# ภาคผนวก จ

## เอกสารการสอบเทียบ
## เครื่องมือตรวจวัดและวิเคราะห์

**Request No.** 22-65 / 0060 **MTC No.** PSL-H 0031 / 65

# *Certificate of Calibration*

| | |
|---|---|
| **Customer :** | Safety Plan Co.,Ltd. |
| | 1034 Moo3, Rangsit-Pathum Rd., T.Bangpoon, A.Muang, Pathum thani 12000 |
| **Equipment :** | Thermo-Hygrometer (Thermal Environment Monitor) |
| **Model /Type :** | TM-188D |
| **Serial Number :** | 200905486 |
| **Maker :** | TENMARS |
| **Date of Request :** | 25 October 2021 |
| **Date of Calibation :** | 24 November 2021 |

This certificate is traceable to International System of Units (SI Units) through Photometry and Temperature Standards Laboratory, Industrial Metrology and Testing Service Centre, Thailand Institute of Scientific and Technology Research (TISTR), NSC-ONSC accredited Calibration No. 0015.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %.

**Calibrated by :** Panit T.

(Ms. Panit Thummasri)

**Approved by :**

(Mr. Kamchai Singhapiwat)
Director
Photometry and Temperature Standards Laboratory

Ref. No : 20122641025043710O1
Issued Date : 30 November 2021



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Tel. (66) 0 2323 1672-80 ext. 115, 116
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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

**Request No.** 22-65 / 0060 **MTC No.** PSL-H 0031 / 65

**Description of Unit Under Calibration :**

| | |
|---|---|
| Customer : | Safety Plan Co.,Ltd. |
| Address : | 1034 Moo3, Rangsit-Pathum Rd., T.Bangpoon, A.Muang, Pathum thani 12000 |
| Equipment : | Thermo-Hygrometer (Thermal Environment Monitor) |
| Serial Number : | 200905486 |
| Calibration Required : | Temperature at ( 25, 30, 35 ) °C |
| Ambient Condition : | Ambient temperature (23 ± 3) °C |
| | Relative humidity (55 ± 20) % |
| Laboratory Address : | Photometry and Temperature Standards Laboratory |
| | Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan |

**Reference Standard :**

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 1081/64.

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

**Calibration Procedure :**

The certifies the above equipment was calibrated according to procedure no. WI.CP.18.

**Support Equipment :**

Temperature & Humidity Controlled Chamber, Model : 9145-5116-00AA, S/N : 1403041

**Adjustments :** NONE



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**Request No.** 22-65 / 0060 **MTC No.** PSL-H 0031 / 65

**Results of Calibration :-**

**Table : Temperature Measurement @ Wet Bulb**

| Average Measured Temperature (°C) | Average Displayed of UUC (°C) | Correction Measured of UUC (°C) | Expanded Uncertainty of Measurement (± °C) |
|---|---|---|---|
| 24.9 | 19.1 | 5.8 | 0.50 |
| 30.0 | 23.1 | 6.9 | 0.50 |
| 34.9 | 26.8 | 8.1 | 0.50 |

**Table : Temperature Measurement @ Dry Bulb**

| Average Measured Temperature (°C) | Average Displayed of UUC (°C) | Correction Measured of UUC (°C) | Expanded Uncertainty of Measurement (± °C) |
|---|---|---|---|
| 24.9 | 25.1 | -0.2 | 0.50 |
| 30.0 | 30.1 | -0.1 | 0.50 |
| 34.9 | 34.9 | 0.0 | 0.50 |



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**Request No.** 22-65 / 0060 **MTC No.** PSL-H 0031 / 65

**Results of Calibration :-**

**Table : Temperature Measurement @ Globe Bulb**

| Average Measured Temperature (°C) | Average Displayed of UUC (°C) | Correction Measured of UUC (°C) | Expanded Uncertainty of Measurement (± °C) |
|---|---|---|---|
| 24.9 | 25.0 | -0.1 | 0.50 |
| 30.0 | 30.0 | 0.0 | 0.50 |
| 34.9 | 34.9 | 0.0 | 0.50 |

**Note :**

1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

*...end of certificate...*



P.T.

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**Professional Calibration & Services Co., Ltd.**
50/888, 50/889 Moo 2, Rungsit-Nakornnayok Rd., Bungyeetho, Thunyaburi, Pathumthani 12130 Thailand
Tel : (+66)2150-6641 (Autoline), (+66)2569-5158 Fax : (+66)2569-5159
Email : info@p-cal.com www.p-cal.com

# Certificate of Calibration



| | |
|---|---|
| Certificate Number | : EL42940/21 |
| Control Number | : PCAL124786 |
| Customer Control | : - |
| Description | : Heat Stress WBGT Meter |
| Manufacturer | : Tenmars |
| Model | : TM-188D |
| Serial Number | : 200905461 |
| Customer | : SAFETY PLAN CO., LTD.<br>1034 Moo 3, Rangsit-Pathumthani Rd., T.Bangpoon,<br>A.Maung, Pathumthani 12000 |
| Date of Receipt | : 07-Dec-21 |
| Date of Calibration | : 08-Dec-21 |
| Environment | : Temperature 23 °C ± 2 °C |
| | : Relative Humidity 50 % ± 20 % |
| Calibration Method | : Calibration Procedure Number CP-EL21 |
| Calibration Results | : See data attached |

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory.The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

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*Calibrated By*

*Mr. Varavut Sripanyachon*

*Authorized Signature*

*(Mr. Songpol Nakanuruk)*

*09-Dec-21*

*Issued Date*

# Professional Calibration & Services Co.,Ltd.

**Certificate Number :** EL42940/21



## Equipment Standards Used

| Description | Serial No. | Traceability to | Certificate No. | Cal. Due Date |
|---|---|---|---|---|
| Hygrolog | 61624608 | NIMT,NIST | SG-H-00324/64 | 21-Mar-22 |

**Condition as received : Normal**

**Definitions :-**

* NIST - National Institute of Standard and Technology
* NIMT - National Institute of Metrology, Thailand

# CALIBRATION REPORT

## Professional Calibration & Services Co., Ltd.



**Calibration Results**

**Temperature Calibration @ Air Temperature (TA)**

UUC Range : 0 ~ 50 °C

| Calibration Point | Standard Value | UUC Reading | Uncertainty (±) | Tolerance Limit Values |
|---|---|---|---|---|
| 10 °C | 10.02 °C | 10.1 °C | 0.33 °C | 9.22 ~ 10.82 °C |
| 25 °C | 25.01 °C | 25.2 °C | 0.33 °C | 24.21 ~ 25.81 °C |
| 40 °C | 40.03 °C | 40.2 °C | 0.33 °C | 39.23 ~ 40.83 °C |

**Humidity Calibration @ Reference Temperature : 25 °C**

UUC Range : 1 ~ 99 %RH

| Calibration Point | Standard Value | UUC Reading | Uncertainty (±) | Tolerance Limit Values |
|---|---|---|---|---|
| 30 %RH | 30.03 %RH | 31.5 %RH | 1.5 %RH | 27.03 ~ 33.03 %RH |
| 50 %RH | 50.05 %RH | 51.2 %RH | 1.7 %RH | 47.05 ~ 53.05 %RH |
| 80 %RH | 80.02 %RH | 81.1 %RH | 1.8 %RH | 77.02 ~ 83.02 %RH |

**...End...**

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ilac-MRA

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT

# Certificate of Calibration



| | |
|---|---|
| Certificate Number | : EL42939/21 |
| Control Number | : PCAL124785 |
| Customer Control | : - |
| Description | : Heat Stress WBGT Meter |
| Manufacturer | : Tenmars |
| Model | : TM-188D |
| Serial Number | : 200905485 |
| Customer | : SAFETY PLAN CO., LTD.<br>1034 Moo 3, Rangsit-Pathumthani Rd., T.Bangpoon,<br>A.Maung, Pathumthani 12000 |
| Date of Receipt | : 07-Dec-21 |
| Date of Calibration | : 08-Dec-21 |
| Environment | : Temperature 23 °C ± 2 °C |
| | : Relative Humidity 50 % ± 20 % |
| Calibration Method | : Calibration Procedure Number CP-EL21 |
| Calibration Results | : See data attached |

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory.The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

---

*Calibrated By*

*Mr. Varavut Sripanyachon*

*Authorized Signature*

*(Mr. Songpol Nakanuruk)*

*09-Dec-21*

*Issued Date*

# Professional Calibration & Services Co.,Ltd.

**Certificate Number :** **EL42939/21**



## Equipment Standards Used

| Description | Serial No. | Traceability to | Certificate No. | Cal. Due Date |
|---|---|---|---|---|
| Hygrolog | 61624608 | NIMT,NIST | SG-H-00324/64 | 21-Mar-22 |

**Condition as received : Normal**

**Definitions :-**

* NIST - National Institute of Standard and Technology
* NIMT - National Institute of Metrology, Thailand

# CALIBRATION REPORT

## Professional Calibration & Services Co., Ltd.



**Calibration Results**

**Temperature Calibration @ Air Temperature (TA)**

UUC Range : 0 ~ 50 °C

| Calibration Point | Standard Value | UUC Reading | Uncertainty (±) | Tolerance Limit Values |
|---|---|---|---|---|
| 10 °C | 10.02 °C | 10.3 °C | 0.33 °C | 9.22 ~ 10.82 °C |
| 25 °C | 25.01 °C | 25.3 °C | 0.33 °C | 24.21 ~ 25.81 °C |
| 40 °C | 40.03 °C | 40.4 °C | 0.33 °C | 39.23 ~ 40.83 °C |

**Humidity Calibration @ Reference Temperature : 25 °C**

UUC Range : 1 ~ 99 %RH

| Calibration Point | Standard Value | UUC Reading | Uncertainty (±) | Tolerance Limit Values |
|---|---|---|---|---|
| 30 %RH | 30.03 %RH | 31.2 %RH | 1.5 %RH | 27.03 ~ 33.03 %RH |
| 50 %RH | 50.05 %RH | 51.0 %RH | 1.7 %RH | 47.05 ~ 53.05 %RH |
| 80 %RH | 80.02 %RH | 81.1 %RH | 1.8 %RH | 77.02 ~ 83.02 %RH |

**...End...**

Request No. : 22-65 / 0059

MTC No. : PSL-P 015 / 65

# CERTIFICATE OF CALIBRATION

Nomenclature : Digital Lux Meter

Maker : TENMARS

Serial No. : 200100541

Model : TM-202

Customer : **SAFETY PLAN CO., LTD.**

Address : 1034 Moo 3, Rangsit-Pathum Thani Rd., T.Bangpoon, A.Muang, Pathum Thani 12000

Date of receipt : 25 October 2021

Date of calibration : 10 November 2021

Place of calibration : Photometry and Temperature Standards Laboratory, MTC. (Bangpoo)

Basis of calibration : calibration at 0 ~ 2000 lux.

Condition of calibration : - Ambient temperature : ( 25 ± 2 ) °C

- Relative humidity : ( 60 ± 20 ) %

Reference Standard : Working Standard Luminous Intensity Lamp, Serial No.: FEL001 and 5002, can be traceable to international system of units (SI), through calibration certificate MTC No. PSL-P 183/64 and PSL-P 184/64, date of calibration 30 August 2021.

Traceability : This certificate is traceable to SI units through the National Institute of Metrology (Thailand), calibration certificate No. PP-1039-17, PP-1040-17 and PP-1041-17

Support Equipment : 1. Photometric bench , 3.0 meter long

2. DC power supply, Serial No.: BC - 341006035007/2

3. Digital Multimeter , Model : R 6551 , S/N : 92041186 and 92041192

Calibration Procedure : The measurement was done in accordance with WI.CP.10.

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



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Request No. : 22-65 / 0059

MTC No. : PSL-P 015 / 65

Serial No. : 200100541

**Results :**

| UUC Range (lux) | Standard (lux) | *UUC Reading (lux) | Uncertainty of Measurement ± (lux) |
|---|---|---|---|
| 2000 | 0 | 0 | 0.6 |
| | 100 | 105 | 2.2 |
| | 500 | 507 | 10.5 |
| | 1000 | 1006 | 21.0 |
| | 1500 | 1500 | 31.6 |
| | 1900 | 1890 | 40.0 |

Note : *UUC = Unit Under Calibration.

**...end of certificate...**

**Calibrated by :**

**(Mr. Kittipat Wiriyaprasat)**

**Approved by :**

**(Mr. Kamchai Singhapiwat)**
**Director**
**Photometry and Temperature Standards Laboratory**

Ref. : 2012264102504366001
Issued date : 11 November 2021



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**Request No.** 21-65/0279 **MTC No.** EEL. BP. 120/0165

# CALIBRATION CERTIFICATE

**Submitted by** : SAFETY PLAN CO., LTD.

**Address** : 1034 Moo 3 Rangsit-pathumthani Rd., Tambol Bangpoon, Amphur Maung Pathumthani 12000.

**Calibrated at** : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

**Instrument Calibrated :**

Description : Sound Level Calibrator

Manufacturer : Rion

Model : NC-73

Serial No. : 10848247

**Ambient Environment**

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 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** : 28 Jan. 2022

**Date of Calibration** : 8 Feb. 2022



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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

**Request No.** 21-65/0279 **MTC No.** EEL. BP. 120/0165

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 20μPa at 1000 Hz**

**Acoustic Output in dB re 20μPa, 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 | 94.26 | 0.26 | ± 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 | 998.7 | -1.3 | ± 1.5 | ±2.0% |

**3. Total Distortion**

| Standard Microphone Type | Measured Total Distortion (%) | Uncertainty (%) | Tolerance limit IEC60942:2003 Class 2 |
|---|---|---|---|
| 1/2 inch Bruel&Kjaer 4180 | 1.95 | ± 0.50 | ±4.0% |

**Note :** 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

**Calibrated by :**

.....

(Mr.Tawikiat Iamsamran)

**Approved by :**

.....

(Mr.Prawate Kluaypa)

**Director**

**Electrical and Electronic Standards Laboratory**

**Industrial Metrology and Testing Service Centre**

**Date of Calibration** : 8 Feb. 2022

**Date of Issue** : 9 Feb. 2022

**Ref** : 20112650128003890002 2 / 2

End of Certificate

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Safety Plan Co., Ltd.
บริษัท เซฟตี้ แพลน จำกัด
1034 หมู่ 3 ถนนรังสิต-ปทุมธานี ตำบลบางพูด อำเภอเมือง จังหวัดปทุมธานี 12000 โทรศัพท์ 0-2567-3549, โทรสาร 0-2567-3485
1034 Moo 3 Rangsit-Pathum Thani Rd., Tambol Bangpoon, Amphur Muang, Pathum Thani 12000 Tel. 0-2567-3549 Fax 0-2567-3485

# Calibration Sound Level Meter Certificate

**Date of Calibration** : February 9, 2022

**Condition of Calibration**

Temperature : (° c) 25 ± 2 Humidity : (%RH) 50 ± 10

Ambient Pressure : 758.8 mmHg

**Signal Level Adjustment**

Level Range : 60-120 dB Time Weighting : Slow

Frequency Weighting : C Acoustic Calibrator : 114.0 dB

**Reference Equipment**

Sound Level Calibrator Quest Technologies

Model : NC-73 Serial No. : 10848247

Reference No. : MTC No. EEL.BP. 38/0264 (TISTR)

Calibration Date : February 8, 2022

Integrating Sound Level Meter : PICCOLO

| Intergrating Sound Level Meter | Reading (dB) | Error (dB) | Adjustment |
|---|---|---|---|
| SLM (No.1) PICCOLO S/N P0220012705 | 113.9 | 0.1 | Adjusted +0.1 to 114.0 |
| SLM (No.2) PICCOLO S/N P0220012801 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |
| SLM (No.3) PICCOLO S/N P0220031802 | 113.9 | 0.1 | Adjusted +0.1 to 114.0 |
| SLM (No.4) PICCOLO S/N P0220031804 | 113.9 | -0.2 | Adjusted +0.1 to 114.0 |
| SLM (No.5) PICCOLO S/N P0220031803 | 113.9 | 0.1 | Adjusted +0.1 to 114.0 |
| SLM (No.6) PICCOLO S/N P0220012704 | 113.9 | -0.2 | Adjusted +0.1 to 114.0 |
| SLM (No.7) PICCOLO S/N P0220012703 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |
| SLM (No.8) PICCOLO S/N P0220031801 | 113.9 | 0.1 | Adjusted +0.1 to 114.0 |
| SLM (No.9) PICCOLO S/N P0220012802 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |
| SLM (No.10) PICCOLO S/N P0220031901 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |

**Calibrated By** : เชาวลิต อ่อนไส้

(Mr. Chawwalit Onswai )

**Approve By** :

(Mr.Narongsak Seripanitkarn)

MECHANICAL ENGINEERING
STANDARDS LABORATORY
Industrial Metrology and
Testing Service Centre
วว.TISTR
Thailand Institute of Scientific and Technological Research
Lab. No. 23-65/0051
Serial No. 011324
Cal. Date 16 Nov 21 By TT.
Due

วว.TISTR

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-65/0051

MTC.No.23-65/0051

Number of page(s) 2

# CALIBRATION CERTIFICATE

**Nomenclature : PRIMARY GAS FLOW CALIBRATOR**

Manufacturer : A.P. Buck Inc.

Serial No.: 011324

Model : -

Scale range : 1 ccm to 6000 ccm

Subdivision : (0.1, 1) ccm

**Submitted by : SAFETY PLAN CO.,LTD.**

1034 Moo3, Rangsit-Pathum Thani Rd., T.Bangpoon,

A.Muang, Pathum Thani 12000, Thailand.

**Received date :** 25 October 2021 **Condition of measured item :** Normal

**Calibration date :** 16 November 2021

**Standard :**

| Standard | Certificate No. | Date due | Traceability |
|---|---|---|---|
| RTD Thermometer | PSL-T 336/63 | 6-Apr-22 | TISTR |
| Molbox/PressureTransducer/UpStream | MP-0013-21 | 25-Jan-23 | NIMT |
| Primary Flow Calibrator S/N 117982 | MW-0011-21 | 8-Apr-23 | NIMT |
| Primary Flow Calibrator S/N 119521 | MW-0012-21 | 31-Mar-23 | NIMT |

**Calibrated by :** Terasak Panna

(Mr.Terasak Panna)

**Approved by :**

(Ms.Kirana Luanghirun)

**Director**

**Mechanical Engineering Standards Laboratory**

วว.TISTR

Ref. 2013264102504367001

Issued Date 16 November 2021

The results relate only to the items tested/calibrated or value assigned.
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Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

**Calibration point :** (50, 1500, 3000) ccm

**Ambient condition :** Temperature ( 23 ± 3 ) °C , Relative humidity ( 55 ± 15 ) %

Atmospheric pressure ( 1010±13) hPa

**Calibration method :** The flowmeter (UUC) was calibrated by comparison method with standard flowmeter according to CP-370.01.

The reported value is the value that converted to value at reference condition within pressure and temperature of the actual gas entering the UUC

**Measurement data :**

| UUC Value (ccm) | Standard Value (ccm) | Temperature (°C) | Pressure (hPa) | Deviation (%) | Uncertainty (%) |
|---|---|---|---|---|---|
| 50.18 | 51.126 | 22.462 | 1010.61 | +0.11 | 1.16 |
| 1511 | 1499.2 | 22.560 | 1010.52 | +0.81 | 0.89 |
| 3032 | 3054.2 | 22.727 | 1010.83 | -0.73 | 0.88 |

The reported expanded uncertainties are based on standard uncertainties multiplied by a coverage factor $k$=2, which provides a level of confidence of approximately 95%.

The end of calibration certificate.

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

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110/254 Moo 3, Tumbon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110
Tel. 098 362 9152, 089 478 7885
E-mail: sales@envi-ees.com



# CERTIFICATE OF CALIBRATION

| | | | |
|---|---|---|---|
| **Customer** | : | Safety Plan Co., Ltd. | |
| **Address** | : | 1034 Moo 3, Rang sit-Pathum Thani Rd., T. Bangpoon, A. Muang, Pathum Thani 12000 | |
| **Description of Equipment** | : | Console meter | |
| **Manufacturer** | : | Apex Instrument | |
| **Model Number** | : | MC-572VS | |
| **Serial Number** | : | 0506007 | |
| **ID./Control No.** | : | - | |
| **Environment Conditions** | : | Temperature | (25 ± 2) °C |
| | : | Humidity | (50 ± 15) % RH |
| **Cal. Date** | : | 26/10/2021 | |
| **Issue Date** | : | 26/10/2021 | |

**Calibration Method or Calibration Procedure Used**

US EPA Method (United State Environmental Protection Agency)

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

**Result of Calibration**

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Envi Equipment Service Co., Ltd. EES

Calibrated by : Mr. Sanya Sangnil

Approved by : _____

(Mr. Mana Fuekhud)
Technical Manger

# METHOD 5 CONSOLE CALIBRATION
# USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425
# 5-POINT METRIC UNIT

| Meter Console Information | |
|---|---|
| Console Model Number | MC-572VS |
| Console Serial Number | 0506007 |
| DGM Model Number | SK25EX |
| DGM Serial Number | 00003585 |

| Calibration Conditions | | | |
|---|---|---|---|
| Date | Time | 26/10/2021 | 12:00 PM |
| Calibration Reference No. | | Ser21-1041 | |
| Barometric Pressure | | 758.99 | mm Hg |
| Calibration Meter Gamma | | 0.999 | |

| Factors/Conversions | | |
|---|---|---|
| Std Temp | 293 | K |
| Std Press | 760 | mm Hg |
| $K_1$ | 0.386 | |
| Console Leak Check | | PASS |

**Calibration Data**

| Run Time | Metering Console | | | | | Calibration Meter | | | |
|---|---|---|---|---|---|---|---|---|---|
| Elapsed | DGM Orifice DH | Volume Initial | Volume Final | Outlet Temp Initial | Outlet Temp Final | Volume Initial | Volume Final | Outlet Temp Initial | Outlet Temp Final |
| (Q) | ($P_m$) | ($V_{mi}$) | ($V_{mf}$) | ($t_{mi}$) | ($t_{mf}$) | (Vwi) | (Vwf) | ($t_{wi}$) | ($t_{wf}$) |
| min | mm $H_2O$ | $m^3$ | $m^3$ | °C | °C | $m^3$ | $m^3$ | °C | °C |
| 12.05 | 13.0 | 475.8500 | 475.9900 | 28 | 28 | 43.98354 | 44.12502 | 28 | 28 |
| 12.08 | 13.0 | 475.9900 | 476.1300 | 27 | 27 | 44.12502 | 44.26632 | 26 | 26 |
| 8.48 | 26.0 | 476.1410 | 476.2810 | 27 | 27 | 44.27666 | 44.41942 | 26 | 26 |
| 8.48 | 26.0 | 476.2810 | 476.4210 | 27 | 27 | 44.41942 | 44.56226 | 25 | 25 |
| 13.90 | 40.0 | 476.4300 | 476.7100 | 27 | 27 | 44.58342 | 44.86648 | 25 | 25 |
| 13.92 | 40.0 | 476.7100 | 476.9900 | 27 | 27 | 44.86648 | 45.15028 | 25 | 25 |
| 10.42 | 70.0 | 476.9990 | 477.2790 | 26 | 26 | 45.16234 | 45.44374 | 25 | 25 |
| 10.43 | 70.0 | 477.2790 | 477.5590 | 26 | 26 | 45.44374 | 45.72500 | 25 | 25 |
| 9.10 | 90.0 | 477.5670 | 477.8470 | 26 | 26 | 45.74624 | 46.02905 | 25 | 25 |
| 9.10 | 90.0 | 477.8470 | 478.1270 | 26 | 26 | 46.02905 | 46.31078 | 25 | 25 |

Envi Equipment Service Co., Ltd. EES

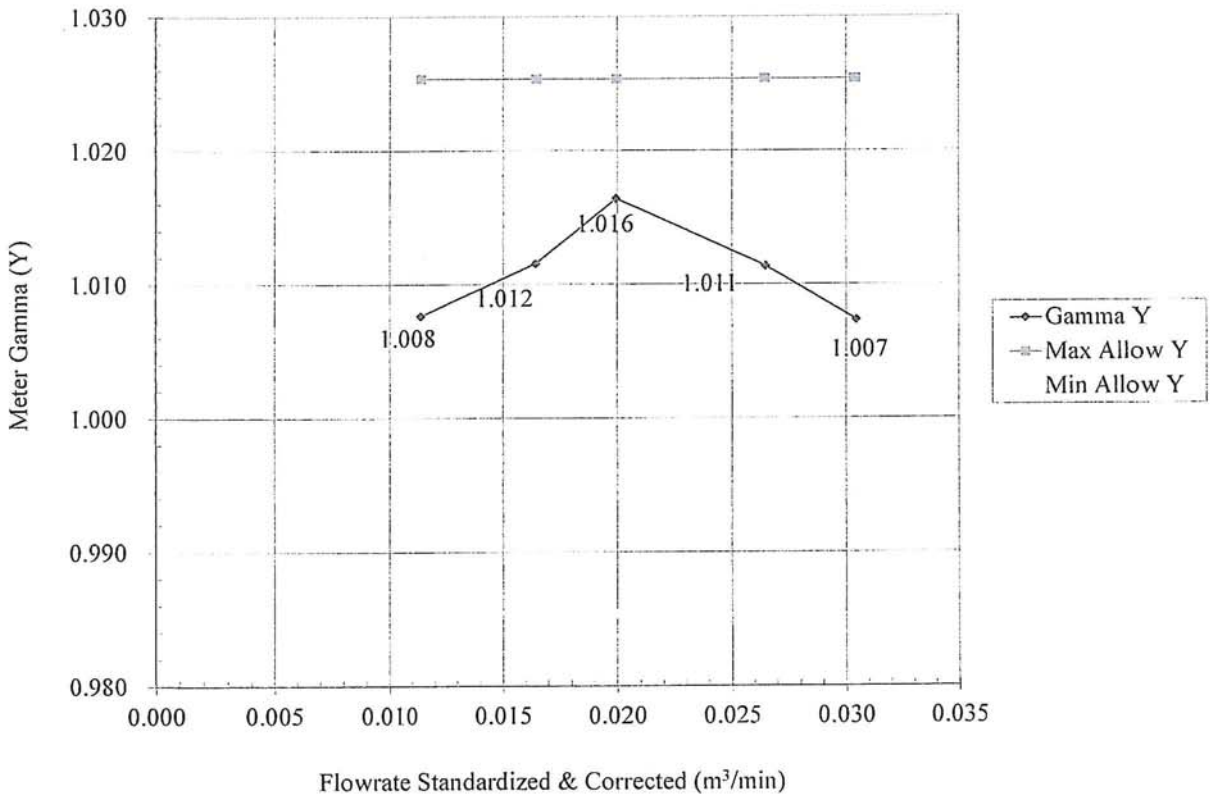
# METHOD 5 CONSOLE CALIBRATION
# USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425
# 5-POINT METRIC UNIT

| Calibration Data | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Results | | | | | | | | |
| Standardized Data | | | | Dry Gas Meter | | | | |
| | | | | Calibration Factor | | Flowrate | | |
| Dry Gas Meter | | Calibration Meter | | Value | Variation | Std & Corr | .0212 $m^3_{std}$/min | Variation |
| ($V_{m(std)}$) | ($Q_{m(std)}$) | ($V_{W(std)}$) | ($Q_{W(std)}$) | (Y) | ($\triangle$Y) | ($Q_{m(std)(corr)}$) | ($\triangle H_@$) | ($\triangle H_@$) |
| $m^3$ | $m^3$/min | $m^3$ | $m^3$/min | | | $m^3$/min | mm $H_2O$ | |
| 0.136 | 0.011 | 0.137 | 0.011 | 1.008 | 0.003 | 0.011 | 43.940 | -0.014 |
| 0.137 | 0.011 | 0.138 | 0.011 | 1.007 | 0.002 | 0.011 | 44.001 | 0.048 |
| 0.137 | 0.016 | 0.140 | 0.016 | 1.016 | 0.011 | 0.016 | 42.601 | -1.352 |
| 0.138 | 0.016 | 0.140 | 0.017 | 1.017 | 0.011 | 0.017 | 42.411 | -1.543 |
| 0.276 | 0.020 | 0.278 | 0.020 | 1.006 | 0.001 | 0.020 | 44.728 | 0.774 |
| 0.276 | 0.020 | 0.278 | 0.020 | 1.009 | 0.003 | 0.020 | 44.602 | 0.648 |
| 0.277 | 0.027 | 0.276 | 0.026 | 0.997 | -0.008 | 0.026 | 44.737 | 0.783 |
| 0.277 | 0.027 | 0.276 | 0.026 | 0.997 | -0.009 | 0.026 | 44.925 | 0.971 |
| 0.277 | 0.030 | 0.277 | 0.030 | 1.000 | -0.005 | 0.030 | 43.628 | -0.326 |
| 0.277 | 0.030 | 0.276 | 0.030 | 0.996 | -0.009 | 0.030 | 43.963 | 0.009 |
| | | | | 1.005 | Y Average | | 43.953 | $\triangle H@$ Average |

**Note:** For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.
For $\triangle H_@$, orifice pressure differential that equates to 0.75 cfm (0.0212 $m^3$/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2 inches (5.1mm) $H_2O$.

Calibration Date: 26-10-2021 Calibration Reference No: SER21-1041

**Meter Gamma vs Flowrate**

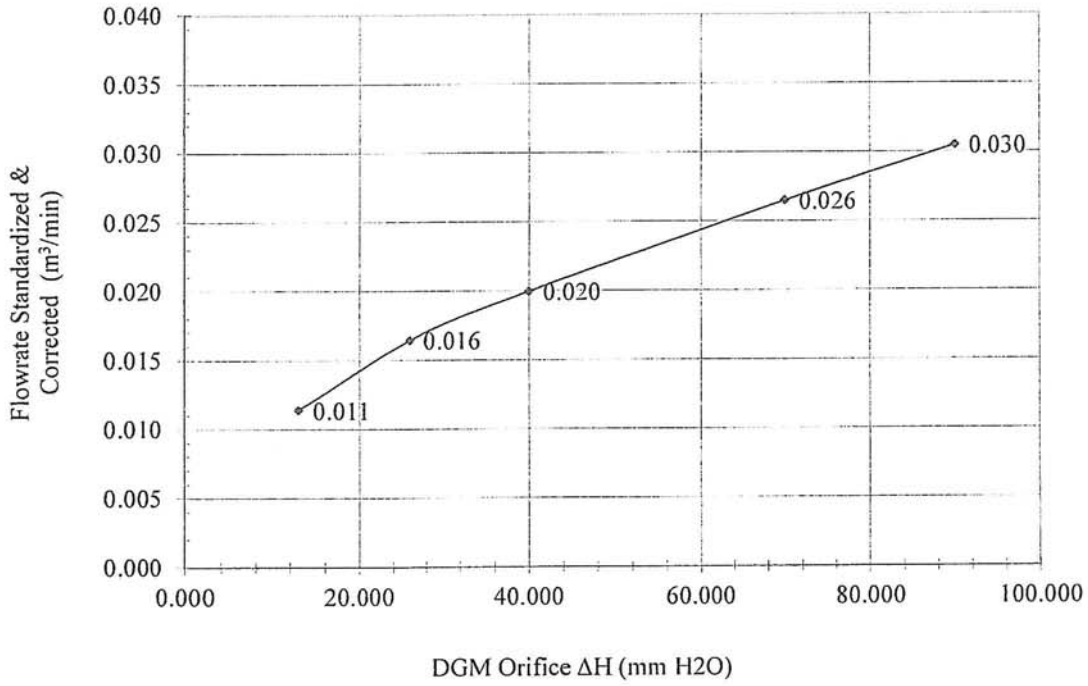



Console Serial: 0506007 Console Model: MC-572VS

Calibration Date: 26-10-2021

Calibration Reference No: SER21-1041

**Meter Pressure vs Flowrate**




Console Serial: 0506007

Console Model: MC-572VS

Envi Equipment Service Co., Ltd.
EES

# THERMOCOUPLES SYSTEM CALIBRATION

| Sampling System Equipment Information | |
|---|---|
| Console Model Number | MC-572VS |
| Console Serial Number | 0506007 |
| DGM Model Number | SK25EX |
| DGM Serial Number | 00003585 |
| Meter Box Model Number | JENCO 765 KF |
| Meter Box Serial Number | |

| Calibration Conditions | | | |
|---|---|---|---|
| Date | Time | 26/10/2564 | 02:20 PM |
| Calibration Reference No. | | SER21-1041 | |
| Reference Thermometer | | DIGICON | |
| Serial Number | | 183169105 | |
| | | | |
| | | | |

**Results**

| Channel and test point | Console Thermocouple Simulator: Meter Box Channel Temperature Reading ( °C ) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | -18.0 | 25.0 | 38.0 | 93.0 | 149.0 | 260.0 | 371.0 | 482.0 | 593.0 | 816.0 | 1038.0 |
| Stack | -18.0 | 23.0 | 36.0 | 92.0 | 148.0 | 258.0 | 370.0 | 481.0 | 592.0 | 815.0 | 1037.0 |
| Aux | -18.0 | 23.0 | 36.0 | 92.0 | 148.0 | | | | | | |
| Probe | -18.0 | 23.0 | 36.0 | 92.0 | 148.0 | | | | | | |
| Filter | -18.0 | 23.0 | 36.0 | 92.0 | 148.0 | | | | | | |
| Oven | - | - | - | - | - | | | | | | |
| Exit | -18.0 | 23.0 | 36.0 | | | | | | | | |

**Tolerance Range**

| | | | | | |
|---|---|---|---|---|---|
| Stack | ± 1.50% | Absolute | Meter | ± 3.0 °C |
| Probe | ± 3.0 °C | | Exit | ± 2.0 °C |
| Filter | ± 3.0 °C | | | |

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Tel. 098 362 9152, 089 478 7885
E-mail: sales@envi-ees.com



# CERTIFICATE OF CALIBRATION

| | | | |
|---|---|---|---|
| **Customer** | : | Safety Plan Co.,Ltd. | |
| **Address** | : | 1034 Moo 3, Rang sit-Pathum Thani Rd., T. Bangpoon, A. Muang, Pathum Thani 12000 | |
| **Description of Equipment** | : | Nozzle | |
| **Manufacturer** | : | Apex Instrument | |
| **Model Number** | : | **NS SET** | |
| **Serial Number** | : | - | |
| **ID./Control No.** | : | - | |
| **Environment Conditions** | : | Temperature | (25 ± 2) °C |
| | : | Humidity | (50 ± 15) % RH |
| **Cal. Date** | : | 26/10/2021 | |
| **Issue Date** | : | 26/10/2021 | |

**Calibration Method or Calibration Procedure Used**

US EPA Method (United State Environmental Protection Agency)

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

**Result of Calibration**

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These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Envi Equipment Service Co., Ltd. EES

Calibrated by : Mr. Sanya Sangnil

Approved by : _____
(Mr. Mana Fuekhud)
Technical Manger

# CALIBRATION RESULTS

**Sampling System Equipment Information**

Nozzle Model : NS SET
Nozzle Number : -
Nozzle Type : Stainless Steel

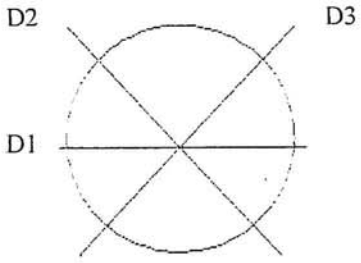
**Calibration Condition**

Date : 26 October 2021
Barometric Pressure : 758.99 mm Hg
Calibration Device : Vernier, 0-150 mm
Method Reference : US. EPA Method

| Nozzle ID | Nozzle Diameter | | | | Different | (D1 + D2 + D3) / 3 |
|---|---|---|---|---|---|---|
| Size | mm | D1 | D2 | D3 | △D | Davg |
| | | mm | mm | mm | mm | mm |
| NS-4 | 3.18 | 3.08 | 3.06 | 3.05 | 0.015 | 3.063 |
| NS-6 | 4.76 | 4.72 | 4.70 | 4.69 | 0.015 | 4.703 |
| NS-8 | 6.35 | 6.41 | 6.41 | 6.44 | 0.017 | 6.420 |
| NS-16 | 12.70 | 12.00 | 12.00 | 12.14 | 0.081 | **12.047** |
| | | | | | | |

**Remark:**

D1, D2, D3 = There difference nozzle diameters, mm; diameter must be within 0.025 mm
△D = Maximum difference between any two diameters, must be ≤ 0.100 mm
Davg = $(D_1 + D_2 + D_3) / 3$



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Envi Equipment Service Co., Ltd.
110/254 Moo 3, Tumbon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110
Tel. 098 362 9152, 089 478 7885
E-mail: sales@envi-ees.com



# CERTIFICATE OF CALIBRATION

| | | |
|---|---|---|
| **Customer** | : | Safety Plan Co.,Ltd. |
| **Address** | : | 1034 Moo 3, Rang sit-Pathum Thani Rd., T. Bangpoon, A. Muang, Pathum Thani 12000 |
| **Description of Equipment** | : | Standard Probe Method 5 |
| **Manufacturer** | : | Apex Instrument |
| **Model Number** | : | PS-6HV |
| **Serial Number** | : | 1911338 |
| **ID./Control No.** | : | - |
| **Environment Conditions** | : | Temperature (25 ± 2) °C |
| | : | Humidity (50 ± 15) % RH |
| **Cal. Date** | : | 26/10/2021 |
| **Issue Date** | : | 26/10/2021 |

**Calibration Method or Calibration Procedure Used**

US EPA Method (United State Environmental Protection Agency)

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

**Result of Calibration**

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Envi Equipment Service Co., Ltd. EES

Calibrated by : Mr. Sanya Sangnil

Approved by : _____
(Mr. Mana Fuekhud)
Technical Manger

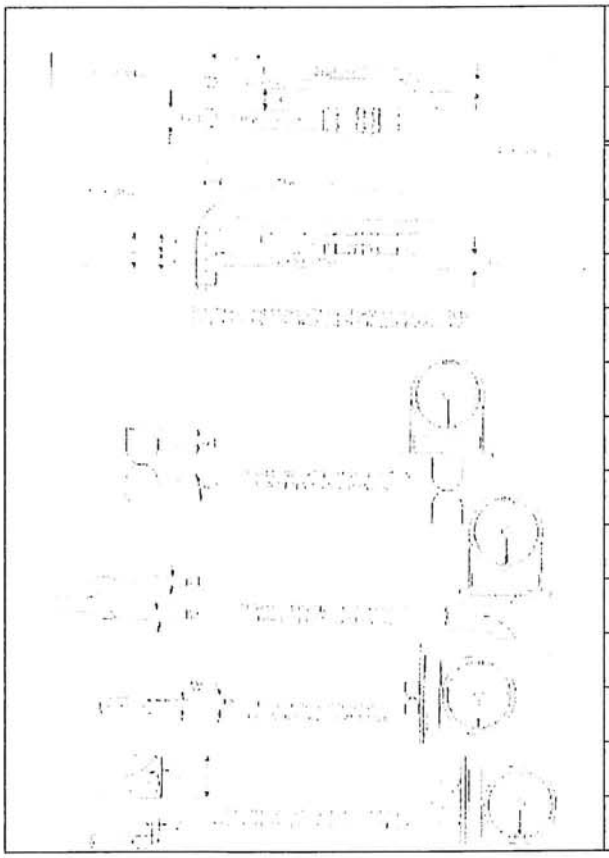
# CALIBRATION RESULTS
## S-Type Geometric Pitot Tube Calibration

**Sampling System Equipment Information**

| | | |
|---|---|---|
| Probe Model | : | PS-6HV |
| Probe Number | : | 1911338 |
| Pitot Number | : | - |
| Pitot Tube Type | : | S-type |

**Calibration Condition**

| | | |
|---|---|---|
| Date | : | 26 October 2021 |
| Barometric Pressure | : | 758.99 mm Hg |
| Digital Caliper | : | CD-6" ASX |
| Serial number | : | A18008059 |



**Pitot tube/Probe: # PS-6HV**

| Parameter | Value | Allowable Range | Check |
|---|---|---|---|
| Assembly level? | Yes | Yes | Pass |
| Ports Damage? | No | No | Pass |
| œ1 | 0 | -10 ° < œ1 < +10 ° | Pass |
| œ2 | 1 | -10 ° < œ2 < +10 ° | Pass |
| ß1 | 0 | -5 ° < ß1 < +5 ° | Pass |
| ß2 | 0 | -5 ° < ß2 < +5 ° | Pass |
| y | *0* | N/A | - |
| ø | 0 | N/A | - |
| Dt | 0.375 | .188 " to .375 " | Pass |
| A | 0.921 | $2.1Dt \leq A \leq 3Dt$ | Pass |
| A/2Dt | 1.228 | $1.05 \leq P_A/D_t \leq 1.5$ | Pass |
| Z = A tan y | 0.047 | Z ≤ .125" | Pass |
| W = A tan ø | 0.015 | W ≤ .031" | Pass |

**Remark:**
I certified that pitot tube /probe number/Model: PS-6HV :1911338 meets or exceeds all specifications, criteria and/or applicable design and is hereby assigned a pitot tube certification factor of **0.84**. See 40 CFR Pt. 60, App. A, EPA Method 2.

Envi Equipment Service Co., Ltd. EES

# THERMOCOUPLES SYSTEM CALIBRATION

| Sampling System Equipment Information | |
|---|---|
| **Probe Model Number** | PS-6HV |
| **Probe Serial Number** | 1911338 |
| **Meter Box Model Number** | JENCO 765 KF |
| **Meter Box Serial Number** | - |

| Calibration Conditions | | | |
|---|---|---|---|
| **Date** | **Time** | 26/10/2021 | 04:30 PM |
| **Calibration Reference No.** | | SER21-1043 | |
| **Reference Thermometer** | | DIGICON | |
| **Serial Number** | | 183169105 | |

| Thermocouple of Standard Probe method 5 = length 6 foot | | | |
|---|---|---|---|
| **Set Point** | **Reference Thermocouple** | **Probe Thermocouple** | **Difference** |
| **100** | 100.0 | 99.0 | 0.27 |
| **250** | 250.0 | 248.0 | 0.38 |
| **300** | 300.0 | 297.0 | 0.52 |
| **350** | 350.0 | 348.0 | 0.32 |

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

**Cert. No.:** 21TM1547


# Certificate of Calibration

| | |
|---|---|
| **Equipment :** | pH Meter with Sensor |
| **Manufacturer :** | Eutech |
| **Model :** | pH 700 |
| **Serial No. :** | 2858459 |
| **ID No. :** | LB-Eq-027 |
| **Submitted by :** | Special Lab Envi And Consultant Co.,Ltd.<br>47/91-93 Moo 3 Thambon Tha-it,<br>Pakkret,<br>Nonthaburi 11120 |
| **Location :** | TPA Chemistry Calibration Laboratory |
| **Received Order :** | 23 August 2021 |
| **Calibrated Date :** | 27 August 2021 |
| **Ambient Temperature :** | ( 26 ± 10 ) °C |
| **Relative Humidity :** | ( 50 ± 30 ) % |
| **AC Line Voltage :** | ( 220 ± 22 ) V |
| **Calibrated by :** | Kunchit Promprat |

**Approved by :** Malu

Approved Signatory

( / ) Pornthippa Tameyakul
(✓) Malee Butkruea
( ) Suwit Imjai

**Issue Date :** 31 August 2021

**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 head of Corporate Services 3 : Equipment Calibration and Testing Services.

**Equipment :** pH Meter with Sensor
**Condition As-Received :** Used Item
**Reference :** 2108-0663WN-2



**Procedure Used :-**

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer ( IPRT ) into Temperature Bath.

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|---|---|---|---|---|
| 1) Digital Thermometer | 1523 | 2188080 | 20I1389 | 20 Nov 2021 |

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

**Result of Calibration :-** ( * ) Without Adjustment

**Function :** Temperature measurement.

This instrument was connected with temperature sensor, ID No.: SL-33/1

| Calibration Point ( °C ) | Immersion Depth ( mm ) | Standard Temperature ( °C ) | UUC* Reading ( °C ) | Error ( °C ) | Uncertainty ( ±°C ) | Coverage Factor *k* |
|---|---|---|---|---|---|---|
| 25.0 | 100 | 25.0 | 25.000 | 0.000 | 0.16 | 2.00 |

**UUC*** : Unit Under Calibration

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

-o0o-

Malu.

**BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.**
**CALIBRATION LABORATORY**
300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2350-1
E-mail: bkk@becthai.com Website: www.becthai.com

NSC-TISI-TIS 17025
CALIBRATION 0131

Certificate No. : CAL-21-517



# CERTIFICATE OF CALIBRATION

| | | |
|---|---|---|
| Equipment | : | Spectrophotometer |
| Manufacturer | : | Merk |
| Model | : | Prove 100 |
| Serial No. | : | 1809112938 |
| ID No. | : | N/A |
| Customer | : | Special Lab Envi And Consultant Co., Ltd. |
| | : | 47/91 Moo 3, Tambol Tait , |
| | : | Amphur Pakrad, Nonthaburi, 11120. |
| Location | : | Becthai Laboratory |
| Date of Receipt | : | 21 August 2021 |
| Date of Calibration | : | 21 August 2021 |
| Date of Issue | : | 21 August 2021 |
| Ambient Temperature | : | (25±10) °C |
| Relative Humidity | : | (60±20) % |
| Condition As-Received | : | Used Item |

Calibrated by

Kittikorn Boonprapai

( Mr. Kittikorn Boonprapai )

Calibration Engineer

Approved by

( Ms. Jintana Sangthaijaroenlap )

Calibration Manager

The reported expended uncertainty of measurement was based on a combined standard uncertainty multiplied by a coverage factor k=2.00, providing a level of confidence of appoximately 95%.

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Indicated values are valid for the state of the Spectrophotometer at the time of calibration only.

BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
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CALIBRATION 0131



# CALIBRATION REPORT

## Conditions of this result of calibration

1. Reference Standard Material :

| Material | Model | Serial No. | Cert.No. | Due date |
|---|---|---|---|---|
| Holmium Glass Filter | RM-HG | 24563 | 90313 | 2 Mar 23 |
| Neutral Density Filter | RM-1N2N3N | 24568 | 90324 | 3 Mar 23 |

2. Traceability : This certification is traceable to the International System of Unit maintained at;

The Starna Scientific Ltd. Accredited Calibration Laboratory No. 0659.

3. Method of calibration :

The calibration procedure was carried out according to the Guide to CPM-CAL-02 based on ASTM E275-08 (2013) and-
ASTM E925-09 (2014).

4. Result of calibration :

( ✓ ) without adjustment ( ) after adjustment

5. Equipment Specifications:

| | | |
|---|---|---|
| Spectral Bandwidth : | 4 | nm |
| Data Interval : | 0.1 | nm |
| Scan Speed : | N/A | nm/min |

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NSC-TISI-TIS 17025
CALIBRATION 0131

Certificate No. : CAL-21-517



# CALIBRATION REPORT

Wavelength Calibration

| Certified Values of Reference Material (nm) | Nominal Value (nm) | UUC*Reading (nm) | Error (nm) | Uncertainty of Measurement (± nm) |
|---|---|---|---|---|
| 418.48 | 418.48 | 418.4 | -0.08 | 0.13 |
| 536.90 | 536.90 | 534.3 | -2.60 | 0.27 |
| 637.94 | 637.94 | 636.1 | -1.84 | 0.17 |

Photometric Calibration for Visible

| Wavelength (nm) | Certified Values of Reference Material (A) | UUC* Reading (A) | Error (A) | Uncertainty of Measurement (± A) |
|---|---|---|---|---|
| 420.0 | Zero | 0.000 | 0.0000 | 0.0028 |
| | 0.5824 | 0.580 | -0.0024 | 0.0044 |
| | 0.7266 | 0.721 | -0.0056 | 0.0041 |
| | 1.0377 | 1.029 | -0.0087 | 0.0040 |
| 440.0 | Zero | 0.000 | 0.0000 | 0.0028 |
| | 0.5659 | 0.559 | -0.0069 | 0.0043 |
| | 0.7126 | 0.710 | -0.0026 | 0.0038 |
| | 1.0172 | 1.013 | -0.0042 | 0.0038 |
| 465.0 | Zero | 0.000 | 0.0000 | 0.0028 |
| | 0.5256 | 0.522 | -0.0036 | 0.0044 |
| | 0.6705 | 0.673 | 0.0025 | 0.0036 |
| | 0.9562 | 0.958 | 0.0018 | 0.0035 |
| 546.1 (546.0) | Zero | 0.000 | 0.0000 | 0.0028 |
| | 0.5236 | 0.520 | -0.0036 | 0.0036 |
| | 0.6962 | 0.695 | -0.0012 | 0.0031 |
| | 0.9933 | 0.991 | -0.0023 | 0.0033 |
| 590.0 | Zero | 0.000 | 0.0000 | 0.0028 |
| | 0.5578 | 0.557 | -0.0008 | 0.0036 |
| | 0.7523 | 0.752 | -0.0003 | 0.0032 |
| | 1.0747 | 1.072 | -0.0027 | 0.0033 |
| 635.0 | Zero | 0.000 | 0.0000 | 0.0028 |
| | 0.5655 | 0.565 | -0.0005 | 0.0036 |
| | 0.7321 | 0.731 | -0.0011 | 0.0032 |
| | 1.0454 | 1.043 | -0.0024 | 0.0031 |

Remark : Each individual filter is measured against the empty filter holder (blank) used to zero the Spectrophotometer.

Note:

UUC* : Unit Under Calibration

- End of Report -

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



# Certificate of Testing

| | |
|---|---|
| **Equipment :** | Dissolved Oxygen Meter |
| **Manufacturer :** | AMTAST |
| **Model :** | DO900 |
| **Serial No. :** | DO900X19081008 |
| **ID No. :** | - |
| **Received Date :** | 18 December 2020 |
| **Test Date :** | 22 December 2020 |
| **Reference :** | 2012-0586DN-1 |
| **Submitted by :** | Safety Plan Co.,Ltd.<br>1034 Moo 3, Rangsit-Pathumthani Road,<br>T.Bangpoon, A.Muang, Pathumthani 12000 |
| **Laboratory Condition :** | Temperature ( 25 ± 5 ) °C<br>Humidity (50 ± 20) % |
| **Test Procedure :** | In - house method : CP-CH9<br>by Comparison Technique with Azide Modification Method |
| **Calibrated by :** | Walalak Sirithean |
| **Approved by :** | Approved Signatory |

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

**Issue Date :** 28 December 2020

Result : **Dissolved Oxygen Meter Adjustment With Air 100 %**

**Dissolved Oxygen Probe No.:** PONPE5805769

| **Titration Method (Azide Modification Method)** (mg/L) | **Dissolved Oxygen Meter Reading** (mg/L) | **Standard Deviation** (mg/L) |
|---|---|---|
| 8.10 | 8.01 | 0.017 |

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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PerkinElmer®
*For the Better*

# PinAAcle 900F
# Preventive Maintenance Report

Company Name: SPECIAL LAB ENVI & CONSULTANT

Instrument Location: PAKKRET NONTHABURI 11120

Instrument Serial No.: PFBS17082303

Date: 03-Sep-2021

# *PinAAcle 900F Preventive Maintenance (PM)*

| | | | |
|---|---|---|---|
| **Company Name:** | SPECIAL LAB ENVI & CONSULTANT | | |
| **Address (Instrument Location):** | PAKKRET NONTHABURI 11120 | | |
| **Serial Number:** | PFBS17082303 | **PM Number:** | 1 of 1 |
| **Customer Name** (if applicable): | K. Fhatiha | **Telephone Number:** | (092) 283-9054 |
| **Customer Support Engineer Name:** | K. Weerayoot keadpon | **Service Order Number:** | WO-00925451 |
| **Date PM Performed:** (DD-MMM-YYYY) | 03-Sep-2021 | **Next PM Due Date:** (DD-MMM-YYYY) | 03-Sep-2022 |
| **Standard Labor Hours to Complete PM :** | | **5 hours** | |

| Part Number | Release | Publication Date | |
|---|---|---|---|
| 09370145 Rev.9 | A | January 2018 | PerkinElmer® |

**Scope**

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

**General Instructions**:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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## Component List

| Component / Specific Model | Serial # | Configuration Notes |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

## Parts Lists

| Parts Included with the PM | | |
|---|---|---|
| **Part Number (if applicable)** | **Description** | **Quantity** |
| B0501696 | Fan Filters | 1 |
| N3160156 | O-Ring Kits for Sampling Introduction ( Stainless Steels Nebulizer) | N/A |
| N3160157 | O-Ring Kits for Sampling Introduction ( Plastic Nebulizer) | 2 |
| N9301714 | Replacement Acetylene Filter Cartridge | 1 |
| TH001022 | Replacement Air Filter Cartridge | 2 |

| Additional Reagents and Standards Required for PM | | | | |
|---|---|---|---|---|
| **Part Number (if applicable)** | **Description** | **Quality** | **Batch/Lot #** | **Expired Date** (MM/YY) |
| N9300183 | 1000 mg/L Copper Standard | AR | 25-20CUY1 | 30-Jan-2022 |

| Additional Reagents and Standards Required for PM (Customer Support Solution) | | | | |
|---|---|---|---|---|
| **Part Number (if applicable)** | **Description** | **Quantity** | **Batch/Lot #** | **Expiration Date** (MM/YY) |
| N/A | DI Water | 250 ml. | AR | AR |
| N/A | 0.5% $HNO_3$ | 250 ml. | AR | AR |

| Additional Tools Required for PM | | | |
|---|---|---|---|
| **Part Number (if applicable)** | **Description** | **Quantity** | **Serial #** |
| N1013000 | 0.2A Neutral density filter | 1 | 5503530856 |
| N1013002 | 1.0A Neutral density filter | 1 | 5503555491 |
| 03030997 | System 2 EDL Driver | 1 | 03030997 |
| N3050605 | As System 2 EDL | 1 | 16148 |
| N3050121 | Cu Lumina HCL | 1 | 021913-020070 |
| N3050109 | Ba Lumina HCL | 1 | 102416-040160 |
| N3050139 | K Lumina HCL | 1 | 110716-010060 |
| N3050152 | Ni Lumina HCL | 1 | 100516-030190 |

# Procedure Checklist

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

1. **General:**
   - ☑ Review the instrument performance with the customer and document any recent problems.
   - ☑ Inspect the customer log book and make any appropriate PM entries.
   - ☑ Perform general inspection of system for cleanliness.

2. **PC Instrument Software:**
   - ☑ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. **Mechanical:**
   - ☑ Inspect and clean all fans and filters. Replace filters if necessary
   - ☑ Inspect all gas lines for leaks and/or wear. Replace if needed.
   - ☑ Clean exterior of the instrument.
   - ☑ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
   - ☑ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
   - ☑ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
   - ☑ Check the drain system for signs of wear. Replace worn or damaged parts.
   - ☑ Visually check for proper flame conditions when igniting the Air-C2H2 and N20-C2H2 flames (if applicable).

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

5. **Optics:**
   - ☑ Inspect and clean the sample compartment windows, if needed.
   - ☑ Inspect optics. Clean or replace if necessary,

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

**7. Flame Interlock Check:**

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

| Parameter | Specification | Test Results | Pass/Fail |
|---|---|---|---|
| Flame Sensor | Air/$C_2H_2$ Flame correctly shuts down | Active | Passed |
| Drain Sensor | Air/$C_2H_2$ Flame correctly shuts down | Active | Passed |
| Nebulizer Sensor | Air/$C_2H_2$ Flame correctly shuts down | Active | Passed |
| $C_2H_2$ Pressure Sensor | Air/$C_2H_2$ Flame correctly shuts down | Active | Passed |
| Air Pressure Sensor | Air/$C_2H_2$ Flame correctly shuts down | Active | Passed |
| Burner Head Sensor | Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down | Active | Passed |

**8. After PM Performance tests:**

*8.1 Detector Linearity with Barium*

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

| Parameter | Specification | Certificate Value at 553.6 nm (Abs.) | Test Results | Pass/Fail |
|---|---|---|---|---|
| 1.0 A ND Filter | ± 5% from Cert. | 0.9798 | 0.9766 | Passed |
| 0.2 A ND Filter | ± 5% from Cert. | 0.2042 | 0.1989 | Passed |

*8.2 Baseline Noise at 1.0 Absorbance with Barium*

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

| Parameter | Specification | Results | Pass/Fail |
|---|---|---|---|
| Standard Deviation | ≤ 0.010 | 0.0015 | Passed |

*8.3 AA Baseline Noise with Copper*

Description: Check baseline noise.

| Parameter | Specification | Results | Pass/Fail |
|---|---|---|---|
| Standard Deviation | ≤ 0.001 | 0.0002 | Passed |

*8.4 $D_2$ Background Compensation with Copper*

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

| Parameter | Specification | Results | Pass/Fail |
|---|---|---|---|
| Standard Deviation | ≤ 0.010 | 0.0079 | Passed |

*8.5 AA-BG Baseline Noise with Copper*

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

| Parameter | Specification | Results | Pass/Fail |
|---|---|---|---|
| Standard Deviation | ≤ 0.005 | 0.0004 | Passed |

*8.6 AA-BG Baseline Noise with Arsenic*

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

| Parameter | Specification | Results | Pass/Fail |
|---|---|---|---|
| Standard Deviation | ≤ 0.005 | 0.0011 | Passed |

*8.7 Flame Sensitivity*

Description: Instrument Sensitivity checked against Copper standard.

| Standard Copper Sensitivity | Specification | Results (Abs.) | Pass/Fail |
|---|---|---|---|
| 5 mg/L Sensitivity SS Neb (if applicable) | > 0.250 Abs. | NA | Not Applicable |
| 2 mg/L Sensitivity HS Neb (if applicable) | > 0.250 Abs. | 0.3221 | Passed |

**10. Review:**

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

## Additional Comments

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

## Review

| | |
| --- | --- |
| ***The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.***<br><br>***This PinAAcle 900F Passes ☑ Fails ☐ the preventive maintenance.*** | |
| **Review of Preventive Maintenance:** | |
| Authorized PerkinElmer Representative: Margaret | Date: 03-Sep-2021 (DD-MMM-YYYY) |
| Authorized Customer Representative: | Date: (DD-MMM-YYYY) |

ELECTRICAL AND ELECTRONIC STANDARDS LABORATORY
Industrial Metrology and Testing Service Centre
NSC-TISI-TIS 17025 CALIBRATION 0037
วว.TISTR
Thailand Institute of Scientific and Technological Research
Lab. No. EEL. BP. 120/0165
Serial No. 10848247
Cal. Date 8 Feb. 2022 By
Due

วว.TISTR

NSC-TISI-TIS 17025
CALIBRATION 0037

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

**Request No.** 21-65/0279 **MTC No.** EEL. BP. 120/0165

# CALIBRATION CERTIFICATE

**Submitted by** : SAFETY PLAN CO., LTD.

**Address** : 1034 Moo 3 Rangsit-pathumthani Rd., Tambol Bangpoon, Amphur Maung Pathumthani 12000.

**Calibrated at** : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

**Instrument Calibrated :**

Description : Sound Level Calibrator

Manufacturer : Rion

Model : NC-73

Serial No. : 10848247

**Ambient Environment**

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 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** : 28 Jan. 2022

**Date of Calibration** : 8 Feb. 2022



The results relate only to the items tested/calibrated or value assigned.
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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

**Request No.** 21-65/0279 **MTC No.** EEL. BP. 120/0165

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 20μPa at 1000 Hz**

**Acoustic Output in dB re 20μPa, 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 | 94.26 | 0.26 | ± 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 | 998.7 | -1.3 | ± 1.5 | ±2.0% |

**3. Total Distortion**

| Standard Microphone Type | Measured Total Distortion (%) | Uncertainty (%) | Tolerance limit IEC60942:2003 Class 2 |
|---|---|---|---|
| 1/2 inch Bruel&Kjaer 4180 | 1.95 | ± 0.50 | ±4.0% |

**Note :** 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

**Calibrated by :**

.....

(Mr.Tawikiat Iamsamran)

**Approved by :**

.....

(Mr.Prawate Kluaypa)

**Director**

**Electrical and Electronic Standards Laboratory**

**Industrial Metrology and Testing Service Centre**

**Date of Calibration** : 8 Feb. 2022

**Date of Issue** : 9 Feb. 2022

**Ref** : 20112650128003890002 2 / 2

End of Certificate

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Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

Safety Plan Co., Ltd.
บริษัท เซฟตี้ แพลน จำกัด
1034 หมู่ 3 ถนนรังสิต-ปทุมธานี ตำบลบางพูด อำเภอเมือง จังหวัดปทุมธานี 12000 โทรศัพท์ 0-2567-3549, โทรสาร 0-2567-3485
1034 Moo 3 Rangsit-Pathum Thani Rd., Tambol Bangpoon, Amphur Muang, Pathum Thani 12000 Tel. 0-2567-3549 Fax 0-2567-3485

# Calibration Sound Level Meter Certificate

**Date of Calibration** : February 9, 2022

**Condition of Calibration**

| | | | | | |
|---|---|---|---|---|---|
| Temperature | : | (° c) 25 ± 2 | Humidity | : | (%RH) 50 ± 10 |
| Ambient Pressure | : | 758.8 mmHg | | | |

**Signal Level Adjustment**

| | | | | | |
|---|---|---|---|---|---|
| Level Range | : | 60-120 dB | Time Weighting | : | Slow |
| Frequency Weighting | : | C | Acoustic Calibrator | : | 114.0 dB |

**Reference Equipment**

Sound Level Calibrator Quest Technologies

| | | | | | |
|---|---|---|---|---|---|
| Model | : | NC-73 | Serial No. | : | 10848247 |
| Reference No. | : | MTC No. EEL.BP. 38/0264 (TISTR) | | | |
| Calibration Date | : | February 8, 2022 | | | |
| Integrating Sound Level Meter | : | ACO TYPE 6226 | | | |

| Intergrating Sound Level Meter | Reading (dB) | Error (dB) | Adjustment |
|---|---|---|---|
| SLM (S1) ACO S/N 140075 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |
| SLM (S2) ACO S/N 120077 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |
| SLM (S3) ACO S/N 140072 | 113.9 | 0.1 | Adjusted +0.1 to 114.0 |
| SLM (S4) ACO S/N 120078 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |
| SLM (S5) ACO S/N 140073 | 113.9 | -0.2 | Adjusted +0.1 to 114.0 |
| SLM (S6) ACO S/N 120080 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |
| SLM (S7) ACO S/N 140074 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |
| SLM (S8) ACO S/N 120079 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |
| SLM (S9) ACO S/N 060176 | 113.9 | 0.1 | Adjusted +0.1 to 114.0 |
| SLM (S10) ACO S/N 060177 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |
| SLM (S11) ACO S/N 090053 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |
| SLM (S12) ACO S/N 75938 | 113.9 | 0.1 | Adjusted +0.1 to 114.0 |
| SLM (S13) ACO S/N 75936 | 113.9 | -0.1 | Adjusted +0.1 to 114.0 |
| SLM (S14) ACO S/N 75937 | 113.9 | -0.2 | Adjusted +0.1 to 114.0 |

**Calibrated By** : เชาวลิต อ่อนไสว

(Mr. Chawwalit Onswai )

**Approve By** :

(Mr.Narongsak Seripanitkarn)

บริษัท เอ็นไวร์ เซอร์วิส จำกัด
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# High Volume Sampler Calibration

## CONDITIONS

| | | | | | |
|---|---|---|---|---|---|
| Barometric Pressure (mm Hg) | : | 752.80 | Corrected Pressure (mm Hg) | : | 753 |
| Temperature rapture (deg C) | : | 32 | Temperature | : | 305 |
| Average Press. (mm Hg) | : | 752.80 | Corrected Average (mm Hg) | : | 753 |
| Average Temp. (deg C) | : | 31 | Average Temp. (deg K) | | 304 |

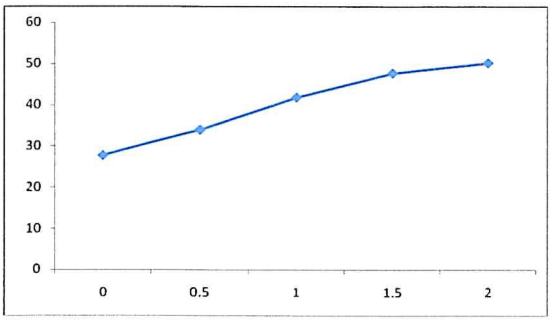
## CALIBRATION ORIFICE

| | | | | | |
|---|---|---|---|---|---|
| Make | : | General Metal Works | Qstd Slope | : | 1.89677 |
| Model | : | GMW | Qstd Intercept | : | -0.02329 |
| Serial # | | F36 | Date Certified | : | January 18, 2022 |

## CALIBRATIONS

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (Chart) | IC (Corrected) | LINEAR REGREESSION | | |
|---|---|---|---|---|---|---|---|
| 15 | 9.20 | 1.587 | 52.5 | 51.69 | Slope | = | 30.0359 |
| 13 | 7.60 | 1.443 | 48.5 | 47.75 | Intercept | = | 4.4591 |
| 10 | 5.22 | 1.198 | 42.5 | 41.84 | Corr. Coeff. | = | 0.9976 |
| 7 | 3.42 | 0.972 | 34.0 | 33.48 | | | |
| 5 | 2.20 | 0.782 | 28.5 | 28.06 # | of Observations | : | 5 |

| | |
|---|---|
| Range of Chart | 37 |
| at 1.1-1.7 m3/min | 56 |




**Calibrated By** :

**Mr. PASAGORN SAMOL**

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# Analyzer Performance Test

**Calibrated Date:** 18 January 2022

## Instruments Information

| | |
|---|---|
| **Analyzer Type:** CO Analyzer | **Manufacturer** API |
| **Model:** 300 | **S/N:** 1306 |

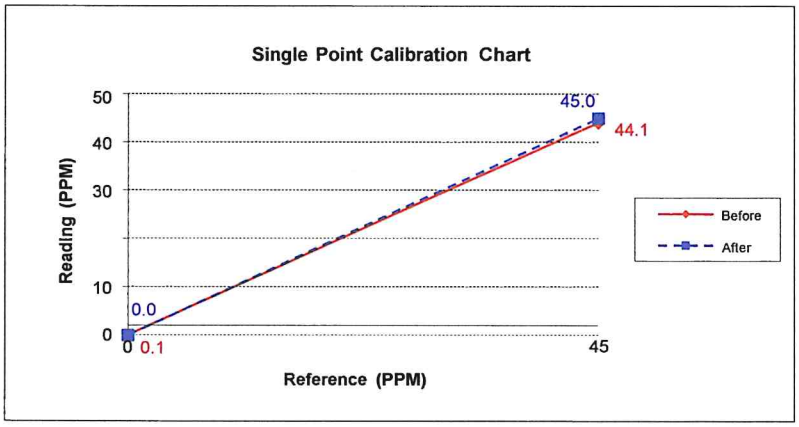
## Calibration System

| *Calibrator Unit* | *Standard Gas* |
|---|---|
| **Dilutor Model** Dasibi Model 5008 | **NO Conc** 45.2 PPM |
| **S/N:** 705 | **SO2 Conc** 44.9 PPM |
| **ZERO AIR Genearator** API MODEL 701 | **CO Conc** 4,490 PPM |
| **S/N:** 1924 | **Expire Date:** 6 October 2022 |

**Environment:** Temperature 25.5 °C Humidity: 51 %RH

## Calibration Report

| Status | *Zero* | | | *Span* | | |
|---|---|---|---|---|---|---|
| | Reference (PPM) | Reading (PPM) | Drift (PPM) | Reference (PPM) | Reading (PPM) | Drift% |
| **Before** | 0.0 | 0.1 | 0.1 | 45.0 | 44.1 | -2.0 |
| **After** | 0.0 | 0.0 | 0.0 | 45.0 | 45.0 | 0.0 |




**Calibrate By :**

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# Analyzer Performance Test

**Calibrated Date:** 18 January 2022

## Instruments Information

| | |
|---|---|
| **Analyzer Type:** CO Analyzer | **Manufacturer** API |
| **Model:** 300 | **S/N:** 1371 |

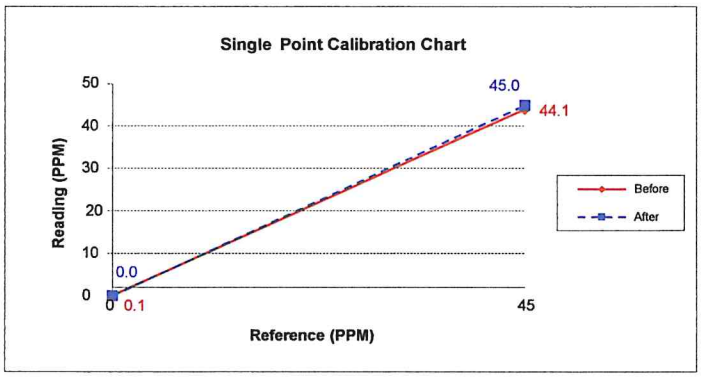
## Calibration System

| *Calibrator Unit* | *Standard Gas* |
|---|---|
| **Dilutor Model** Dasibi Model 5008 | **NO Conc** 45.2 PPM |
| **S/N:** 705 | **SO2 Conc** 44.9 PPM |
| **ZERO AIR Genearator** API MODEL 701 | **CO Conc** 4,490 PPM |
| **S/N:** 1924 | **Expire Date:** 6 October 2022 |

**Environment:** Temperature 25.5 °C Humidity: 51 %RH

## Calibration Report

| Status | *Zero* | | | *Span* | | |
|---|---|---|---|---|---|---|
| | Reference (PPM) | Reading (PPM) | Drift (PPM) | Reference (PPM) | Reading (PPM) | Drift% |
| **Before** | 0.0 | 0.1 | 0.1 | 45.0 | 44.1 | -2.0 |
| **After** | 0.0 | 0.0 | 0.0 | 45.0 | 45.0 | 0.0 |




**Calibrate By :**

**Mr. PASAGORN SAMOL**

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# Analyzer Performance Test

**Calibrated Date:** 18 January 2022

## Instruments Information

| | |
|---|---|
| **Analyzer Type:** CO Analyzer | **Manufacturer** Thermo Environmental |
| **Model:** 48C | **S/N:** 48C-65775-350 |

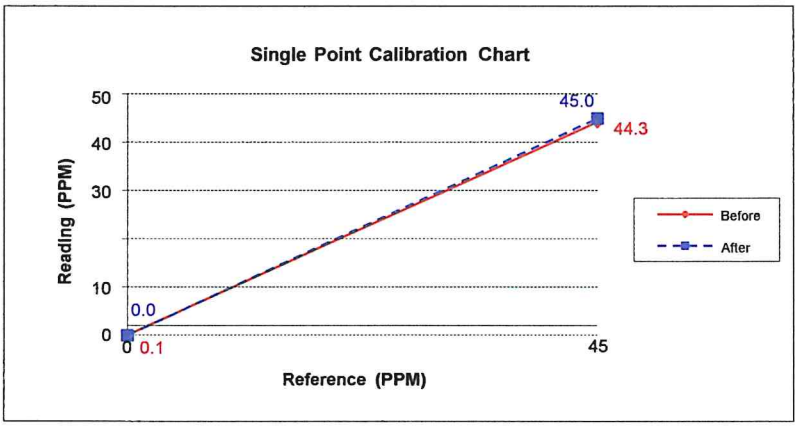
## Calibration System

| *Calibrator Unit* | *Standard Gas* |
|---|---|
| **Dilutor Model** Dasibi Model 5008 | **NO Conc** 45.2 PPM |
| **S/N:** 705 | **SO2 Conc** 44.9 PPM |
| **ZERO AIR Genearator** API MODEL 701 | **CO Conc** 4,490 PPM |
| **S/N:** 1924 | **Expire Date:** 6 October 2022 |

**Environment:** Temperature 25.5 °C Humidity: 51 %RH

## Calibration Report

| Status | *Zero* | | | *Span* | | |
|---|---|---|---|---|---|---|
| | Reference (PPM) | Reading (PPM) | Drift (PPM) | Reference (PPM) | Reading (PPM) | Drift% |
| **Before** | 0.0 | 0.1 | 0.1 | 45.0 | 44.3 | -1.6 |
| **After** | 0.0 | 0.0 | 0.0 | 45.0 | 45.0 | 0.0 |




**Calibrate By :**

**Mr. PASAGORN SAMOL**

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# Analyzer Performance Test

**Calibrated Date:** 18 January 2022

## Instruments Information

| | |
|---|---|
| **Analyzer Type:** CO Analyzer | **Manufacturer** API |
| **Model:** 300 | **S/N:** 1307 |

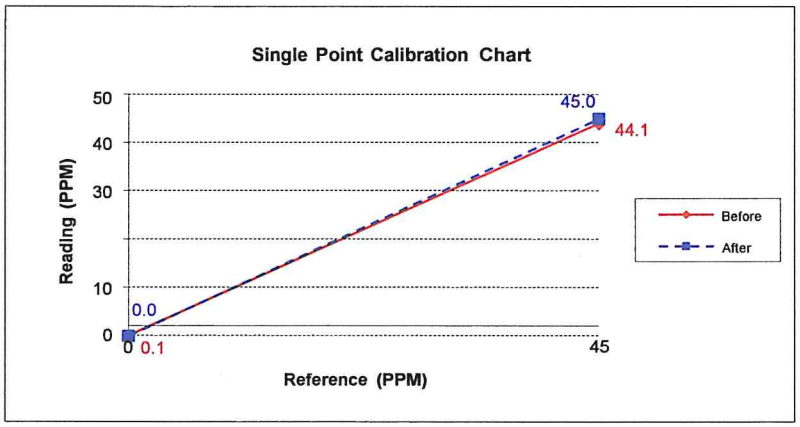
## Calibration System

| *Calibrator Unit* | *Standard Gas* |
|---|---|
| **Dilutor Model** Dasibi Model 5008 | **NO Conc** 45.2 PPM |
| **S/N:** 705 | **SO2 Conc** 44.9 PPM |
| **ZERO AIR Genearator** API MODEL 701 | **CO Conc** 4,490 PPM |
| **S/N:** 1924 | **Expire Date:** 6 October 2022 |

**Environment:** Temperature 25.5 °C Humidity: 51 %RH

## Calibration Report

| Status | *Zero* | | | *Span* | | |
|---|---|---|---|---|---|---|
| | Reference (PPM) | Reading (PPM) | Drift (PPM) | Reference (PPM) | Reading (PPM) | Drift% |
| **Before** | 0.0 | 0.1 | 0.1 | 45.0 | 44.1 | -2.0 |
| **After** | 0.0 | 0.0 | 0.0 | 45.0 | 45.0 | 0.0 |




**Calibrate By :**

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# Analyzer Performance Test

**Calibrated Date:** 18 January 2022

## Instruments Information

| | |
|---|---|
| **Analyzer Type:** SO2 Analyzer | **Manufacturer** Thermo Environmental |
| **Model:** 43C | **S/N:** 43C-53168-294 |

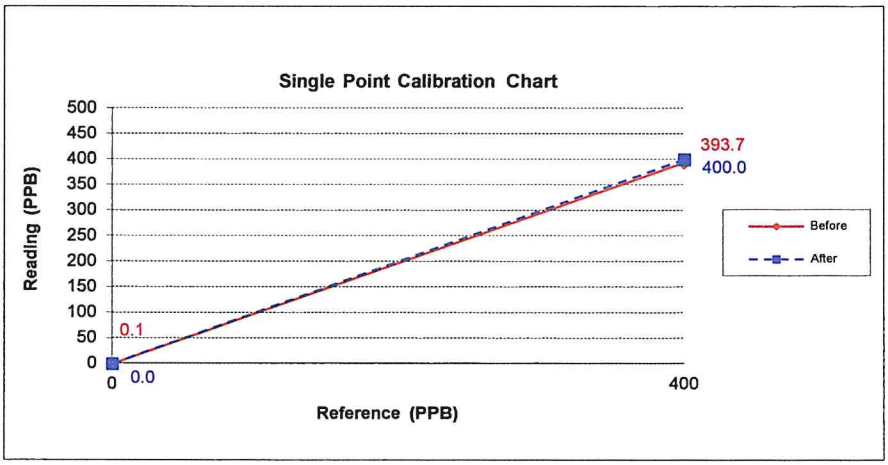
## Calibration System

| *Calibrator Unit* | *Standard Gas* |
|---|---|
| **Dilutor Model** Dasibi Model 5008 | **NO Conc** 45.2 PPM |
| **S/N:** 705 | **SO2 Conc** 44.9 PPM |
| **ZERO AIR Genearator** API MODEL 701 | **CO Conc** 4,490 PPM |
| **S/N:** 1924 | **Expire Date:** 6 October 2022 |

**Environment:** Temperature 25.5 °C Humidity: 51 %RH

## Calibration Report

| Status | *Zero* | | | *Span* | | |
|---|---|---|---|---|---|---|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| **Before** | 0.0 | 0.1 | 0.1 | 400.0 | 393.7 | -1.6 |
| **After** | 0.0 | 0.0 | 0.0 | 400.0 | 400.0 | 0.0 |
| | | | | | | |




**Calibrate By :**

**Mr.PASAGORN SAMOL**

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# *Analyzer Performance Test*

**Calibrated Date:** 18 January 2022

## *Instruments Information*

| | |
|---|---|
| **Analyzer Type:** SO2 Analyzer | **Manufacturer** Thermo Environmental |
| **Model:** 43C | **S/N:** 43C-73377-373 |

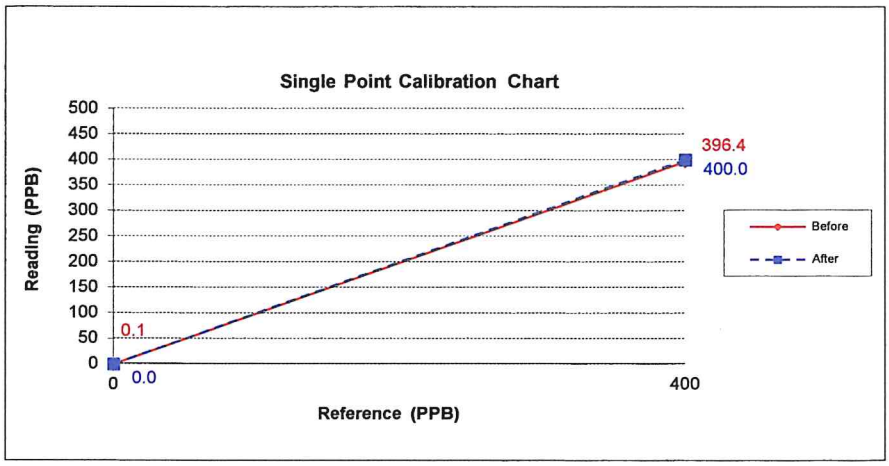
## *Calibration System*

| *Calibrator Unit* | *Standard Gas* |
|---|---|
| **Dilutor Model** Dasibi Model 5008 | **NO Conc** 45.2 PPM |
| **S/N:** 705 | **SO2 Conc** 44.9 PPM |
| **ZERO AIR Genearator** API MODEL 701 | **CO Conc** 4,490 PPM |
| **S/N:** 1924 | **Expire Date:** 6 October 2022 |

**Environment:** Temperature 25.5 °C Humidity: 51 %RH

## *Calibration Report*

| Status | *Zero* | | | *Span* | | |
|---|---|---|---|---|---|---|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| **Before** | 0.0 | 0.1 | 0.1 | 400.0 | 396.4 | -0.9 |
| **After** | 0.0 | 0.0 | 0.0 | 400.0 | 400.0 | 0.0 |
| | | | | | | |




**Calibrate By :**

**Mr.PASAGORN SAMOL**

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# Analyzer Performance Test

**Calibrated Date:** 18 January 2022

## Instruments Information

| | |
|---|---|
| **Analyzer Type:** SO2 Analyzer | **Manufacturer** Thermo Environmental |
| **Model:** 43C | **S/N:** 43C-62237-334 |

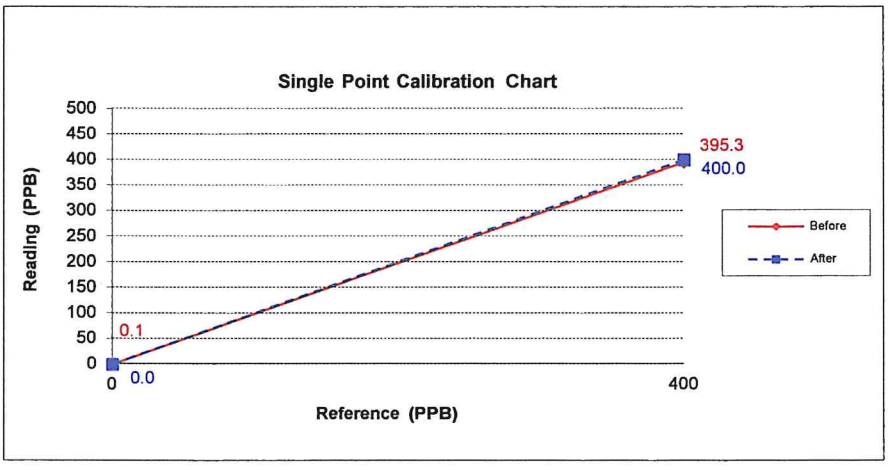
## Calibration System

| *Calibrator Unit* | *Standard Gas* |
|---|---|
| **Dilutor Model** Dasibi Model 5008 | **NO Conc** 45.2 PPM |
| **S/N:** 705 | **SO2 Conc** 44.9 PPM |
| **ZERO AIR Genearator** API MODEL 701 | **CO Conc** 4,490 PPM |
| **S/N:** 1924 | **Expire Date:** 6 October 2022 |

**Environment:** Temperature 25.5 °C Humidity: 51 %RH

## Calibration Report

| Status | *Zero* | | | *Span* | | |
|---|---|---|---|---|---|---|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| **Before** | 0.0 | 0.1 | 0.1 | 400.0 | 395.3 | -1.2 |
| **After** | 0.0 | 0.0 | 0.0 | 400.0 | 400.0 | 0.0 |
| | | | | | | |




**Calibrate By :**

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# Analyzer Performance Test

**Calibrated Date:** 18 January 2022

## Instruments Information

| | |
|---|---|
| **Analyzer Type:** SO2 Analyzer | **Manufacturer** Thermo Environmental |
| **Model:** 43C | **S/N:** 43C-53168-300 |

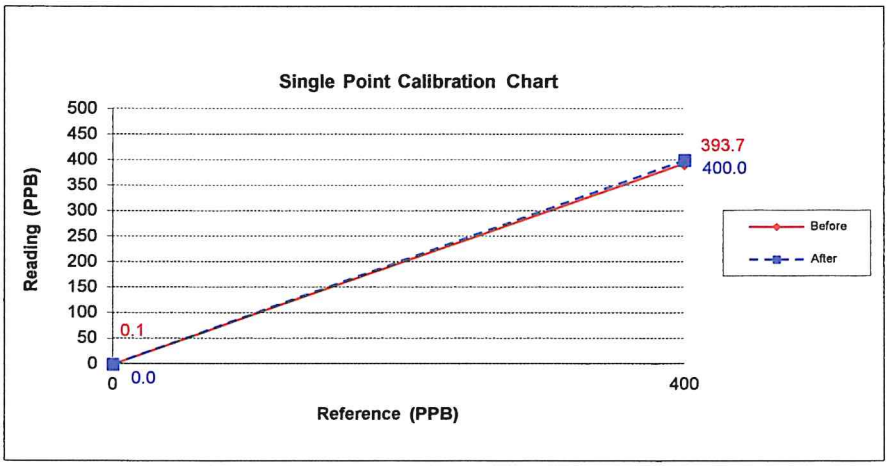
## Calibration System

| *Calibrator Unit* | *Standard Gas* |
|---|---|
| **Dilutor Model** Dasibi Model 5008 | **NO Conc** 45.2 PPM |
| **S/N:** 705 | **SO2 Conc** 44.9 PPM |
| **ZERO AIR Genearator** API MODEL 701 | **CO Conc** 4,490 PPM |
| **S/N:** 1924 | **Expire Date:** 6 October 2022 |

**Environment:** Temperature 25.5 °C Humidity: 51 %RH

## Calibration Report

| Status | *Zero* | | | *Span* | | |
|---|---|---|---|---|---|---|
| | Reference (PPB) | Reading (PPB) | Drift (PPB) | Reference (PPB) | Reading (PPB) | Drift% |
| **Before** | 0.0 | 0.1 | 0.1 | 400.0 | 393.7 | -1.6 |
| **After** | 0.0 | 0.0 | 0.0 | 400.0 | 400.0 | 0.0 |
| | | | | | | |




**Calibrate By :**

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# Analyzer Performance Test

**Calibrated Date:** 18 January 2022

## Instruments Information

| | |
|---|---|
| **Analyzer Type:** NO/NO2/NOx Analyzer | **Manufacturer** Thermo Environmental |
| **Model:** 42C | **S/N:** 42CLS-76495-383 |

## Calibration System

| *Calibrator Unit* | *Standard Gas* |
|---|---|
| **Dilutor Model** Dasibi Model 5008 | **NO Conc** 45.2 PPM |
| **S/N:** 705 | **SO2 Conc** 44.9 PPM |
| **ZERO AIR Genearator** API Model 701 | **CO Conc** 4,490 PPM |
| **S/N:** 1924 | **Expire Date:** 6 October 2022 |

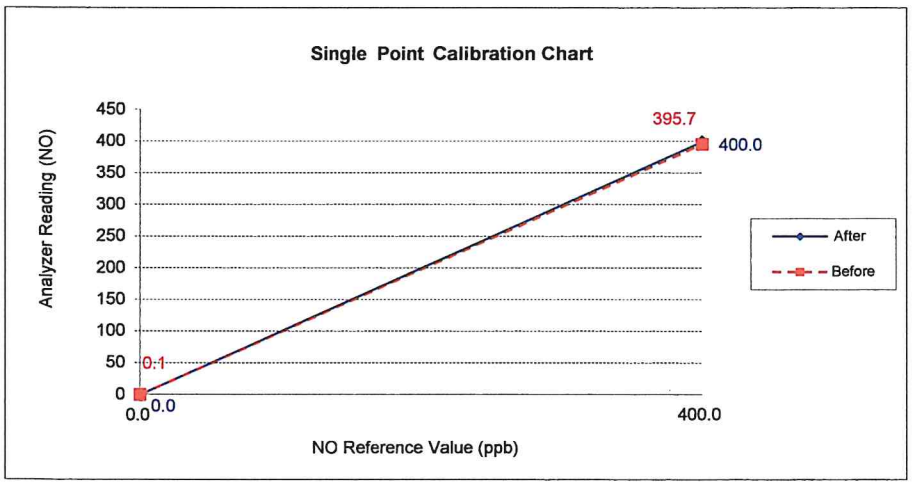
**Environment:** Temperature 25.5 °C Humidity: 51 %RH

*Calibration Check ( Before adjust )*

| GAS | Zero | | | Span | | |
|---|---|---|---|---|---|---|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.1 | 0.0 | 0.1 | 395.7 | 400.0 | -1.1 |
| NOx | 0.1 | 0.0 | 0.1 | 400.0 | 400.0 | 0.0 |

*Calibration Check ( After adjust )*

| GAS | Zero | | | Span | | |
|---|---|---|---|---|---|---|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.0 | 0.0 | 0.0 | 400.0 | 400.0 | 0.0 |
| NOx | 0.0 | 0.0 | 0.0 | 400.0 | 400.0 | 0.0 |




**Calibrate By : Mr. Pasagorn Samol**

บริษัท เอ็นไวร์ เซอร์วิส จำกัด
42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นไวร์ เซอร์วิส จำกัด
ENVIR SERVICE CO., LTD.
42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

# Analyzer Performance Test

**Calibrated Date:** 18 January 2022

## Instruments Information

| | |
|---|---|
| **Analyzer Type:** NO/NO2/NOx Analyzer | **Manufacturer** Thermo Environmental |
| **Model:** 42C | **S/N:** 70968-367 |

## Calibration System

| *Calibrator Unit* | *Standard Gas* |
|---|---|
| **Dilutor Model** Dasibi Model 5008 | **NO Conc** 45.2 PPM |
| **S/N:** 705 | **SO2 Conc** 44.9 PPM |
| **ZERO AIR Genearator** API Model 701 | **CO Conc** 4,490 PPM |
| **S/N:** 1924 | **Expire Date:** 6 October 2022 |

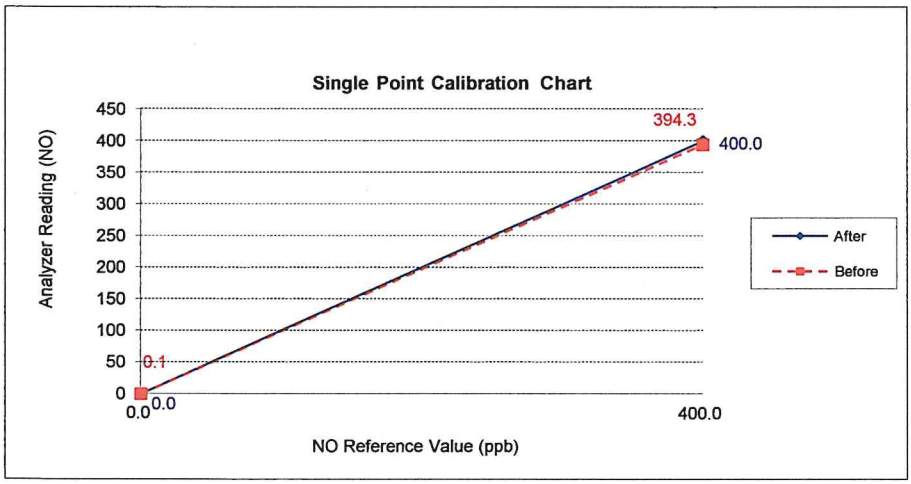
**Environment:** Temperature 25.5 °C Humidity: 51 %RH

*Calibration Check ( Before adjust )*

| GAS | Zero | | | Span | | |
|---|---|---|---|---|---|---|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.1 | 0.0 | 0.1 | 394.3 | 400.0 | -1.4 |
| NOx | 0.1 | 0.0 | 0.1 | 400.0 | 400.0 | 0.0 |

*Calibration Check ( After adjust )*

| GAS | Zero | | | Span | | |
|---|---|---|---|---|---|---|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.0 | 0.0 | 0.0 | 400.0 | 400.0 | 0.0 |
| NOx | 0.0 | 0.0 | 0.0 | 400.0 | 400.0 | 0.0 |




Calibrate By : **Mr. Pasagorn Samol**

บริษัท เอ็นไวร์ เซอร์วิส จำกัด
42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
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ENVIR SERVICE CO., LTD. 42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

# Analyzer Performance Test

**Calibrated Date:** 18 January 2022

## Instruments Information

| | |
|---|---|
| **Analyzer Type:** NO/NO2/NOx Analyzer | **Manufacturer** Thermo Environmental |
| **Model:** 42C | **S/N:** 0508011077 |

## Calibration System

| *Calibrator Unit* | *Standard Gas* |
|---|---|
| **Dilutor Model** Dasibi Model 5008 | **NO Conc** 45.2 PPM |
| **S/N:** 705 | **SO2 Conc** 44.9 PPM |
| **ZERO AIR Genearator** API Model 701 | **CO Conc** 4,490 PPM |
| **S/N:** 1924 | **Expire Date:** 6 October 2022 |

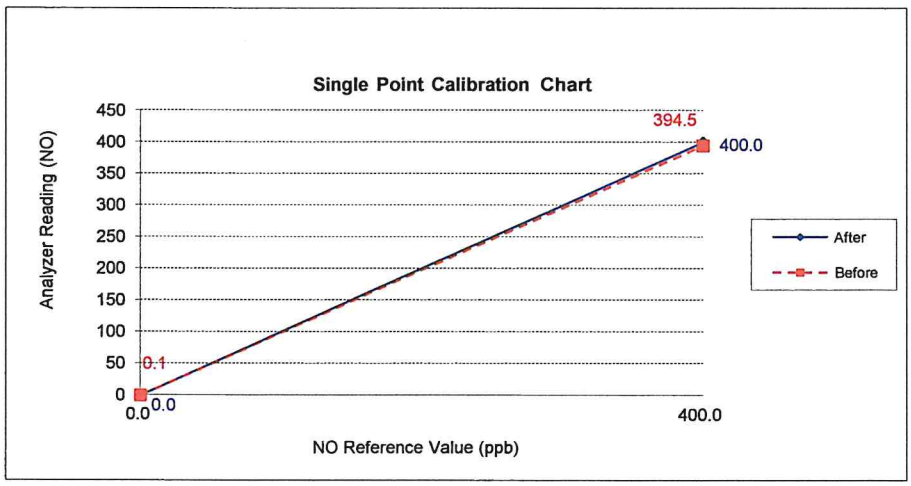
**Environment:** Temperature 25.5 °C Humidity: 51 %RH

*Calibration Check ( Before adjust )*

| GAS | Zero | | | Span | | |
|---|---|---|---|---|---|---|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.1 | 0.0 | 0.1 | 394.5 | 400.0 | -1.4 |
| NOx | 0.1 | 0.0 | 0.1 | 400.0 | 400.0 | 0.0 |

*Calibration Check ( After adjust )*

| GAS | Zero | | | Span | | |
|---|---|---|---|---|---|---|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.0 | 0.0 | 0.0 | 400.0 | 400.0 | 0.0 |
| NOx | 0.0 | 0.0 | 0.0 | 400.0 | 400.0 | 0.0 |




Calibrate By : **Mr. Pasagorn Samol**

บริษัท เอ็นไวร์ เซอร์วิส จำกัด
42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นไวร์ เซอร์วิส จำกัด
ENVIR SERVICE CO., LTD. 42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

# Analyzer Performance Test

**Calibrated Date:** 18 January 2022

## Instruments Information

| | |
|---|---|
| **Analyzer Type:** NO/NO2/NOx Analyzer | **Manufacturer** Thermo Environmental |
| **Model:** 42C | **S/N:** 42CLS-76495-380 |

## Calibration System

| *Calibrator Unit* | *Standard Gas* |
|---|---|
| **Dilutor Model** Dasibi Model 5008 | **NO Conc** 45.2 PPM |
| **S/N:** 705 | **SO2 Conc** 44.9 PPM |
| **ZERO AIR Genearator** API Model 701 | **CO Conc** 4,490 PPM |
| **S/N:** 1924 | **Expire Date:** 6 October 2022 |

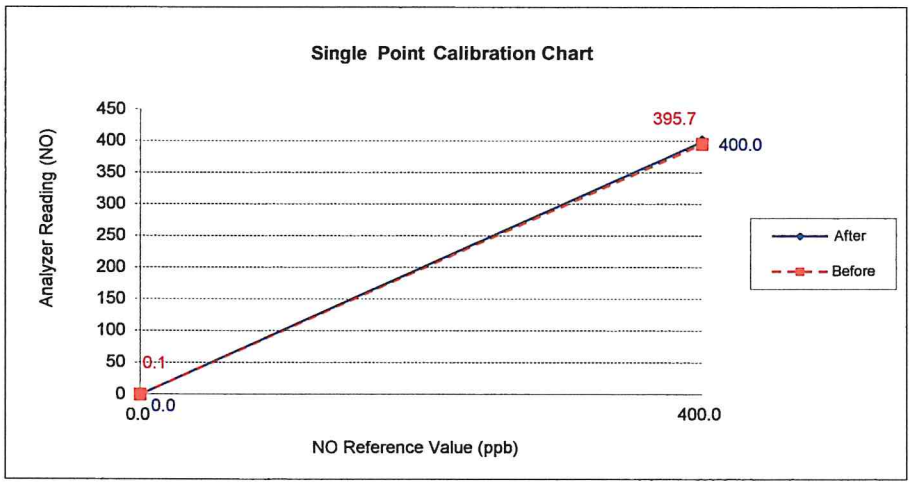
**Environment:** Temperature 25.5 °C Humidity: 51 %RH

*Calibration Check ( Before adjust )*

| GAS | Zero | | | Span | | |
|---|---|---|---|---|---|---|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.1 | 0.0 | 0.1 | 395.7 | 400.0 | -1.1 |
| NOx | 0.1 | 0.0 | 0.1 | 400.0 | 400.0 | 0.0 |

*Calibration Check ( After adjust )*

| GAS | Zero | | | Span | | |
|---|---|---|---|---|---|---|
| | Reading Value (ppb) | Expected Value (ppb) | Drift (ppb) | Reading Value (ppb) | Expected Value (ppb) | Drift% |
| NO | 0.0 | 0.0 | 0.0 | 400.0 | 400.0 | 0.0 |
| NOx | 0.0 | 0.0 | 0.0 | 400.0 | 400.0 | 0.0 |




**Calibrate By : Mr. Pasagorn Samol**