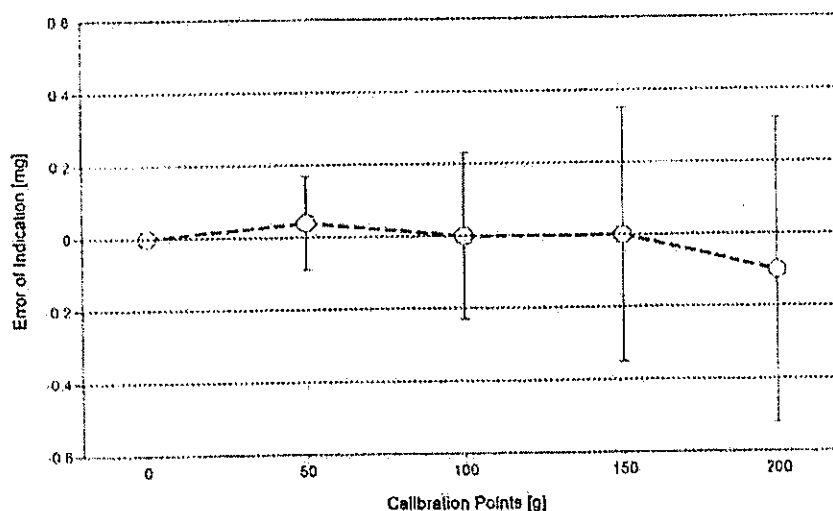
As Found

The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

As Found

| | Reference Value | Indication | Error of Indication | Expanded Uncertainty | k |
|----|-----------------|------------|---------------------|----------------------|---|
| 1 | 0.00000 g | 0.00000 g | 0.00000 g | 0.017 mg | 2 |
| 2 | 0.10000 g | 0.10000 g | 0.00000 g | 0.023 mg | 2 |
| 3 | 0.50000 g | 0.50001 g | 0.00001 g | 0.028 mg | 2 |
| 4 | 0.99999 g | 0.99999 g | 0.00000 g | 0.032 mg | 2 |
| 5 | 1.99999 g | 2.00000 g | 0.00001 g | 0.040 mg | 2 |
| 6 | 5.00001 g | 5.00001 g | 0.00000 g | 0.048 mg | 2 |
| 7 | 10.00001 g | 10.00002 g | 0.00001 g | 0.062 mg | 2 |
| 8 | 49.99998 g | 50.00002 g | 0.00004 g | 0.13 mg | 2 |
| 9 | 100.0000 g | 100.0000 g | 0.0000 g | 0.23 mg | 2 |
| 10 | 150.0000 g | 150.0000 g | 0.0000 g | 0.35 mg | 2 |
| 11 | 199.9999 g | 199.9998 g | -0.0001 g | 0.42 mg | 2 |



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.



Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

| | | | |
|---------------------|--------|-----------------------|-------------|
| Weight Set No.: | WS22 | Date of Issue: | 06-Jan-2022 |
| Certificate Number: | 177036 | Calibration Due Date: | 03-Jul-2023 |

Weight Set 2: OIML E2

| | | | |
|---------------------|------------|-----------------------|-------------|
| Weight Set No.: | WS76 | Date of Issue: | 31-Jan-2022 |
| Certificate Number: | C205470237 | Calibration Due Date: | 12-Jul-2023 |

Thermo Hygrometer

| | | | |
|---------------------|---------|-----------------------|-------------|
| Equipment No.: | IN193 | Date of Issue: | 14-Jun-2021 |
| Certificate Number: | 21H1221 | Calibration Due Date: | 01-Jun-2022 |

Remarks

FACT adjustment functionality activated

Equipment condition: Good

Next calibration according to customer's procedure

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.5 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: $3 K$

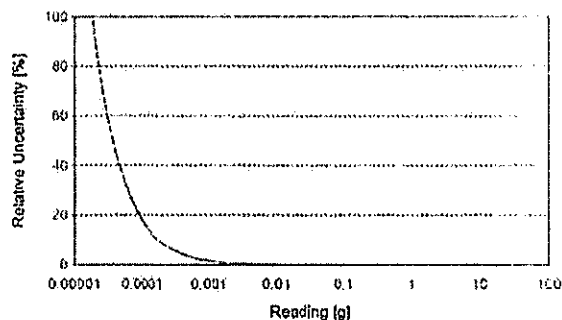
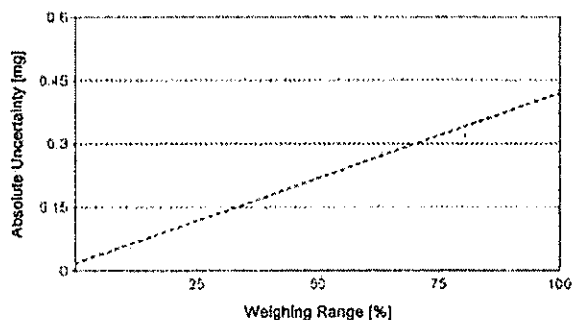
Linearization of Uncertainty Equation

| | Range | | As Found | As Left |
|---|-----------|-------|---|---------|
| | d | Max | | |
| 1 | 0.00001 g | 81 g | $U_1 = 0.018 \text{ mg} + 0.00497 \text{ mg/g} \cdot R$ | N/A |
| 2 | 0.0001 g | 220 g | $U_2 = 0.06 \text{ mg} + 0.00492 \text{ mg/g} \cdot R$ | N/A |

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty In Use for Various Net Indications (Examples)

| Net Indication | As Found | | As Left | |
|----------------|----------|----------|---------|-----|
| 0.00220 g | 0.018 mg | 0.82% | N/A | N/A |
| 0.02200 g | 0.018 mg | 0.082% | N/A | N/A |
| 0.22000 g | 0.019 mg | 0.0087% | N/A | N/A |
| 2.20000 g | 0.029 mg | 0.0013% | N/A | N/A |
| 220.0000 g | 1.1 mg | 0.00052% | N/A | N/A |



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.





SK SALES AND SERVICE CO. LTD.

194/56, 194/57 Thakham Rd. Samoe Dam
Bang Khun Thien, Bangkok 10160
Tel : 02-417-2144 Fax : 02-417-2155



Certificate of Calibration

Reference No. : 4182/2202-017 Certificate No. : L2203-290
Customer : Envilab Co., Ltd. (Head Office) Page 1 of 2
: 540, 540/1 Soi Bangkhuae 7, Bangkhuae,
: Bangkhuae Bangkok 10160
Equipment : Digital Thermo-Hygrometer
Manufacturer : Testo
Model : 608-H1
Serial No. : 83353607
ID No. : -
Received Date : 7 March 2022
Calibrated Date : 9 March 2022
Issued Date : 15 March 2022

| Environment | Start Calibration | Stop Calibration |
|--------------------------|-------------------|------------------|
| Ambient Temperature (°C) | 24.7 | 25.5 |
| Relative Humidity (% RH) | 51 | 52 |

Calibrated by : Mr. Nattawut Reangdech

Calibration Method

In-house method : by comparison with standard hygrometer for humidity measurement function
and comparison with standard thermometer for temperature measurement function into humidity/temperature chamber

Condition of this result of calibration

1. Reference standard instrument

| Instrument | Model | Serial No. | Certificate No. | Due Date |
|-----------------------------------|----------|------------|-----------------|------------------|
| 1) Hygrometer | HL-NT2-D | 61468576 | QR21-0851 | 13 May 22 |
| 2) Digital Thermometer With Probe | GT11 | 08000089 | PSL-T 0072/65 | 14 November 2022 |

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

3. This certificate can be traceable to International System of Unit :

- Through Thailand Institute of Scientific And Technological Research (TISTR)
- Through Quality Reborn Co., Ltd.

Approved by :

☐ Mr. Suphachai Saksri

☐ Mr. Phayak Toolit

☒ Miss Tantaraporn Peltong

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

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รับรองสำเนาถูกต้อง

Result of Calibration

Function : Humidity Measurement Reference Temperature at 25 °C

| STD Reading (% RH) | UUC Reading (% RH) | UUC Error (% RH) | Measurement Uncertainty (\pm % RH) |
|-----------------------|-----------------------|---------------------|--|
| 50.00 | 49.0 | -1.00 | 2.3 |

Function : Temperature Measurement

| STD Reading (°C) | UUC Reading (°C) | UUC Error (°C) | Measurement Uncertainty (\pm °C) |
|---------------------|---------------------|-------------------|--|
| 25.012 | 25.0 | -0.012 | 0.35 |

Resolution : 0.1 (°C) , 0.1 % RH

STD= Standard

UUC= Unit Under Calibration

** End of Calibration Report **

*Th. W. W.**ep.*

รับรองสำหรับกวดัง

ศูนย์บริการและพัฒนากล้องจุลทรรศน์และเครื่องมือวัด

CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpoed, 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. : 64-420055-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : pH Meter (Pocket)

pH meter

Manufacturer : Eutech

Model : pHTestr 30

Range : -1.00 to 15.00 pH

Resolution : 0.01 pH

Serial No. : 2856418

ID No. : ELABPHTEST3016

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

Ambient Temperature : (24.5 to 25.0) °C

Relative Humidity : (50 to 54) %

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 24 March 2021

Calibrated by : Bunjerd Masri

Calibration Method : In-house method CAL-M4201 direct measurement by using certified reference material (CRM)

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

Standard Buffer Solution

| pH | Cert. No. | Lot No. | Exp. Date | Traceability |
|-------|-----------|---------|-------------|--------------|
| 4.004 | 61208711 | 684575 | 01 Sep 2021 | CPA chem |
| 6.985 | 61191143 | 684576 | 01 Sep 2021 | CPA chem |
| 9.963 | 61208865 | 684577 | 01 Sep 2021 | CPA chem |

Approved by :

(Bunjerd Masri)

Supervisor

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-F0091-03

รับรองสถานภาพถูกต้อง

ผลการสอบเทียบถูกต้อง



CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 64-420055-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

| Adjustment Curve at nominal pH | Standard Buffer (pH) | UUC Reading (pH) | Correction (pH) | Uncertainty (\pm pH) |
|-----------------------------------|---------------------------|-----------------------|----------------------|-----------------------------|
| 4, 7, 10 | 4.004 | 4.00 | 0.01 | 0.011 |
| | 6.985 | 7.00 | -0.01 | 0.020 |
| | 9.963 | 10.00 | -0.04 | 0.053 |

Remark

1 UUC : Unit Under Calibration

2 pH meter does not have voltage mode because the plug can not BNC socket

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

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

- ๐(๐) -





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES


534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 21TW57

Page.: 1 of 2

Certificate of Testing

| | |
|---|---|
| Equipment : | DO Meter |
| Manufacturer : | Hanna |
| Model : | HI 9146 |
| Serial No. : | G0007931 |
| ID No. : | EDOH1914607931 |
| Received Date : | 16 March 2021 |
| Test Date : | 19 March 2021 |
| Reference : | 2103-0669DN-1 |
| Submitted by : | Envilab Co.,Ltd (Head office) 540, 540/1 Soi Bangkhuae 7, Bangkhuae, Bangkhuae, Bangkok 10160 |
| Laboratory Condition : | Temperature (25 ± 5) °C Humidity (50 ± 20) % |
| Test Procedure : | In - house method : CP-CH9 by Comparison Technique with Azide Modification Method |
| Calibrated by : | Walalak Sirithean |
| Approved by : |  Approved Signatory |
| <input checked="" type="checkbox"/> Malee Bulkrua <input type="checkbox"/> Saithip Meangmai <input type="checkbox"/> Warakorn Lerngagtrakul | |
| Issue Date : | 23 March 2021 |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

B 0257191

Envilab Co. Ltd.



Cert.No.: 21TW57

Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: KC1A01TAF

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|---|-------------------------------|------------------------------|
| 8.00 | 8.17 | 0.00 |

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

-o0o-

Malee



Envilab Co., Ltd.

Om

a 1047872

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co., Ltd.

7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, Pakkret, 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. : 64-400527-3

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Incubator)

Manufacturer : M-LAB

Model : BIC-140

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 100613-0

ID No. : ELABREFRIG140L

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

Ambient Temperature : (24.5 to 25.0) °C

Relative Humidity : (55 to 58) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 15 October 2021

Date of Calibration : 15 October 2021

Date of Issue : 16 October 2021

Calibrated by : Bunjerd Masri

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

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No.

Cert. No.

Due Date

Traceability

400046 & 400023 64-400443-1

29 Mar 2022

National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-00031-03



รับรองสำเนาถูกต้อง

ผู้จัดทำฝ่ายควบคุมคุณภาพ



GALE F0031-03

CAL

Calibratech Co.,Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400569-1

Page : 1 of 2

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

Equipment : Air Chamber (Refrigerator)
Manufacturer : M-LAB Model : BIC-140
Range : N/A °C Resolution : 0.1 °C
Serial No. : 1011 ID No. : ELABBODCI40N03

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

Ambient Temperature : (23.0 to 23.8) °C

Relative Humidity : (55 to 60) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 12 November 2021

Date of Calibration : 12 November 2021

Date of Issue : 18 November 2021

Calibrated by : Bunjerd Masri

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

The temperature scale used was based on ITS-90

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

| ID No. | Cert. No. | Due Date | Traceability |
|-----------------|-------------|-------------|---|
| 400046 & 400023 | 64-400443-1 | 29 Mar 2022 | National Institute of Metrology Thailand (NIMT) |

Approved by :

(Bunjerd Masri)

Supervisor

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รับรองผลการวัด

ผู้ตรวจวัด : Bunjerd Masri



Certificate of Calibration

Certificate No. : 64-400569-1

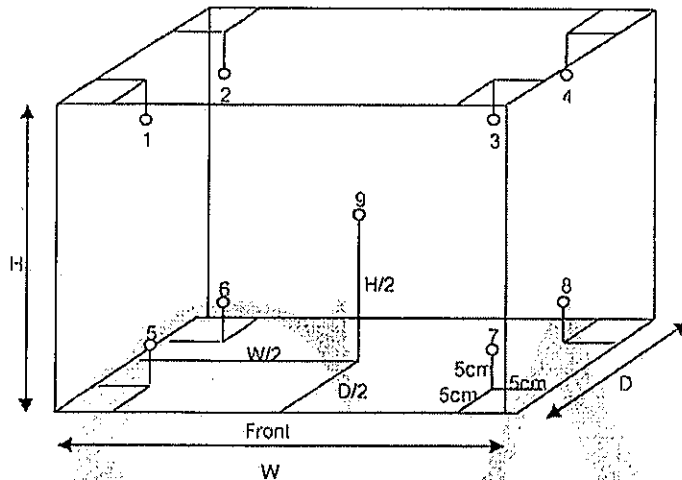
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.38 m

D = 0.35 m

H = 1.15 m

Capacity = 0.15 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|--------------------|-----------------------------|--------------------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 4.0 | 4.0 | 4.0 | 3.3 | 3.2 | 3.4 | 3.4 | 3.9 | 3.9 | 4.0 | 3.4 | 4.2 | 0.57 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 4.0 | 4.0 | 4.0 | 1.0 | 0.1 | 1.0 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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[Signature]



รับรองสำเนาถูกต้อง



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Calibratech Co., Ltd.

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400163-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Oven)

Manufacturer : Memmert

Model : UF 75

Range : N/A °C

Resolution : 0.1 °C

Serial No. : B319.0600

ID No. : N/A

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

Ambient Temperature : (30.0 to 31.5) °C

Relative Humidity : (50 to 55) %

Line Voltage : (224.2 to 225.2) V

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 25 March 2021

Calibrated by : Permpoon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

| ID No. | Cert. No. | Due Date | Traceability |
|-----------------|-------------|-------------|---|
| 400029 & 400032 | 63-400450-1 | 30 Mar 2021 | National Institute of Metrology Thailand (NIMT) |

Approved by :

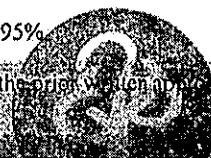
(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03



รับรองมาตรฐานผลิตภัณฑ์

มาตรฐาน ISO 9001:2015



Certificate of Calibration

Certificate No. : 64-400163-2

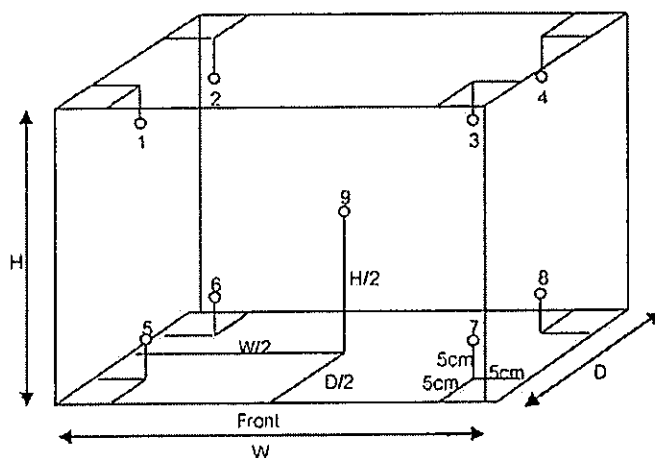
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.56 m

Capacity = 0.07 m³

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ Sensor No. | | | | | | | | | Uncertainty (± °C) |
|--------------------|-----------------------------|--------------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 104.0 | 103.5 | 103.5 | 104.0 | 104.3 | 104.3 | 104.2 | 104.2 | 103.9 | 103.7 | 104.2 | 104.1 | 0.69 |
| 110.0 | 109.5 | 109.5 | 110.0 | 110.4 | 110.4 | 110.2 | 110.2 | 109.9 | 109.6 | 110.2 | 110.1 | 0.69 |
| 180.0 | 179.0 | 179.0 | 179.0 | 180.3 | 180.2 | 180.2 | 180.3 | 180.0 | 179.0 | 180.4 | 180.3 | 0.95 |

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Uniformity (°C) | Measured Stability (°C) | Overall Variation (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|---------------------------|
| 104.0 | 103.5 | 103.5 | 0.5 | 0.1 | 0.8 |
| 110.0 | 109.5 | 109.5 | 0.7 | 0.1 | 1.0 |
| 180.0 | 179.0 | 179.0 | 1.5 | 0.2 | 1.7 |

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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Calibratech Co.,Ltd.

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

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NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 65-400053-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhac7, Bangkhac, Bangkok 10160

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB29

Range : N/A °C

Resolution : 0.1 °C

Serial No. : L617.0156

ID No. : ELABWBWNB29N01

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

Ambient Temperature : (22.7 to 23.5) °C

Relative Humidity : (45 to 50) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 02 February 2022

Date of Calibration : 02 February 2022

Date of Issue : 07 February 2022

Calibrated by : Permpon Chanpu

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

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

| ID No. | Cert. No. | Due Date | Traceability |
|-----------------|-------------|-------------|---|
| 400029 & 400031 | 64-400588-1 | 24 May 2022 | National Institute of Metrology Thailand (NIMT) |

Approved by :

(Bunjerd Masri)

Supervisor

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CAL-F0031-03



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Envilab Co., Ltd. ผู้ให้บริการสอบเทียบ



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

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Certificate of Calibration

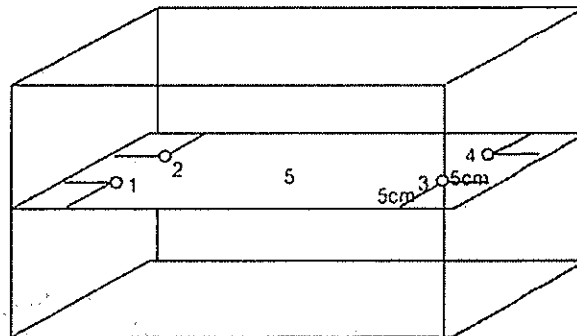
Certificate No. :65-400053-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Front

| Test Point (°C) | Setting Temperature (°C) | Indicating Temperature (°C) | Measured Temperature (°C) @ | | | | | Uncertainty (± °C) | Measured Uniformity (°C) | Measured Stability (°C) |
|--------------------|-----------------------------|--------------------------------|-----------------------------|-------|-------|-------|-------|-----------------------|-----------------------------|----------------------------|
| | | | Sensor No. | | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | | | |
| 95.0 | 95.0 | 95.0 | 95.35 | 95.45 | 95.51 | 95.66 | 95.56 | 0.19 | 0.27 | 0.06 |

Remark The uncertainty is not combine uniformity of the water bath

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

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

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B



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Calibratech Co.,Ltd.

7/10/7 Moo 2, Sukhprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-300152-2

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : PYREX

Class : A

Capacity : 50 ml

Graduation : 1 ml

ID No. : C-WW-002/21

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |

Approved by :

(Wipa Tovadec)

Supervisor

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CAL-00031-03

Calibratech Co.,Ltd.

ผู้ตรวจการควบคุมคุณภาพ

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

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Certificate of Calibration

Certificate No. : 64-300152-2

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 30 | 29.93 |
| 50 | 50.01 |

Uncertainty of measurement with in \pm 0.054 ml

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%

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D.



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ผู้จัดการฝ่ายควบคุมคุณภาพ



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7/106-7 Moo 2, Sukhaprachasin 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. : 64-300152-6

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : Wileg

Class : A

Capacity : 1000 ml

Graduation : 10 ml

ID No. : C-WW-029/18

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Arcerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-------------|-------------|---|
| 241002 | 63-200378-1 | 02 Jun 2021 | National Institute of Metrology (Thailand) (NIMT) |

Approved by :

(Wipa Tovadee)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Wipa



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

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech_cal@ynhoo.com. calibratech_cal@hotmail.com

Certificate of Calibration

Certificate No. : 64-300152-6

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

| Nominal Volume (ml) | Measuring Volume (ml) |
|-----------------------|-------------------------|
| 500 | 502.85 |
| 1000 | 1001.86 |

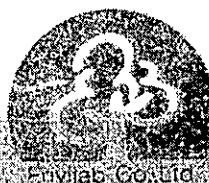
Uncertainty of measurement with in \pm 0.17 ml

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%

- o0o -

D.



Signature

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



ประจำเดือนมิถุนายน พ.ศ. 2565



บริษัท เอ็นไวโรเทสติง จำกัด 540,540/1 ซอย บางกะปิ 7 บางกะปิ กรุงเทพฯ 10140
E-Enviro Co., Ltd. 540,540/1 Soi Bangkok 7 Bangkok Bangkok 10140
Tel: 02-802-9577-8 Fax: 02-802-9773 E-mail: info@evltesting.com



TSP High Volume Sampler Calibration

Verification Report No.

D6506 -TSP 02

☒ PM ☐ Onsite

Site: บริษัท เอ็นไวโรเทสติง จำกัด

UTM: 47P N1514475 E654269

Sampler: ETSP#02

Recorder: ECRANG15315224

Date: 2 Jun 22

Technical: Wisan R.

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1011.0

Temperature (deg C): 30.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 758.3

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-5028A

Serial#: 1328

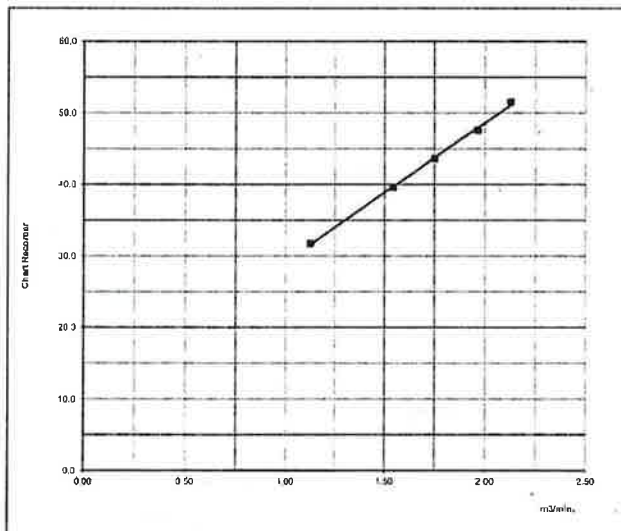
Qstd Slope: 1.63957

Qstd Intercept: -0.01202

Date Certified: 19 Jan 22

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|------------------------------------|
| 1 | 12.21 | 2.119 | 54.0 | 53.49 | Slope = 14.1679 |
| 2 | 10.56 | 1.971 | 52.0 | 51.51 | Intercept = 23.6311 |
| 3 | 7.55 | 1.667 | 48.0 | 47.55 | Corr. coeff. = 0.9979 |
| 4 | 4.14 | 1.237 | 42.0 | 41.61 | |
| 5 | 3.69 | 1.168 | 40.0 | 39.62 | |
| | | | | | # of Observations: 5 |
| | | | | | Range of Chart at 1.1 - 1.7 m3/min |
| | | | | | 40 |
| | | | | | 48 |



Calibrated by:

(Wisan Ritthikamon)
2 June 2022

Approved by:

(Sarawut Keawsrinal)
2 June 2022



รับรองว่าถูกต้อง

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www.evltesting.com

Environmental responsibility with accuracy measurement

FE-MNT-29 Rev.00-01/08/63



บริษัท เอ็นไวแล็บ จำกัด SAR-540/1 ซอยบางกะปิ 7 แขวงบางกะปิ เขตห้วยขวาง กรุงเทพฯ 10300
EnviLab Co., Ltd. SAR-540/1 Soi Bangkapi 7 Bangkapi Bangkapi Bangkok 10300
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@envilab.com



www.envilab.com

PM10 High Volume Sampler Calibration

Verification Report No.

C6506 -PM 01

☒ PM ☐ Onsite

Site: บริษัท เอ็นไวแล็บ จำกัด

UTM : 47P N1514475 E654269

Sampler: EPM#20

Recorder: ECRDS01618124

Date: 1 Jun 22

Technical: Wisan R.

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1011.0

Temperature (deg C): 30.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 758.3

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-5028A

Serial#: 1328

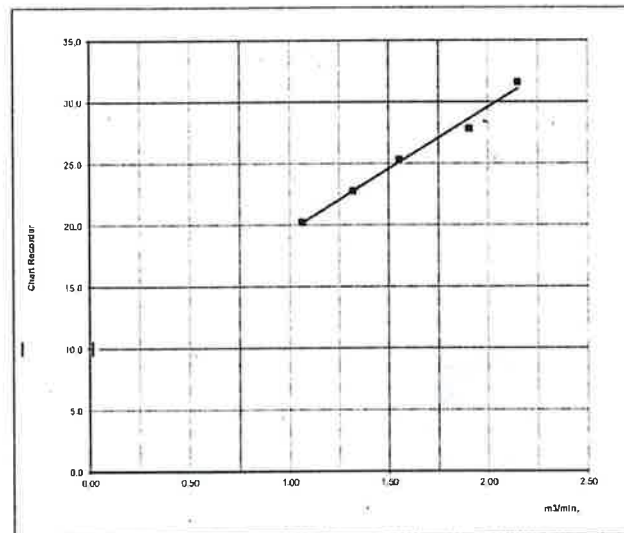
Slope: 1.02667

Intercept: -0.00753

Date Certified: 19 Jan 22

CALIBRATIONS

| Plate or Test # | H2O (In) | Qa (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|-------------|-----------|----------------|-----------------------|
| 1 | 12.11 | 2.150 | 50.0 | 31.61 | Slope = 10.0313 |
| 2 | 9.52 | 1.907 | 44.0 | 27.81 | Intercept = 9.4984 |
| 3 | 6.31 | 1.554 | 40.0 | 25.28 | Corr. coeff. = 0.9936 |
| 4 | 4.55 | 1.321 | 36.0 | 22.76 | SFR = 1.132 |
| 5 | 2.94 | 1.063 | 32.0 | 20.23 | SSP = 32.99 |
| | | | | | # of Observations: 5 |
| | | | | | Range of Chart 32 |
| | | | | | at SFR $\pm 10\%$ 34 |



Calibrated by :

(Wisan Ritthikamon)
1 June 2022

Approved by :

(Sarawut Keawsinual)
1 June 2022



รับรองสำเนาถูกต้อง
ผู้ตรวจดำเนินการควบคุม

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RE-MNT-29 Rev.00:01/08/21



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6506007

Page:1/1

Calibrated Date: 1-Jun-22

☒ PM ☐ Onsite

Instruments Information

| | |
|--|---|
| Analyzer Type: SO2 Analyzer Model: THERMO_43C | Manufacturer: THERMO S/N: ESOTE43C703317 |
|--|---|

Calibration System

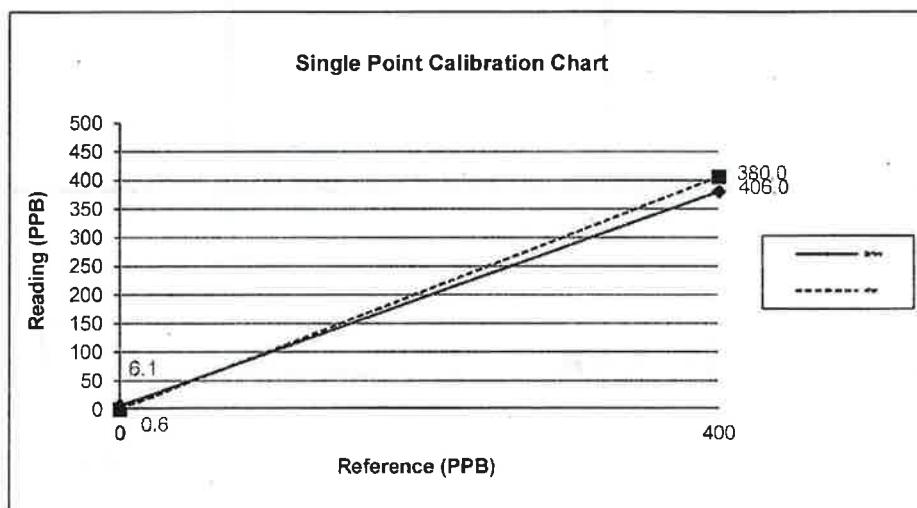
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 26.4 °C

Humidity: 47 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0 | 6.1 | 6.1 | 400.0 | 380 | -5.0 |
| After | 0.0 | 0.6 | 0.6 | 400.0 | 406 | 1.5 |



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Neediss Supply Instrument Co., Ltd.



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ผู้จัดการฝ่ายควบคุมคุณภาพ

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We know the best thing to save environment



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-06-2022

S/N : ESOTE43C703317

| Test Function Value | Before | After |
|---------------------------------|--------|-------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -650 | -653 |
| LAMP VOLTAGE 950 - 1,200 (V) | 990 | 985 |
| LAMP INTENSITY 20000 - 50000 Hz | 32568 | 32577 |
| INTER TEMP 15 - 45 DEG C | 37 | 37 |
| CHAMBER TEMP 47 - 51 C | 49 | 49 |
| COOLER TEMP -5 - (-2) DEG C | -2.5 | -2.5 |
| PRESSURE 400 - 1000.0 mm Hg | 764 | 765 |
| FLOW 0.350 - 0.650 LPM | 0.42 | 0.4 |
| | | |
| | | |
| | | |



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Calibrate By : 

Approve By : 

Sirirat Poonlak

Sarawut Keawsrinual

Date: 1-Jun-22

Date: 1-Jun-22
 **neediss**

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Neediss Supply Instrument Co., Ltd.536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Bangkok Bangkok
Tel. 02-802-3780-2 Fax 02-802-3788 E:info@neediss.com**NOx Analyzer Verification Test Report**

Calibration Report No.: 6506001

Page:1/2

Calibrated Date: 1-Jun-22

☒ PM ☐ Onsite**Instruments Information**

| | |
|--|----------------------------|
| Analyzer Type: NO/NO ₂ /NOx Analyzer | Manufacturer THERMO |
| Model: 42C | S/N: ENOTE42C412226 |

Calibration System

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

Environment: Temperature 26.4 °C

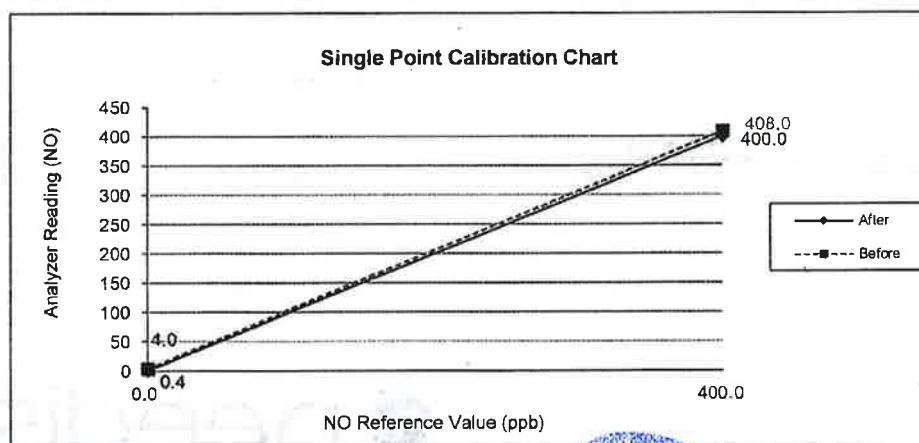
Humidity: 47 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 4.0 | 0.0 | 4.0 | 408 | 400.0 | 1.0 |
| NO ₂ | 4.4 | 0.0 | 4.4 | 7.0 | 0.0 | 0.9 |
| NOx | 8.4 | 0.0 | 8.4 | 415 | 400.0 | 1.8 |

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 | 400 | 400.0 | 0.0 |
| NO ₂ | 0.5 | 0.0 | 0.5 | 2.0 | 0.0 | 0.2 |
| NOx | 0.9 | 0.0 | 0.9 | 402 | 400.0 | 0.2 |

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Tel. 02-602-3980-2 Fax. 02-602-3988 E:info@neediss.com

MODEL : NOx ANALYZER Model 42C THERMO

DATE :1-06-2022

S/N : ENOTE42C412226

Page:2/2

| Test Function Value | Before | After |
|----------------------------------|---------|---------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -675 | -678 |
| LAMP VOLTAGE 950 - 1,200 (V) | | |
| INTER TEMP 15 - 45 DEG C | 43 | 43 |
| CHAMBER TEMP 47 - 51 C | 49 | 50 |
| COOLER TEMP -5 - (-2) DEG C | -2 | -2 |
| PRESSURE 400 - 1000.0 mm Hg | 350 | 380 |
| SAMPLE FLOW 0.350 - 0.900 LPM | 0.45 | 0.46 |
| OZONEATOR FLOW 0.035 - 0.075 LPM | 0.05 | 0.05 |
| No/Nox BKG | 12/9.0 | 12/9.1 |
| No/Nox Slope | 1.0/0.8 | 0.9/0.8 |
| | | |

Calibrate By :

Approve By :

Sirirat Poonlak

Sarawut Keawsrinual

Date:

1-Jun-22

Date:

1-Jun-22

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Neediss Supply Instrument Co.,Ltd.

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

Verification Test Report

Report No.:

6506 -SLM 02

☒ PM

☐ Onsite UTM :

47P N 1514462 E 654258

Calibrated Date: 1 June 2022

Site : บริษัทเอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 8008

Environment: Temperature 25 °C Humidity 58 %RH

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

Serial No.1351075

Date of Calibration : March.21, 2022

Result of Test

| Reference Standard (dB) | Instrument reading (dB) | Error (dB) | Adjust (dB) |
|----------------------------|----------------------------|---------------|----------------|
| 93.66 | 93.80 | 0.14 | 93.66 |

Calibrated By:

(Wisan Ritthikamon)

1 June 2022



Approve By:

Date:

(Sarawut Keawsrinual)

1 June 2022

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Envilab Co., Ltd. 540,540/1 Soi Bangkapi 7 Bangkapi Bangkok Bangkok 10180
Tel : 02-302-3577-8 Fax: 02-302-3773 E-mail : info@evltesting.com



envilab is a member of the quality management system

TSP High Volume Sampler Calibration

Verification Report No.

E6506 -TSP 01

| | |
|--|---------------------------------|
| <input checked="" type="checkbox"/> PM | <input type="checkbox"/> Onsite |
| Site: บริษัท เอ็นวิล เทสติ้ง จำกัด | |
| UTM: 47P N1514475 E654269 | |
| Sampler: ETSP#03 | |
| Recorder: ECRANG15315224 | |
| Date: 2 Jun 22 | |
| Technical: Wisan R. | |
| Approval: Sarawut K. | |

CONDITIONS

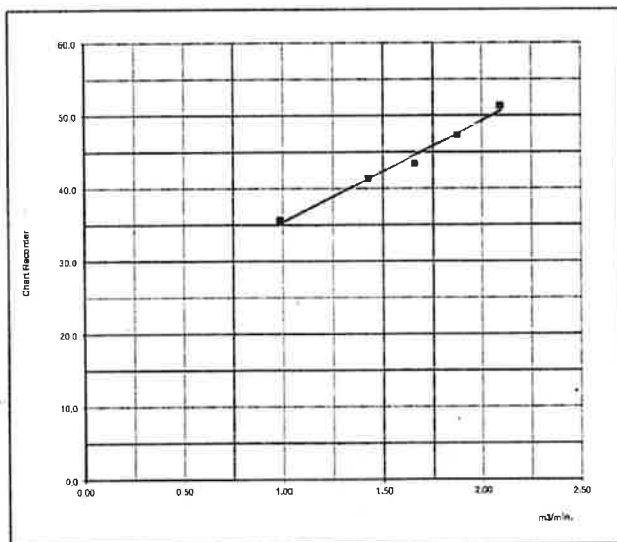
| | |
|---------------------------------|--------------------------------------|
| Barometric Press. (hPa): 1011.0 | Corrected Pressure (mm Hg): 758.3 |
| Temperature (deg C): 32.0 | Temperature (deg K): 305.0 |
| Average Press. (hPa): 1013.0 | Corrected Avg. Press. (mm Hg): 759.8 |
| Average Temp. (deg C): 30.0 | Average Temp. (deg K): 303.0 |

CALIBRATION ORIFICE

| | |
|---------------------------------|---------------------------|
| Brand: Tisch Environmental, Inc | Qstd Slope: 1.63957 |
| Model: TE-5028A | Qstd Intercept: -0.01202 |
| Serial#: 1328 | Date Certified: 19 Jan 22 |

CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | LINEAR REGRESSION |
|-----------------|----------|---------------|-----------|----------------|--|
| 1 | 12.01 | 2.094 | 52.0 | 51.34 | |
| 2 | 9.63 | 1.876 | 48.0 | 47.39 | Slope = 13.9233 Intercept = 21.4403 Corr. coeff. = 0.9932 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 38 45 |
| 3 | 7.52 | 1.659 | 44.0 | 43.44 | |
| 4 | 5.57 | 1.429 | 42.0 | 41.47 | |
| 5 | 2.64 | 0.986 | 36.0 | 35.54 | |



Calibrated by : _____
(Wisan Ritthikamon)
2 June 2022

Approved by : _____
(Sarawut Keawsinual)
2 June 2022



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Environmental responsibility with accuracy measurement

IE-MNT-23 Rev.001/08/03



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Envilab Co., Ltd. 540,540/1 Soi Bangnae 7 Bangkhoe Bangkok Bangkok 10150
Tel : 02-802-8577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



PM10 High Volume Sampler Calibration

Verification Report No.

C6506 -PM 02

☒ PM ☐ Onsite

Site: บริษัท เอ็นไวเทสティング จำกัด

UTM : 47P N1514475 E654269

Sampler: EPM#21

Recorder: ECRDS01618124

Date: 1 Jun 22

Technical: Wisan R.

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1011.0

Temperature (deg C): 30.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 758.3

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-5028A

Serial#: 1328

Slope: 1.02667

Intercept: -0.00753

Date Certified: 19 Jan 22

CALIBRATIONS

| Plate or Test-# | H2O (in) | Qa (m3/min) | I (chart) | IC (corrected) |
|-----------------|----------|-------------|-----------|----------------|
| 1 | 12.32 | 2.168 | 48.0 | 30.34 |
| 2 | 9.71 | 1.926 | 44.0 | 27.81 |
| 3 | 7.31 | 1.672 | 42.0 | 26.55 |
| 4 | 5.42 | 1.441 | 38.0 | 24.02 |
| 5 | 2.36 | 0.953 | 34.0 | 21.49 |

LINEAR REGRESSION

Slope = 7.2415

Intercept = 14.2248

Corr. coeff. = 0.9905

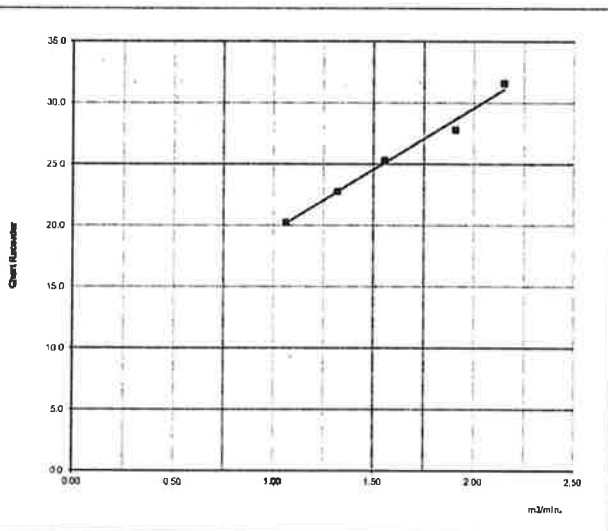
SFR = 1.132

SSP = 35.47

of Observations: 5

Range of Chart 35

at SFR $\pm 10\%$ 36



Calibrated by :

(Wisan Ritthikamon)

1 June 2022

Approved by :

(Sarawut Keawsrnuat)

1 June 2022



รับรองสำเนาถูกต้อง

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

Environmental responsibility with accuracy measurement.

FE-MNT-29 Rev.00-01/06/13



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6506005

Page:1/1

Calibrated Date: 1-Jun-22

☒ PM ☐ Onsite

Instruments Information

| | |
|---|--|
| Analyzer Type: SO2 Analyzer Model: THERMO.,43C | Manufacturer THERMO S/N: ESOTE43C668327 |
|---|--|

Calibration System

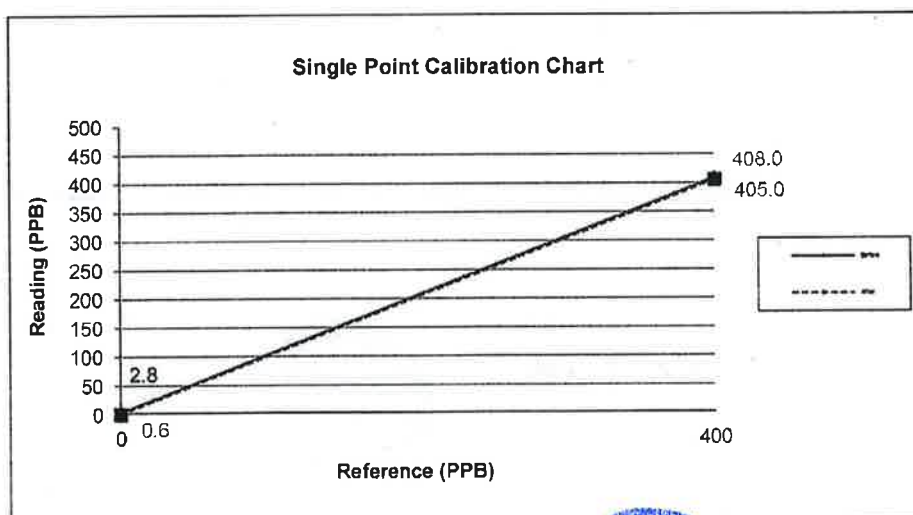
| Calibrator Unit | Standard Gas |
|--|---|
| Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644 | NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762 |

Environment: Temperature 26.5 °C

Humidity: 48 %RH

Calibration Report

| Status | Zero | | | Span | | |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| Before | 0.0 | 2.8 | 2.8 | 400.0 | 408 | 2.0 |
| After | 0.0 | 0.6 | 0.6 | 400.0 | 405 | 1.3 |




 บริษัท ซัลเบอเนก จำกัด


 Envilab Co., Ltd.

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 ผู้จัดการฝ่ายควบคุมคุณภาพ

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Neediss Supply Instrument Co., Ltd.536 ซอยบางนา 7 แขวงบางนา เขตบางนา กรุงเทพฯ 10160 536 Soi Bangkhoe 7 Bangkhoe Bangkok
Tel. 02-802-3780-2 Fax. 02-802-3788 E info@neediss.com

MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-06-2022

S/N : ESOTE43C668327

| Test Function Value | Before | After |
|---------------------------------|--------|-------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -650 | -653 |
| LAMP VOLTAGE 950 - 1,200 (V) | 990 | 985 |
| LAMP INTENSITY 20000 - 50000 Hz | 32568 | 32577 |
| INTER TEMP 15 - 45 DEG C | 37 | 37 |
| CHAMBER TEMP 47 - 51 C | 49 | 49 |
| COOLER TEMP -5 - (-2) DEG C | -2.5 | 2.5 |
| PRESSURE 400 - 1000.0 mm Hg | 764 | 765 |
| FLOW 0.350 - 0.650 LPM | 0.42 | 0.4 |
| | | |
| | | |
| | | |

Calibrate By : Sirirat Poonlak

Sirirat Poonlak

Date:

1-Jun-22

Approve By : Sarawut Keawsrinual

Sarawut Keawsrinual

Date:

1 Jun-22

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Tel. 02-802-3980-2 Fax. 02-802-3988 Email: neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: 6506005

Page:1/2

Calibrated Date: 1-Jun-22

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer
Model: 42C

Manufacturer THERMO
S/N: ENOTE42C789390

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 26.2 °C

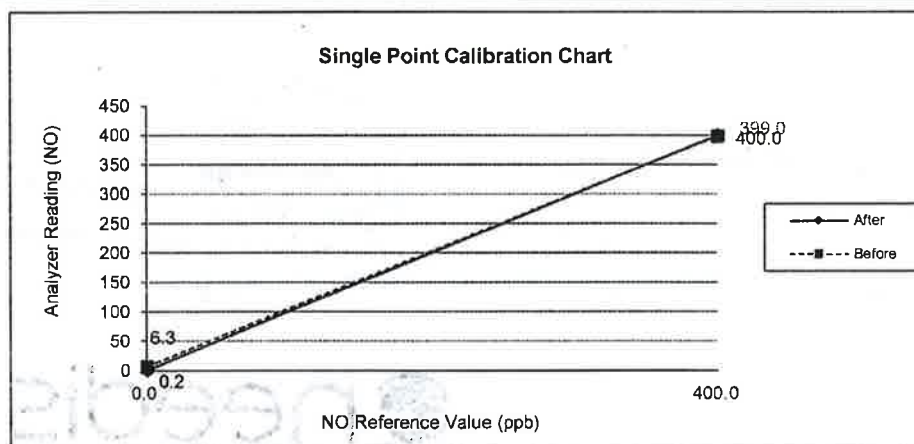
Humidity: 46 %RH

Calibration Check (Before adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 6.3 | 0.0 | 6.3 | 399 | 400.0 | -0.1 |
| NO ₂ | 3.8 | 0.0 | 3.8 | 11.0 | 0.0 | 1.4 |
| NOx | 10.1 | 0.0 | 10.1 | 410 | 400.0 | 1.2 |

Calibration Check (After adjust)

| GAS | Zero | | | Span | | |
|-----------------|---------------------|----------------------|-------------|---------------------|----------------------|--------|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.2 | 0.0 | 0.2 | 400 | 400.0 | 0.0 |
| NO ₂ | 0.3 | 0.0 | 0.3 | 2.0 | 0.0 | 0.2 |
| NOx | 0.5 | 0.0 | 0.5 | 402 | 400.0 | 0.2 |



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Tel. 02-802-3986-2 Fax. 02-802-3988 Email: neediss.com

MODEL : NOx ANALYZER Model 42C THERMO

DATE : 1-06-2022

S/N : ENOTE42C789390

Page:2/2

| Test Function Value | Before | After |
|----------------------------------|---------|---------|
| Range 500 (PPB) | 500 | 500 |
| PMT VOLTS -450 - -850 (V) | -675 | -678 |
| LAMP VOLTAGE 950 - 1,200 (V) | | |
| INTER TEMP 15 - 45 DEG C | 43 | 43 |
| CHAMBER TEMP 47 - 51 C | 49 | 50 |
| COOLER TEMP -5 - (-2) DEG C | -2 | -2 |
| PRESSURE 400 - 1000.0 mm Hg | 350 | 380 |
| SAMPLE FLOW 0.350 - 0.900 LPM | 0.45 | 0.46 |
| OZONEATOR FLOW 0.035 - 0.075 LPM | 0.05 | 0.05 |
| No/Nox BKG | 12/9.0 | 12/9.1 |
| No/Nox Slope | 1.0/0.8 | 0.9/0.8 |
| | | |

Calibrate By :

Approve By :

Sirirat Poonlak

Sarawat Keawsrinual

Date:

1-Jun-22

Date:

1-Jun-22

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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



Check 5280003 Signature

Verification Test Report

Report No.:

6506 -SLM 03

☒ PM ☐ Onsite UTM : 47P N 1514462 E 654258

Calibrated Date: 1 June 2022

Site : บริษัทเอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 8002

Environment: Temperature 25 °C Humidity 58 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer
Serial No.1351075
Date of Calibration : March.21, 2022

Result of Test

| Reference Standard (dB) | Instrument reading (dB) | Error (dB) | Adjust (dB) |
|----------------------------|----------------------------|---------------|----------------|
| 93.66 | 93.70 | 0.04 | 93.66 |

Calibrated By:

(Wisan Ritthikamon)

1 June 2022



Approve By:

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

(Sarawut Keawsrinual)

Date:

1 June 2022

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Certificate of Calibration

Calibration Certification Information

Cal. Date: January 19, 2022 Rootsmeter S/N: 438320 Ta: 294 °K
 Operator: Jim Tisch Pa: 749.05 mm Hg
 Calibration Model #: TE-5028A Calibrator S/N: 1328

| Run | Vol. Inlt (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.3190 | 3.7 | 1.50 |
| 2 | 3 | 4 | 1 | 1.0220 | 6.2 | 2.50 |
| 3 | 5 | 6 | 1 | 0.9290 | 7.5 | 3.00 |
| 4 | 7 | 8 | 1 | 0.8590 | 8.7 | 3.50 |
| 5 | 9 | 10 | 1 | 0.6530 | 14.8 | 6.00 |

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) | $\sqrt{\Delta H \left(Ta/Pa \right)}$ (y-axis) |
|-------------|---------------|--|-----------|-------------|---|
| 0.9941 | 0.7536 | 1.2241 | 0.9951 | 0.7544 | 0.7673 |
| 0.9907 | 0.9694 | 1.5803 | 0.9917 | 0.9704 | 0.9906 |
| 0.9890 | 1.0646 | 1.7312 | 0.9900 | 1.0656 | 1.0851 |
| 0.9874 | 1.1495 | 1.8699 | 0.9884 | 1.1506 | 1.1721 |
| 0.9793 | 1.4996 | 2.4483 | 0.9802 | 1.5011 | 1.5346 |
| QSTD | m= | 1.63957 | QA | m= | 1.02667 |
| | b= | -0.01202 | | b= | -0.00753 |
| | r= | 0.99999 | | r= | 0.99999 |

Calculations

| | | | |
|--|---|-----|--|
| Vstd= | $\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$ | Va= | $\Delta Vol((Pa-\Delta P)/Pa)$ |
| Qstd= | $Vstd/\Delta Time$ | Qa= | $Va/\Delta Time$ |
| 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= | $1/m \left(\left(\sqrt{\Delta H \left(Ta/Pa \right)} \right) - b \right)$ |

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. : 65-200022-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA224-1S

Serial No. : 0034803270

ID No. : ELABBALANCEN04

Capacity : 220 g

Resolution : 0.0001 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.

Ambient Temperature : (23.7 to 23.8) °C

Relative Humidity : (57.1 to 58.0) %

Air Pressure : 1012.0 mbar

Date of Received : 02 February 2022

Date of Calibration : 02 February 2022

Date of Issue : 09 February 2022

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-----------|-------------|--|
| E261-E2624 | C02213103 | 18 Nov 2022 | National Institute of Metrology (Thailand), (NIMT) |



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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

Certificate of Calibration

Certificate No. : 65-200022-1

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) |
|----------------------|-------------------|--------------------------|
| 0.01 | 0.0001 | 0.00011 |
| 0.1 | 0.0001 | 0.00011 |
| 1 | 0.0000 | 0.00011 |
| 2 | 0.0001 | 0.00011 |
| 5 | 0.0000 | 0.00012 |
| 10 | 0.0001 | 0.00012 |
| 20 | -0.0001 | 0.00013 |
| 50 | 0.0000 | 0.00014 |
| 100 | -0.0002 | 0.00020 |
| 200 | -0.0004 | 0.00038 |

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

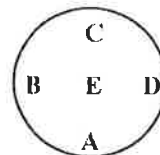
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.11$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g

A B C D E

-0.0001 -0.0002 -0.0002 -0.0001 0.0000 g



Repeatability

Load test : 200 g

Stdev. : 0.00005 g



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



Certificate of Calibration

Certificate No. : 65-200022-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA3102-IS

Serial No. : 0034409695

ID No. : ELABBALANCEN03

Capacity : 3100 g

Resolution : 0.01 g

Environment : On site calibration was carried out at the Balance Room, Envilab Co., Ltd.

Ambient Temperature : (23.7 to 24.2) °C

Relative Humidity : (57.6 to 57.8) %

Air Pressure : 1012.0 mbar

Date of Received : 02 February 2022

Date of Calibration : 02 February 2022

Date of Issue : 09 February 2022

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

| ID No. | Cert. No. | Due Date | Traceability |
|------------|-------------|-------------|--|
| F181-F1821 | 65-210044-1 | 31 Jul 2022 | National Institute of Metrology (Thailand), (NIMT) |



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 65-200022-2

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) |
|----------------------|-------------------|--------------------------|
| 10 | 0.00 | 0.0082 |
| 20 | 0.00 | 0.0082 |
| 50 | 0.00 | 0.0082 |
| 100 | 0.00 | 0.0082 |
| 200 | 0.00 | 0.0083 |
| 500 | -0.01 | 0.0085 |
| 1000 | -0.01 | 0.0093 |
| 1500 | -0.01 | 0.011 |
| 2000 | -0.01 | 0.012 |
| 3000 | -0.01 | 0.023 |

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

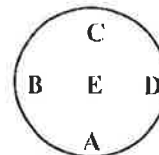
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 1000 g

| | | | | |
|------|------|------|------|------|
| A | B | C | D | E |
| 0.00 | 0.01 | 0.02 | 0.00 | 0.00 |

g



Repeatability

Load test : 2000 g

Stdev. : 0.000 g

- oOo -



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0383

MTC No. EEL. BP. 59/0365

CALIBRATION CERTIFICATE

Submitted by : Envilab Co.,Ltd.

Address : 540, 540/1 Soi Bangkhuae 7, Bangkhuae, Bangkok, 10160, Thailand.

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

Instrument Calibrated :

Description : Acoustic Calibrator
Manufacturer : 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/N 4106495.
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level 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 : 10 Mar. 2022

Date of Calibration : 21 Mar. 2022



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

1 / 2

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

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FM.BL.MTC.002 Rev.4

Head Office

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

Office/Laboratory

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

Office

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



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0383

MTC No. EEL. BP. 59/0365

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 | 93.66 | -0.34 | ± 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 | 997.8 | -2.2 | ± 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 | 1.55 | ± 0.50 | $\pm 3.0\%$ |

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Wcerachai Deechaiyac)

Approved by :


(Mr. Prawate Khunypa)



Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Mar. 2022

Date of Issue : 22 Mar. 2022

Ref : 2011265031501147002

End of Certificate

2 / 2

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Head Office

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

Office/Laboratory

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

Office

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

FM.BL.MTC.002 Rev.4

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD
Part Number: E05NI91E15A0003
Cylinder Number: EB0146406
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12022
Gas Code: CO,CO2,NO,NOX,SO2,BALN
Reference Number: 160-402305646-1
Cylinder Volume: 148.7 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Jan 03, 2022

Expiration Date: Jan 03, 2030

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.

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 | 100.0 PPM | 100.2 PPM | G1 | +/- 0.9% NIST Traceable | 12/27/2021, 01/03/2022 |
| CARBON MONOXIDE | 100.0 PPM | 98.02 PPM | G1 | +/- 0.5% NIST Traceable | 12/27/2021 |
| NITRIC OXIDE | 100.0 PPM | 100.1 PPM | G1 | +/- 1.0% NIST Traceable | 12/27/2021, 01/03/2022 |
| SULFUR DIOXIDE | 100.0 PPM | 100.2 PPM | G1 | +/- 1.0% NIST Traceable | 12/27/2021, 01/03/2022 |
| CARBON DIOXIDE | 8.000 % | 7.962 % | G1 | +/- 0.9% NIST Traceable | 12/27/2021 |
| NITROGEN | Balance | | | | |

CALIBRATION STANDARDS

| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
|------|--------------|-------------|-------------------------------------|-------------|-----------------|
| NTRM | 09010241 | KAL004894 | 98.48 PPM CARBON MONOXIDE/NITROGEN | +/- 0.5% | Oct 16, 2024 |
| NTRM | 200610-56 | CC733475 | 98.61 PPM NITRIC OXIDE/NITROGEN | +/- 0.6% | Oct 06, 2026 |
| GMIS | 124206889119 | CC322885 | 4.294 PPM NITROGEN DIOXIDE/NITROGEN | +/- 2.0% | Sep 03, 2024 |
| NTRM | 11010419 | KAL004813 | 99.6 PPM SULFUR DIOXIDE/NITROGEN | +/- 0.8% | Jul 28, 2023 |
| NTRM | 08010636 | K019200 | 13.94 % CARBON DIOXIDE/NITROGEN | +/- 0.6% | Jan 30, 2024 |

ANALYTICAL EQUIPMENT

| Instrument/Make/Model | Analytical Principle | Last Multipoint Calibration |
|----------------------------------|----------------------|-----------------------------|
| Nicolet iS50 FTIR AUP2010245 CO2 | FTIR | Dec 02, 2021 |
| SIEMENS ULTRAMAT6E N1-C8-180 | NDIR | Dec 09, 2021 |
| Nicolet iS50 FTIR AUP2010245 NO | FTIR | Dec 16, 2021 |
| Nicolet iS50 FTIR AUP2010245 NO2 | FTIR | Dec 29, 2021 |
| Nicolet iS50 FTIR AUP2010245 SO2 | FTIR | Dec 23, 2021 |

Triad Data Available Upon Request

NOTES: Gross Weight: 28.1 Kg, Net Weight: 5.1 Kg.

UF0X5CX



Michael A. [Signature]
Approved for Release

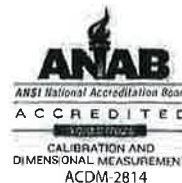


ON [Signature]
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ผู้จัดการฝ่ายควบคุมคุณภาพ



CALIBRATION LABORATORY Co., LTD.

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



Supplement to Calibration Certificate No. Q22008276

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14631/UM14631[EVMINMMATE4631]
CLID. NO. : 252200218
JOB CONTROL NO. : 220125008276

CUSTOMER : ENVILAB CO., LTD. [HEAD OFFICE]
540,540/1 SOI BANGKHAE 7,
BANGKHAE, BANGKHAE BANGKOK 10160

DATE OF RECEIVED : 25 January 2022

DATE OF ISSUED : 04 February 2022

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Suwit Phuanbusabong

Calibration Engineer

Approved By :

Mongkol Yotsoontorn

Authorized Signatory

04 February 2022



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

Certificate No. Q22008276A1

F3-012-04/01-12



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

page 1 of 3

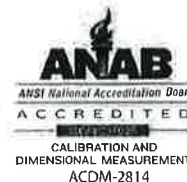


@clccalibration



CALIBRATION LABORATORY Co., LTD.

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



REPORT OF CALIBRATION FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14631/UM14631[EVMINMMATE4631]
DATE OF CALIBRATION : 26 January 2022

ENVIRONMENT CONDITIONS :

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

Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPEE-08** based on **ISO 16063-21** as calibration guideline.
The calibration was performed by using Digital Multimeter, Universal Counter and Portable Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Agilent Technologies Model 34401A S/N. US36044686.
2. Universal Counter, Hewlett Packard Model 5315A S/N. 2448A13042.
3. Portable Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0070-21, Due Date 23 July 2022.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0073/21, Due Date 14 May 2022.
3. The measurements are traceable to International System of Units (SI), through The Modal Shop, Inc. Certificate No. 2649.01, Due Date 10 November 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2,00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. Q22008276

F3-011-04/01-12



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

page 2 of 3



@clccalibration



CALIBRATION LABORATORY Co., LTD.

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



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

| Test point | | Mode | STD Reading | DUC Reading | Correction | Uncertainty |
|------------|---------------|------|-------------|-------------|------------|---------------------|
| (g) | (frequency) | | (g) | (g) | (g) | \pm (% of rdg.) |
| 1 | 50 Hz | peak | 1.000 | 1.044 | -0.044 | 1.1 |
| 2 | 50 Hz | | 2.000 | 2.069 | -0.069 | 1.0 |
| 3 | 50 Hz | | 3.000 | 3.088 | -0.088 | 1.0 |

2. VELOCITY RESULT

| Test point | | Mode | STD Reading | DUC Reading | Correction | Uncertainty |
|------------|---------------|------|-------------|-------------|------------|---------------------|
| (mm/s) | (frequency) | | (mm/s) | (mm/s) | (mm/s) | \pm (% of rdg.) |
| 10 | 50 Hz | peak | 10.000 | 10.089 | -0.089 | 2.3 |
| 20 | 50 Hz | | 20.000 | 20.097 | -0.097 | 1.8 |
| 30 | 50 Hz | | 30.000 | 30.157 | -0.157 | 1.0 |

*3. DISPLACEMENT RESULT

| Test point | | Mode | STD Reading | DUC Reading | Correction | Uncertainty |
|------------|---------------|------|-------------|-------------|------------|---------------------|
| (mm) | (frequency) | | (mm) | (mm) | (mm) | \pm (% of rdg.) |
| 0.01 | 50 Hz | peak | 0.010 | 0.010 | 0.000 | 6.0 |
| 0.02 | 50 Hz | | 0.020 | 0.020 | 0.000 | 3.1 |
| 0.03 | 50 Hz | | 0.030 | 0.030 | 0.000 | 2.7 |

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 1 of 54

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

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

End of Certificate

Certificate No. Q22008276

F3-011-04/01-12



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

page 3 of 3



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