

ภาคผนวก 4

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สำเนาเอกสารสอบเทียบอุปกรณ์  
และเครื่องมือที่ใช้ในการตรวจวิเคราะห์



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



Envilab & Needles Supply Instrument

## TSP High Volume Sampler Calibration

Verification Report No.

AO2300035-E002 -TSP 01

☐ PM ☒ Onsite

Site: หน้าท่าเทียบเรือแม่น้ำป่าสัก

UTM : 47P N 1597158 E 672591

Sampler: ETSP#29

Recorder: ECRDS016339508

Date: 29 Sep 23

Technical: Sarawut W.

Approval: Wisan R.

### CONDITIONS

Barometric Press. (hPa): 1009.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.8

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

### CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 759

Qstd Slope: 2.03736

Qstd Intercept: -0.03733

Date Certified: 18 Jan 23

### CALIBRATIONS

#### LINEAR REGRESSION

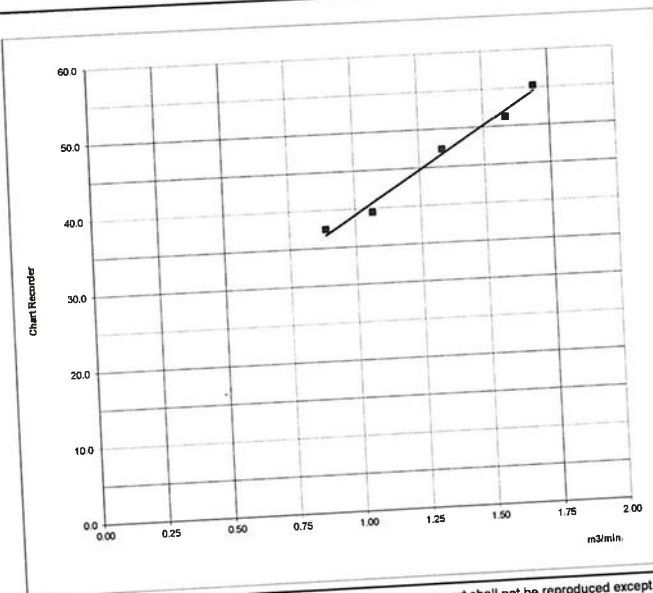
Slope = 22.1668

Intercept = 17.0311

Corr. coeff. = 0.9920

# of Observations: 5

Range of Chart at 1.1 - 1.7 m3/min. 42 55



Calibrated by :

( Sarawut Wangwan )  
29 September 2023

Approved by :

( Wisan Ritthikamon )  
29 September 2023

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



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Envilab & Needass Supply Instrument

## TSP High Volume Sampler Calibration

Verification Report No.

AO2300035-E002 -TSP 02

☐ PM ☒ Onsite

Site: หลังท่าเทียบเรือแม่น้ำป่าสัก

UTM : 47P N 1597133 E 672332

Sampler: ETSP#28

Recorder: ECRAN000031071

Date: 29 Sep 23

Technical: Sarawut W.

Approval: Wisan R.

### CONDITIONS

Barometric Press. (hPa): 1009.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.8

Temperature (deg K): 305.0

Corrected Avg.Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

### CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 759

Qstd Slope: 2.03736

Qstd Intercept: -0.03733

Date Certified: 18 Jan 23

### CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	11.56	1.664	56.0	55.24
2	10.69	1.601	52.0	51.29
3	7.55	1.349	46.0	45.37
4	4.99	1.100	40.0	39.46
5	3.32	0.900	36.0	35.51

### LINEAR REGRESSION

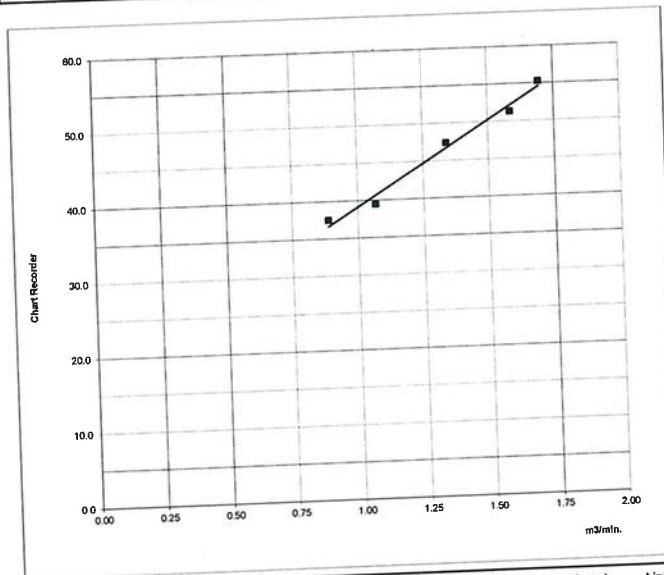
Slope = 24.8306

Intercept = 12.5246

Corr. coeff. = 0.9927

# of Observations: 5

Range of Chart at 1.1 - 1.7 m3/min. 41 55



Calibrated by :

( Sarawut Wangwan )  
29 September 2023

Approved by :

( Wisan Ritthikamon )  
29 September 2023

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Envilab & Needles Supply Instrument

## TSP High Volume Sampler Calibration

Verification Report No.

AO2300035-E002 -TSP 03

☐ PM ☒ Onsite

Site: บริเวณหมู่ที่ 5 บ้านดามทอง

UTM : 47P N 1597348 E 672179

Sampler: ETSP#38

Recorder: ECRAN000031071

Date: 29 Sep 23

Technical: Sarawut W.

Approval: Wisan R.

### CONDITIONS

Barometric Press. (hPa): 1007.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 755.3

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-5025A

Serial#: 759

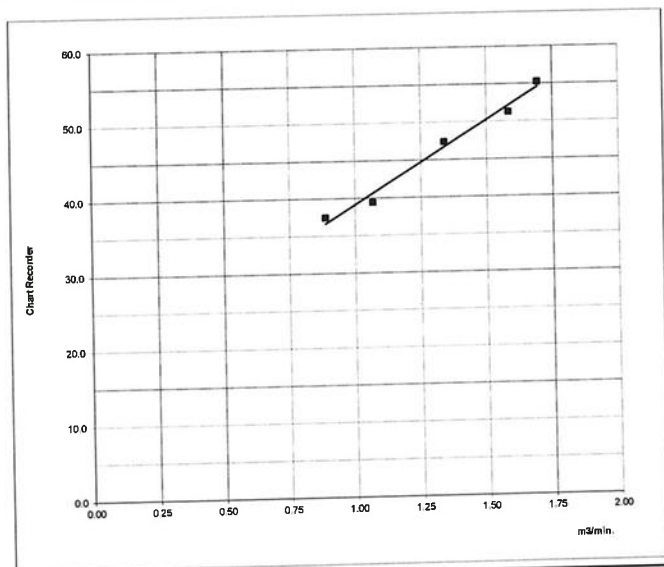
Qstd Slope: 2.03736

Qstd Intercept: -0.03733

Date Certified: 18 Jan 23

### CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION  Slope = 27.1984 Intercept = 6.8573 Corr. coeff. = 0.9964  # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 38 53
1	11.73	1.675	54.0	53.21	
2	10.41	1.579	50.0	49.27	
3	7.85	1.373	44.0	43.36	
4	4.98	1.098	38.0	37.45	
5	3.42	0.913	32.0	31.53	



Calibrated by :

( Sarawut Wangwan )  
29 September 2023

Approved by :

( Wisan Ritthikamon )  
29 September 2023

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Envilab & Needles Supply Instrument

## TSP High Volume Sampler Calibration

Verification Report No.

AO2300035-E002 -TSP 03

<input type="checkbox"/> PM	<input checked="" type="checkbox"/> Onsite
Site: โรงเรียนวัดละมุด	
UTM : 47P N 1597414 E 672616	
Sampler: ETSP#27	
Recorder: ECRAN000031071	
Date: 29 Sep 23	
Technical: Sarawut W.	
Approval: Wisan R.	

### CONDITIONS

Barometric Press. (hPa): 1008.0

Temperature (deg C): 31.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.1

Temperature (deg K): 304.0

Corrected Avg.Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

### CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 759

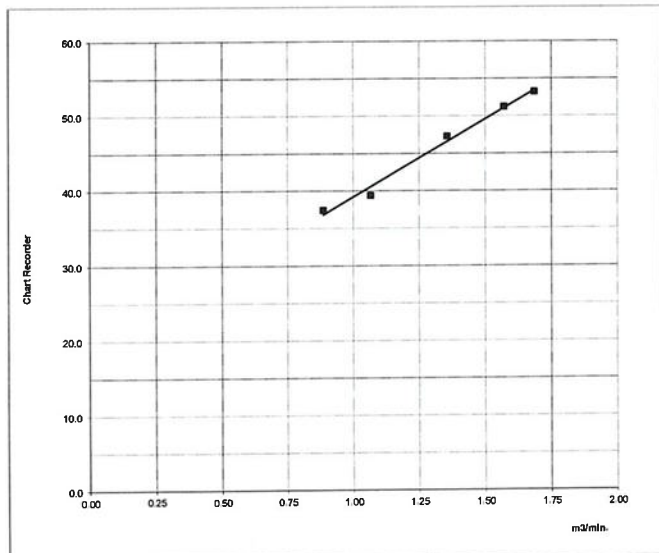
Qstd Slope: 2.03736

Qstd Intercept: -0.03733

Date Certified: 18 Jan 23

### CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION  Slope = 23.8234 Intercept = 12.7080 Corr. coeff.= 0.9923  # of Observations: 5  Range of Chart at 1.1 - 1.7 m3/min. 40 53
1	11.89	1.690	54.0	53.33	
2	10.43	1.584	50.0	49.38	
3	7.54	1.349	46.0	45.43	
4	4.78	1.078	40.0	39.50	
5	3.44	0.917	34.0	33.58	



Calibrated by :

( Sarawut Wangwan )  
29 September 2023

Approved by :

( Wisan Ritthikamon )  
29 September 2023

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Envilab & Needless Supply Instrument

## TSP High Volume Sampler Calibration

Verification Report No.

AO2300035-E002 -TSP 05

☒ PM ☐ Onsite

Site: บริเวณชุมชนหมู่ที่ 6 บ้านหัวโคก  
UTM : 47P N 1596867 E 671686  
Sampler: ETSP#37  
Recorder: ECRDS016339512

Date: 29 Sep 23  
Technical: Sarawut W.  
Approval: Wisan R.

### CONDITIONS

Barometric Press. (hPa): 1007.0  
Temperature (deg C): 32.0  
Average Press. (hPa): 1013.0  
Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 755.3  
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-5025A  
Serial#: 759

Qstd Slope: 2.03736  
Qstd Intercept: -0.03733  
Date Certified: 18 Jan 23

### CALIBRATIONS

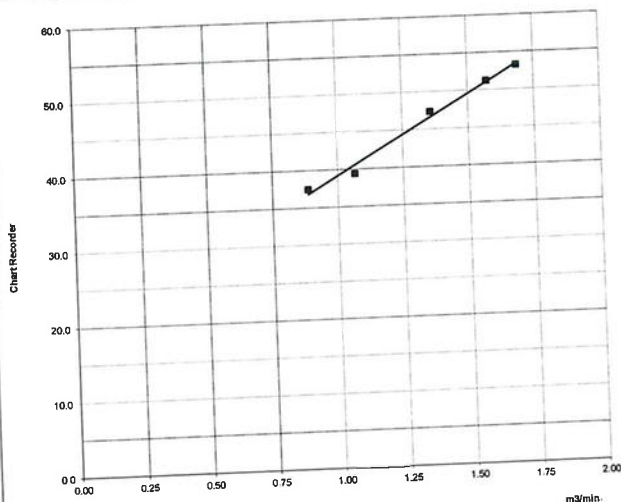
Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	11.67	1.671	54.0	53.21
2	10.31	1.571	50.0	49.27
3	7.54	1.346	46.0	45.33
4	4.87	1.086	38.0	37.45
5	3.35	0.904	32.0	31.53

### LINEAR REGRESSION

Slope = 27.2348  
Intercept = 7.5297  
Corr. coeff. = 0.9953

# of Observations: 5

Range of Chart at 1.1 - 1.7 m3/min. 39 54



Calibrated by :

( Sarawut Wangwan )  
29 September 2023

Approved by :

( Wisan Ritthikamon )  
29 September 2023

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Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok 10160  
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Envilab & Needless Supply Instrument

## PM10 High Volume Sampler Calibration

Verification Report No.

AO2300035-E002 -PM 01

☐ PM ☒ Onsite

Site: หน้าท่าเทียมเรือแม่น้ำปาลัก

UTM : 47P N 1597158 E 672591

Sampler: EPM#25

Recorder: ECRDS016180801

Date: 29 Sep 23

Technical: Sarawut W.

Approval: Wisan R.

### CONDITIONS

Barometric Press. (hPa): 1009.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.8

Temperature (deg K): 305.0

Corrected Avg.Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

### CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 759

Slope: 1.27576

Intercept: -0.02337

Date Certified: 18 Jan 23

### CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	10.73	1.648	52.0	33.01
2	7.59	1.389	46.0	29.20
3	6.23	1.260	44.0	27.93
4	4.28	1.048	38.0	24.12
5	3.47	0.945	34.0	21.58

### LINEAR REGRESSION

Slope = 15.8412

Intercept = 7.2395

Corr. coeff. = 0.9929

SFR = 1.142

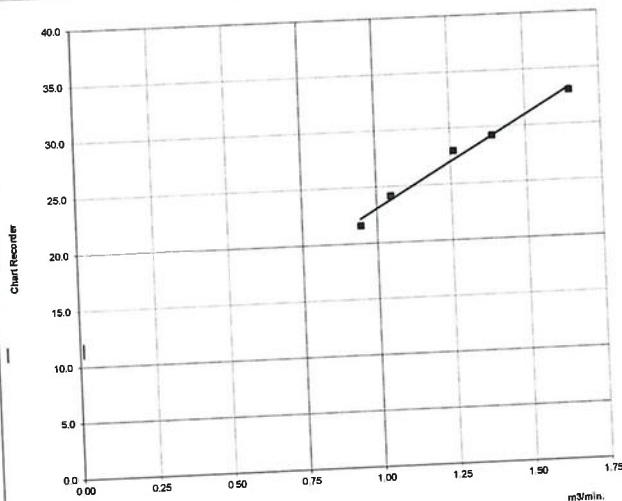
SSP = 39.90

# of Observations: 5

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

38

42



Calibrated by :

( Sarawut Wangwan )  
29 September 2023

Approved by :

( Wisan Ritthikamon )  
29 September 2023

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Envilab & Needles Supply Instrument

## PM10 High Volume Sampler Calibration

Verification Report No.

AO2300035-E002 -PM 02

☐ PM

☒ Onsite

Site: หลังท่าเทียบเรือแม่น้ำป่าสัก

UTM : 47P N 1597133 E 672332

Sampler: EPM#36

Recorder: NCRT1500904859

Date: 29 Sep 23

Technical: Sarawut W.

Approval: Wisan R.

### CONDITIONS

Barometric Press. (hPa): 1008.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.1

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

### CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 759

Slope: 1.27576

Intercept: -0.02337

Date Certified: 18 Jan 23

### CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	10.98	1.668	52.0	33.03
2	7.89	1.417	48.0	30.49
3	6.61	1.298	44.0	27.95
4	4.45	1.069	38.0	24.14
5	3.12	0.898	34.0	21.59

### LINEAR REGRESSION

Slope = 15.3558

Intercept = 7.9384

Corr. coeff. = 0.9943

SFR = 1.143

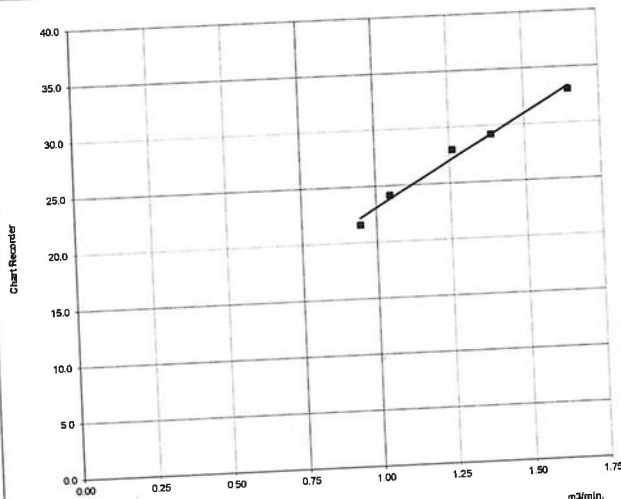
SSP = 40.14

# of Observations: 5

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

38

42



Calibrated by :

( Sarawut Wangwan )  
29 September 2023

Approved by :

( Wisan Ritthikamon )  
29 September 2023

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

FE-MNT-28 Rev.00:01/08/63



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Envilab & Needas Supply Instrument

## PM10 High Volume Sampler Calibration

Verification Report No.

AO2300035-E002 -PM 03

☐ PM ☒ Onsite

Site: บริเวณหมู่ที่ 5 บ้านดามทอง

UTM : 47P N 1597348 E 672179

Sampler: EPM#13

Recorder: ECRDS016180800

Date: 29 Sep 23

Technical: Sarawut W.

Approval: Wisan R.

### CONDITIONS

Barometric Press. (hPa): 1007.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 755.3

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-5025A

Serial#: 759

Slope: 1.27576

Intercept: -0.02337

Date Certified: 18 Jan 23

### CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	10.77	1.653	52.0	33.04
2	7.59	1.391	46.0	29.23
3	6.87	1.324	44.0	27.96
4	4.23	1.043	38.0	24.15
5	3.12	0.898	32.0	20.33

### LINEAR REGRESSION

Slope = 16.2854

Intercept = 6.3967

Corr. coeff. = 0.9938

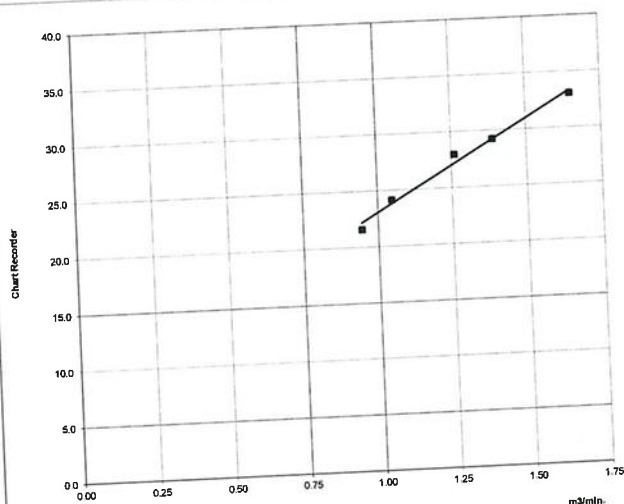
SFR = 1.144

SSP = 39.39

# of Observations: 5

Range of Chart 37

at SFR  $\pm 10\%$  41



Calibrated by :

( Sarawut Wangwan )  
29 September 2023

Approved by :

( Wisan Ritthikamon )  
29 September 2023

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



Envilab & Needles Supply Instrument

## PM10 High Volume Sampler Calibration

Verification Report No.

AO2300035-E002 -PM 03

☐ PM ☒ Onsite

Site: โรงเรียนวัดละมุด

UTM : 47P N 1597414 E 672616

Sampler: EPM#11

Recorder: ECRDS016303492

Date: 29 Sep 23

Technical: Sarawut W.

Approval: Wisan R.

### CONDITIONS

Barometric Press. (hPa): 1008.0

Temperature (deg C): 31.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.1

Temperature (deg K): 304.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

### CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 759

Slope: 1.27576

Intercept: -0.02337

Date Certified: 18 Jan 23

### CALIBRATIONS

#### LINEAR REGRESSION

Slope = 18.1008

Intercept = 4.0480

Corr. coeff. = 0.9928

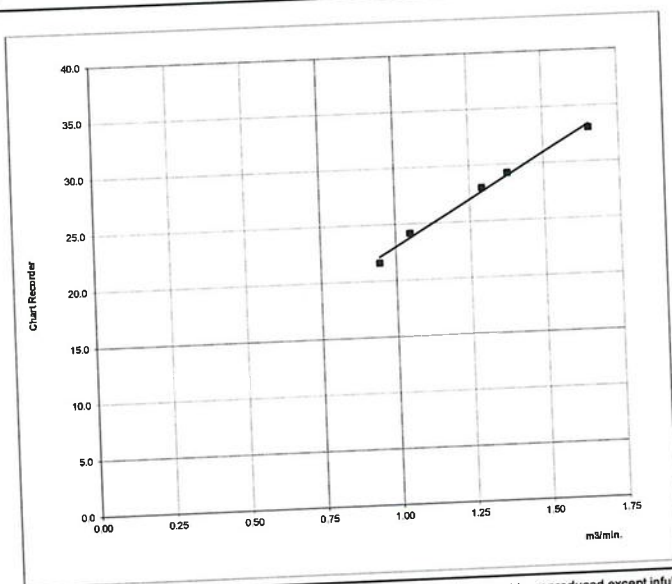
SFR = 1.139

SSP = 38.91

# of Observations: 5

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

37  
41



Calibrated by :

( Sarawut Wangwan )  
29 September 2023

Approved by :

( Wisan Ritthikamon )  
29 September 2023

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ผู้จัดการฝ่ายเทคนิคคุณภาพ



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



Envilab & Needas Supply Instrument

## PM10 High Volume Sampler Calibration

Verification Report No.

AO2300035-E002 -PM 05

☐ PM

☒ Onsite

Site: บริเวณชุมชนหมู่ที่ 6 บ้านหัวโคก

UTM : 47P N 1596867 E 671686

Sampler: EPM#30

Recorder: ECRDS016180800

Date: 29 Sep 23

Technical: Sarawut W.

Approval: Wisan R.

### CONDITIONS

Barometric Press. (hPa): 1007.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 755.3

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-5025A

Serial#: 759

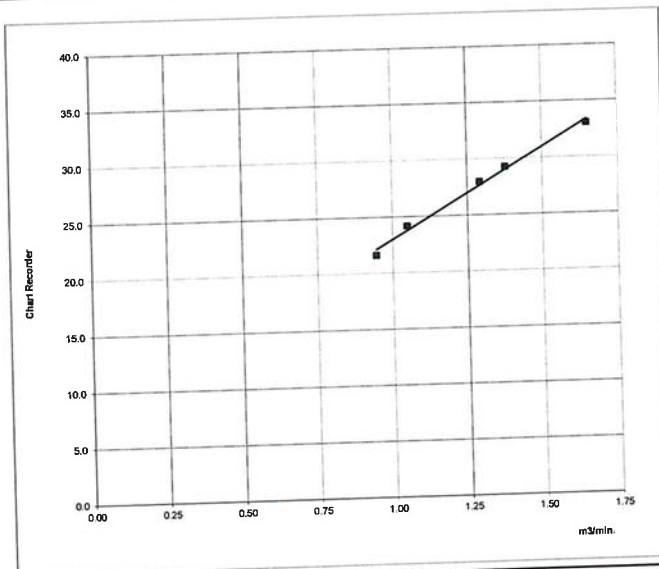
Slope: 1.27576

Intercept: -0.02337

Date Certified: 18 Jan 23

### CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.68	1.646	52.0	33.04	Slope = 18.1608
2	7.89	1.417	48.0	30.50	Intercept = 3.8153
3	6.98	1.334	44.0	27.96	Corr. coeff. = 0.9915
4	4.73	1.102	38.0	24.15	SFR = 1.144
5	3.41	0.938	32.0	20.33	SSP = 38.71
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					36
					41



Calibrated by :

(Sarawut Wangwan)  
29 September 2023

Approved by :

(Wisan Ritthikamon)  
29 September 2023

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Environmental responsibility with accuracy measurement

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

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



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Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Neediss Supply Instrument

## Verification Test Report

Report No.:

AO2300035-E002 -SLM 01

☐ PM

☒ Onsite UTM :

47P N 1597087 E 672441

Calibrated Date: 29 September 2023

Site : หน้าท่าเทียบเรือแม่น้ำป่าสัก

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 45

Serial : 0018

Environment: Temperature

31 °C

Humidity

72 %RH

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

Serial No.1351075

Date of Calibration : 16 March 2023

### Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.57	-0.21	93.78

Calibrated By:

( Sarawut Wangwan )

Date:

29 September 2023

Approve By:

( Wisan Ritthikamon )

Date:

29 September 2023

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



Envilab & Needless Supply Instrument

## Verification Test Report

Report No.:

AO2300035-E002 -SLM 02

☐ PM

☒ Onsite UTM :

47P N 1597423 E 672664

Calibrated Date: 29 September 2023

Site : โรงเรียนวัดละมุด

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 45

Serial : 0013

Environment: Temperature

31 °C Humidity 72 %RH

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

Serial No.1351075

Date of Calibration : 16 March 2023

### Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.57	-0.21	93.78

Calibrated By:

( Sarawut Wangwan )

Date:

29 September 2023

Approve By:

( Wisan Ritthikamon )

Date:

29 September 2023

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



Envilab & Needass Supply Instrument

## Verification Test Report

Report No.:

AO2300035-E002 -SLM 02

☐ PM

☒ Onsite UTM :

47P N 1596880 E 671586

Calibrated Date: 29 September 2023

Site : บริเวณชุมชนหมู่ที่ 6 บ้านหัวโคก

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 45

Serial : 0016

Environment: Temperature 31 °C Humidity 72 %RH

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

Serial No.1351075

Date of Calibration : 16 March 2023

### Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.57	-0.21	93.78

Calibrated By:

( Sarawut Wangwan )

Date:

29 September 2023

Approve By:

( Wisan Ritthikamon )

Date:

29 September 2023

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## Certificate of Calibration

Calibration Certification Information			
Cal. Date: January 18, 2023	Rootsmer S/N: 438320	Ta: 294 °K	
Operator: Jim Tisch		Pa: 750.1 mm Hg	
Calibration Model #: TE-5025A	Calibrator S/N: 0759		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3960	3.2	2.00
2	3	4	1	0.9950	6.4	4.00
3	5	6	1	0.8850	8.0	5.00
4	7	8	1	0.8450	8.8	5.50
5	9	10	1	0.6990	12.8	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left( \frac{Ta}{Pa} \right)}$ (y-axis)
0.9961	0.7135	1.4145	0.9957	0.7133	0.8854
0.9918	0.9968	2.0004	0.9915	0.9964	1.2521
0.9897	1.1183	2.2365	0.9893	1.1179	1.3999
0.9886	1.1700	2.3456	0.9883	1.1695	1.4683
0.9833	1.4067	2.8289	0.9829	1.4062	1.7708
QSTD	m=	2.03736	QA	m=	1.27576
	b=	-0.03733		b=	-0.02337
	r=	0.99997		r=	0.99997

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:	rootsmer 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.  
145 South Miami Avenue  
Village of Cleves, OH 45002

www.tisch-env.com  
TOLL FREE: (877)263-7610  
FAX: (513)467-9009





# 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. :** 66-200035-1

**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 :** (23.4 to 23.7) °C

**Relative Humidity :** (61.4 to 62.8) %

**Air Pressure :** 1011.0 mbar

**Date of Received :** 02 February 2023

**Date of Calibration :** 02 February 2023

**Date of Issue :** 04 February 2023

**Calibrated by :** Akaradath Thippichai

**Calibration Method :** In-house method CAL-M2001 based on UKAS Publication ref : LAB 14

Edition 7 - November 2022

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

**Standard Weights**

ID No.	Cert. No.	Due Date	Traceability
E261-E2624	C02222345	10 Nov 2023	National Institute of Metrology (Thailand), (NIMT)

Approved by :

( Surachai Promthong )

Laboratory Manager

Envilab Co.,Ltd.

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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. : 66-200035-1

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	0.0000	0.00011
20	0.0000	0.00013
50	0.0001	0.00014
100	0.0000	0.00020
200	-0.0001	0.00038

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

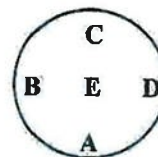
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2.11$ , providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g

A B C D E

-0.0001 0.0001 0.0000 -0.0001 0.0000 g



Repeatability

Load test : 200 g

Stdev. : 0.00000 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. : 66-410024-1

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)
25.01	25.0	0.0	0.46

Result of Calibration : Without Adjustment

Function : Humidity measurement

Reference Temperature @ 25 °C

Standard Humidity (%R.H.)	UUC Reading (%R.H.)	Correction (%R.H.)	Uncertainty (±%R.H.)
50.00	49	1	2.2

### Remark

UUC : Unit Under Calibration

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

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

- ๐0๐ -



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## 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. Perkins*  
Approved for Release







neediss

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



## NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6609001

Page: 1/1

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

### Instruments Information

Analyzer Type: NO/NO <sub>2</sub> /NO <sub>x</sub> Analyzer Model: T200	Manufacturer API S/N: ENOAIT20002469
--	---

### 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 <sub>2</sub> Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 25.1 °C

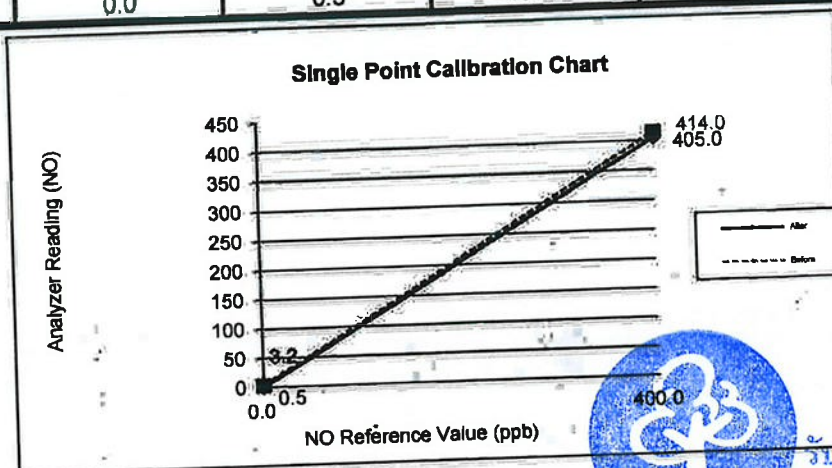
Humidity: 49 %RH

### Calibration Check ( Before adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	1.9	0.0	1.9	410.2	400.0	1.3
NO <sub>2</sub>	1.3	0.0	1.3	3.8	0.0	0.5
NO <sub>x</sub>	3.2	0.0	3.2	414.0	400.0	1.7

### 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	403.0	400.0	0.4
NO <sub>2</sub>	0.0	0.0	0.0	2.0	0.0	0.2
NO <sub>x</sub>	0.5	0.0	0.5	405.0	400.0	0.6



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Tel. 02-802-3980-2 Fax. 02-802-3988 E:info@neediss.com**NOx Analyzer Verification Test Report**

Calibration Report No.: AP-N6609001

Page:1/1

Calibrated Date: 1-Sep-23



PM



Onsite

Page:2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Sep-23				
Time	13:30:00 AM				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.5	0.2	
Sample Flow	500+/- 50	cc/min	505	480	
Ozone Flow	80-90	cc/min	79	72	
PMT Detector	0-5000	mV	28.2	29.3	
AZERO	-20-150	mV	56.0	55.0	
HVPS	400-900 constant	V	755	755	
DCPS	2500 +/- 200	mV	-	-	
RCELL TEMP	50+/- 1	Dreegee C	50	50	
BOX TEMP	20-35	Dreegee C	30.2	32.0	
PMT TEMP	7 +/-1	Dreegee C	7.2	7.2	
IZS TEMP	50+/- 4	Dreegee C	-	-	
MOLY Temp	315 +/- 5	Dreegee C	315.0	315.0	
RCEL PRES	4-10 contant	IN-Hg-A	4	5	
SAMP PRES	20-30 contant	IN-Hg-A	29	29	
NO Slope	1 +/- 0.3		0.890	1.118	
Nox Slope	1 +/- 0.3		0.911	1.046	
NO Offset	-10 to + 150	mV	12.9	2.2	
NOx Offset	-10 to.+ 150	mV	-2.4	9.1	
<b>Span and Cal Values</b>					
Zero Value	NO	0	ppb	1.9	0.5
	NOx	0	ppb	3.2	0.5
Span Value	NO	400	ppb	410.2	403.0
	NOx	400	ppb	414.0	405.0

Calibrate By :

Sirirat Poonlak

Date:

1-Sep-23

Approve By :

Sarawut Keawsrinal

Date:

1-Sep-23

**neediss**

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Envilab Co., Ltd.

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หน้า 21/129



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



## SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6609002

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

Page:1/2

### Instruments Information

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

### Calibration System

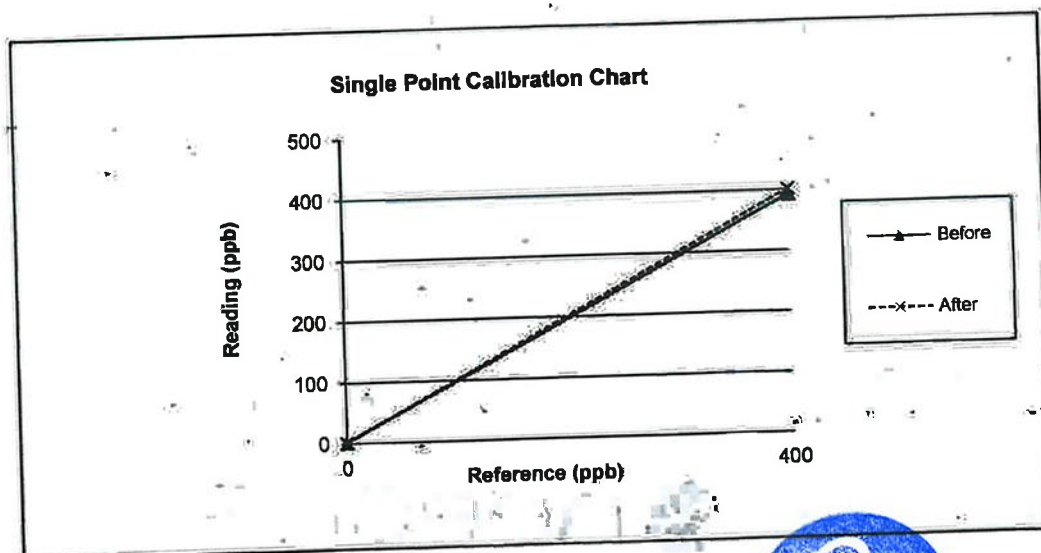
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 24.5 °C

Humidity: 50 %RH

### Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	1.5	1.5	400.0	392.3	-1.0
After	0.0	0.9	0.9	400.0	401.0	0.1



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## SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6609002

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

Page: 2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Sep-23				
Time	13:10				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.6	0.2	
Sample Flow	650 (+/- 50)	cc/min	663	659	
PMT Detector	0 - 5000	mV	36.5	34.5	
Norm PMT Detector	0 - 5000	mV	34.1	32.8	
HVPS	400-900 constant	V	719	648	
DCPS	2500 (+/- 200)	mV	-	-	
RCELL TEMP	50 (+/- 1)	Dreegee C	50	50	
BOX TEMP	20-40	Dreegee C	34.1	32.7	
PMT TEMP	7 (+/- 1)	Dreegee C	8.0	8.0	
UV lamp	1000-4900	mV	4034.0	4034.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR. Light (Zero Gas)	<100	PPB	29	29	
Dark PMT	(-50) - (+200)	mV	44.7	44.7	
Dark lamp	(-50) - (+200)	mV	5.1	5.1	
SAMP PRES	20-30 constant	IN-Hg-A	28.1	27.8	
<b>Electric Test/Optic Test</b>					
PMT Volts	2000 (+/- 500)	mV	2004	2020	
SO2 Conc	1000 (+/- 250)	PPB	1002	1010	
SO2 Slope	1 (+/- 0.3)		0.920	0.866	
SO2 Offset	< 250	mV	65	130.1	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.6	0.2	
<b>Gas Test Response</b>					
Zero Gas (0.00 PPB)	0	ppb	1.5	0.9	
Span Gas (400 PPB)	400	ppb	392.3	401.0	± 5% of Range

Calibrate By:

*Sirirat Poonlak*

Sirirat Poonlak

Date:

1-Sep-23

Approve By:

*Tanin Huadcharoen*

1-Sep-23

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## CO Analyzer Verification Test Report

Calibration Report No.: ES-C6609002

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

### Instruments Information

Page:1/2

<b>Analyzer Type:</b> CO Analyzer <b>Model:</b> CO12E	<b>Manufacturer</b> Environnement SA., France <b>S/N:</b> ECOESACO12E202
--	---

### Calibration System

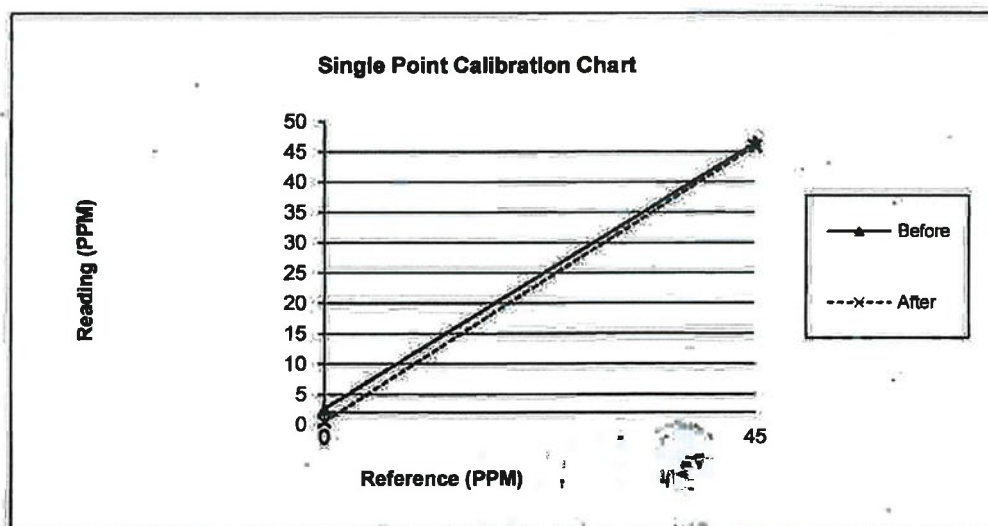
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 24.7 °C

Humidity: 51 %RH

### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	2.600	2.6	45.0	46.32	1.4
After	0.0	0.478	0.5	45.0	45.90	1.0



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## CO Analyzer Verification Test Report

Calibration Report No.: ES-C6609002

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

Page:2/2

Analyzer Signal Values					
Date	1-Sep-23	Time	10:09:00		
Power Supplies					
Option	0.0	mV	+5 V Sensor	5	V
+3.3 V	3.3	V	+24 V	24.2	V
+12 V	11.8	V	+5 V	5.1	V
+24 V	1.1	mV			
Optical Bench					
IR current ratio	884.7	mA	Pbse current	618.2	mV
Optical T.	46.0	deg.C	Pbse T.	-24.2	deg.C
Measure sig.	506.4	mV	Refer Sig.	456.4	mV
Min sig.	945.0	mV	Max Sig.	2840	mV
Sample					
inst. Ratio	1.109		Ratio	1.105	
Ref. ratio	1.109		Internal Temp.	28.9	deg.C
Source Temp.	46.0	deg.C	Gas Pressure	997	hPa
Up Pressure	947.0	hPa	Flow	59	l/h

Calibrate By:

Sirirat Poonlak

Sirirat Poonlak

Date:

1-Sep-23

Approve By:

Sarawut Keawsrinual

Date:

1-Sep-23



Neediss Supply Instrument Co., Ltd.



Envilab Co., Ltd.

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## NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6609002

Page:1/1

Calibrated Date: 1-Sep-23



PM



Onsite

### Instruments Information

Analyzer Type: NO/NO<sub>2</sub>/NOx Analyzer  
Model: T200

Manufacturer API  
S/N: ENOAIT20003572

### 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 <sub>2</sub> Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 25.0 °C

Humidity: 50 %RH

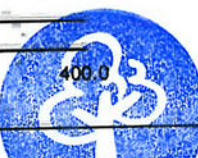
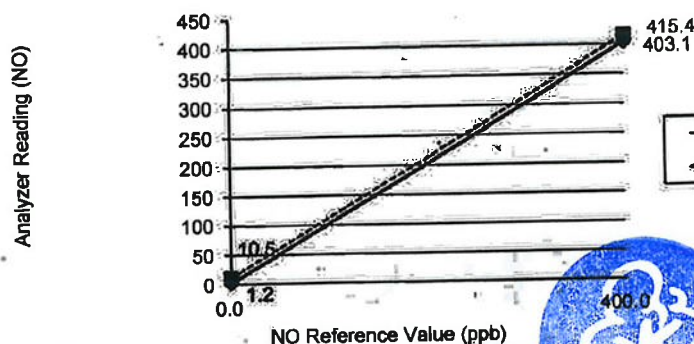
### Calibration Check ( Before adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	9.5	0.0	9.5	411.2	400.0	1.4
NO <sub>2</sub>	1.0	0.0	1.0	4.2	0.0	0.5
NOx	10.5	0.0	10.5	415.4	400.0	1.9

### 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	400.8	400.0	0.1
NO <sub>2</sub>	0.6	0.0	0.6	2.3	0.0	0.3
NOx	1.2	0.0	1.2	403.1	400.0	0.4

Single Point Calibration Chart



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## NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6609002

Page:1/1

Calibrated Date: 1-Sep-23

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Page:2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Sep-23				
Time	11:25				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.4	0.2	
Sample Flow	500 +/- 50	cc/min	500	490	
Ozone Flow	60-90	cc/min	89	80	
PMT Detector	0-5000	mV	50.9	20.4	
AZERO	-20-150	mV	48.3	49.1	
HVPS	400-900 constant	V	745	745	
DCPS	2500 +/- 200	mV	-	-	
RCELL TEMP	50 +/- 1	Dreegee C	50.0	50.0	
BOX TEMP	20-35	Dreegee C	33.2	32.6	
PMT TEMP	7 +/- 1	Dreegee C	7.2	7.2	
IZS TEMP	50 +/- 4	Dreegee C	-	-	
MOLY Temp	315 +/- 5	Dreegee C	313.3	314.5	
RCEL PRES	4-10 contant	IN-Hg-A	3.7	3.7	
SAMP PRES	20-30 contant	IN-Hg-A	28.3	28.7	
NO Slope	1 +/- 0.3		1.025	1.178	
Nox Slope	1 +/- 0.3		1.066	1.153	
NO Offset	-10 to + 150	mV	8.7	-1.6	
NOx Offset	-10 to + 150	mV	2.1	2.6	
Span and Cal Values					
Zero Value	NO	0	ppb	9.5	0.6
	NOx	0	ppb	10.5	1.2
Span Value	NO	400	ppb	411.2	400.8
	NOx	400	ppb	415.4	403.1

Calibrate By:

*Sirir Poonlak*

Approve By:

*Sarawut Keawsrinal*

Date:

1-Sep-23

Date:

1-Sep-23

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## SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6609003

Calibrated Date: 1-Sep-23

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### Instruments Information

Page:1/2

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

### Calibration System

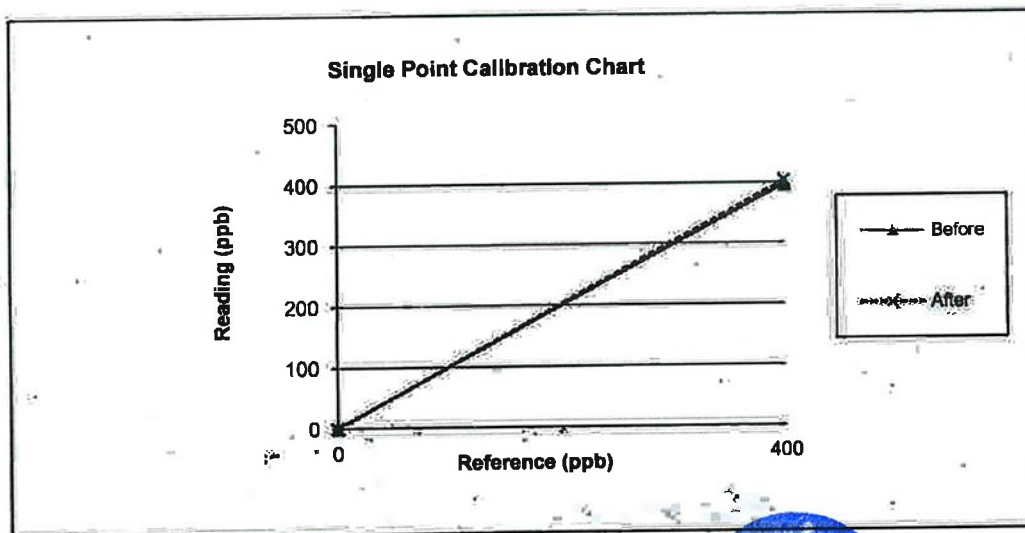
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 24.5 °C

Humidity: 50 %RH

### Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.9	0.9	400.0	397.0	-0.4
After	0.0	0.3	0.3	400.0	403.0	0.4



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Tel. 02-802-3980-2 Fax. 02-802-3988 E:info@neediss.com**SO2 Analyzer Verification Test Report**

Calibration Report No.: AP-S6609003

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

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Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Sep-23				
Time	13:10				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.6	0.2	
Sample Flow	650 (+/- 50)	cc/min	663	659	
PMT Detector	0 - 5000	mV	36.5	34.5	
Norm PMT Detector	0 - 5000	mV	34.1	32.8	
HVPS	400-900 constant	V	719	648	
DCPS	2500 (+/- 200)	mV	27	2	
RCELL TEMP	50 (+/- 1)	Dreegee C	50	50	
BOX TEMP	20-40	Dreegee C	34.1	32.7	
PMT TEMP	7 (+/-1)	Dreegee C	8.0	8.0	
UV lamp	1000-4900	mV	4034.0	4034.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR. Light (Zero Gas)	<100	PPB	29	29	
Dark PMT	(-50) - (+200)	mV	44.7	44.7	
Dark lamp	(-50) - (+200)	mV	5.1	5.1	
SAMP PRES	20-30 constant	IN-Hg-A	28.1	27.8	
<b>Electric Test/Optic Test</b>					
PMT Volts	2000 (+/- 500)	mV	2004	2020	
SO2 Conc	1000 (+/- 250)	PPB	1002	1010	
SO2 Slope	1 (+/- 0.3)		0.920	0.866	
SO2 Offset	< 250	mV	65	130.1	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.6	0.2	
<b>Gas Test Response</b>					
Zero Gas (0.00 PPB)	0	ppb	0.9	0.3	
Span Gas (400 PPB)	400	ppb	397.0	403.0	± 5% of Range

Calibrate By:

Sirir Poonlak

Approve By:

Sarawat Keawsrinual

Date:

Sirir Poonlak

1-Sep-23

Date:

1-Sep-23

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## CO Analyzer Verification Test Report

Calibration Report No.: ES-C6609007

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

Page:1/2

### Instruments Information

<b>Analyzer Type:</b> CO Analyzer <b>Model:</b> CO12E	<b>Manufacturer</b> Environnement SA., France <b>S/N:</b> NCOESACO12E356
--	---

### Calibration System

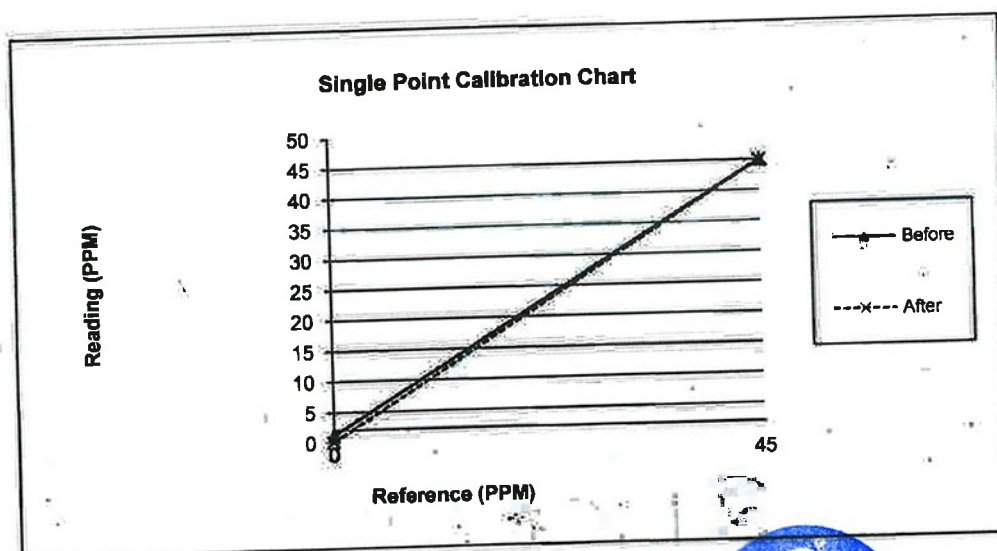
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 24.6 °C

Humidity: 51 %RH

### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	1.098	1.1	45.0	44.99	0.0
After	0.0	0.067	0.1	45.0	45.00	0.0



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## CO Analyzer Verification Test Report

Calibration Report No.: ES-C6609007

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

Page:2/2

Analyzer Signal Values					
Date	1-Sep-23	Time	10:09:00		
Power Supplies					
Option	0.0	mV	+5 V Sensor	5	V
+3.3 V	3.3	V	+24 V	24.2	V
+12 V	11.8	V	+5 V	5.1	V
+24 V	1.1	mV			
Optical Bench					
IR current ratio	884.7	mA	Pbse current	618.2	mV
Optical T <sub>s</sub>	46.0	deg.C	Pbse T <sub>s</sub>	-24.2	deg.C
Measure sig.	506.4	mV	Refer Sig.	456.4	mV
Min sig.	945.0	mV	Max Sig.	2840	mV
Sample					
inst. Ratio	1.109		Ratio	1.105	
Ref. ratio	1.109		Internal Temp.	28.9	deg.C
Source Temp.	46.0	deg.C	Gas Pressure	997	hPa
Up Pressure	947.0	hPa	Flow	59	l/h

Calibrate By:

Sirrat Poonlak

Sirrat Poonlak

Approve By:

Sarawut Keawsrinual

Date: 1-Sep-23

Date:

1-Sep-23



Neediss Supply Instrument Co., Ltd.



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## NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6609005

Page:1/1

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

### Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: 200E	Manufacturer API S/N: ENOAI200E02788
---	---

### 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 24.3 °C

Humidity: 50 %RH

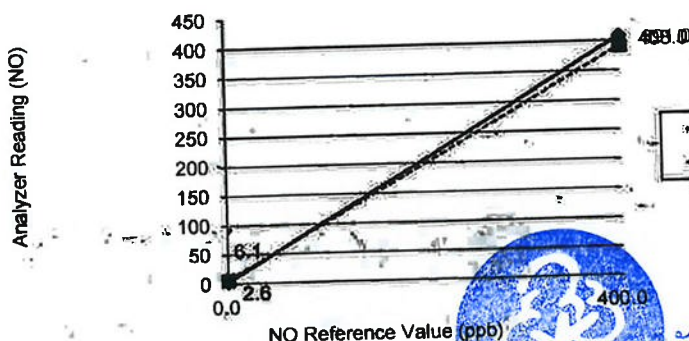
### Calibration Check ( Before adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	3.7	0.0	3.7	387.0	400.0	-1.7
NO <sub>2</sub>	2.4	0.0	2.4	4.0	0.0	0.5
NOx	6.1	0.0	6.1	391.0	400.0	-1.1

### Calibration Check ( After adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	1.7	0.0	1.7	405.0	400.0	0.6
NO <sub>2</sub>	0.9	0.0	0.9	408.2	0.0	0.4
NOx	2.6	0.0	2.6	408.0	400.0	1.0

Single Point Calibration Chart



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## NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6609005

Calibrated Date: 1-Sep-23

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Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Sep-23				
Time	10:10				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.5	0.2	
Sample Flow	500 +/- 50	cc/min	511	532	
Ozone Flow	60-80	cc/min	80	80	
PMT Detector	0-5000	mV	27.4	16.4	
AZERO	-20-150	mV	54.2	54.2	
HVPS	400-900 constant	V	819	819	
DCPS	2500 +/- 200	mV			
RCELL TEMP	50 +/- 1	Dreegee C	50	50	
BOX TEMP	20-35	Dreegee C	33.7	32.9	
PMT TEMP	7 +/- 1	Dreegee C	7.1	7.1	
IZS TEMP	50 +/- 4	Dreegee C			
MOLY Temp	315 +/- 5	Dreegee C	314.4	315.0	
RCEL PRES	4-10 contant	IN-Hg-A	10	10	
SAMP PRES	20-30 contant	IN-Hg-A	29.0	29.4	
NO Slope	1 +/- 0.3		0.820	0.801	
Nox Slope	1 +/- 0.3		0.848	0.813	
NO Offset	-10 to + 150	mV	10.2	15.3	
NOx Offset	-10 to + 150	mV	-2.0	-3.4	
Span and Cal Values					
Zero Value	NO	0	ppb	3.7	1.7
	NOx	0	ppb	6.1	2.6
Span Value	NO	400	ppb	387.0	405.0
	NOx	400	ppb	391.0	408.0

Calibrate By : Sirir Poonlak  
Sirirat Poonlak  
Date: 1-Sep-23

Approve By : Sarawat Keawsrinual  
Date: 1-Sep-23



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## SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S66089004

Calibrated Date: 1-Sep-23

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Page:1/2

### Instruments Information

Analyzer Type: SO2 Analyzer Model: 100A	Manufacturer API S/N: ESOAIT10003032
--	---

### Calibration System

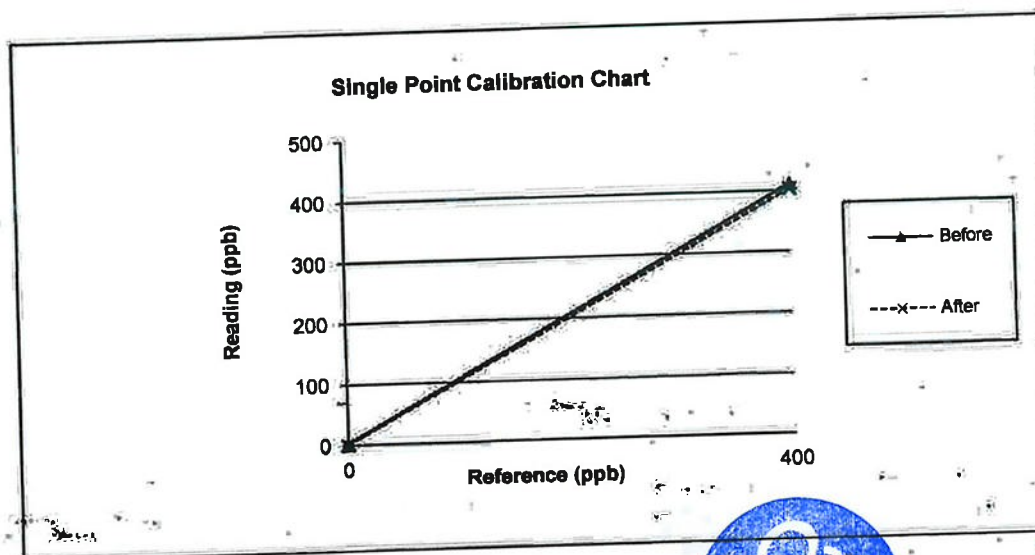
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 25.2 °C

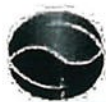
Humidity: 51 %RH

### Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	1.4	1.4	400.0	410.1	1.2
After	0.0	0.6	0.6	400.0	402.6	0.3



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## SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S66089004

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

Page: 2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Sep-23				
Time	8:30				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.4	0.2	
Sample Flow	650 (+/- 50)	cc/min	666	662	
PMT Detector	0 - 5000	mV	24.3	28.2	
Norm PMT Detector	0 - 5000	mV	31.4	34.3	
HVPS	400-900 constant	V	725	725	
DCPS	2500 (+/- 200)	mV			
RCCELL TEMP	50 (+/- 1)	Dreegee C	50	50	
BOX TEMP	20-40	Dreegee C	32.6	35.1	
PMT TEMP	7 (+/-1)	Dreegee C	8.3	8.3	
UV lamp	1000-1900	mV	3251	3251	
Lamp Ratio	30-120	%	87.4	87.4	
STR. Light (Zero Gas)	<100	PPB	38.5	38.5	
Dark PMT	(-50) - (+200)	mV	27.6	27.6	
Dark lamp	(-50) - (+200)	mV	3.6	3.6	
SAMP PRES	20-30 contant	IN-Hg-A	26.9	27.3	
<b>Electric Test/Optic Test</b>					
PMT Volts	2000 (+/- 500)	mV	2010	2006	
SO2 Conc	1000 (+/- 250)	PPB	1005	1003	
SO2 Slope	1 (+/- 0.3)		1.054	1.053	
SO2 Offset	< 250	mV	94.7	90.4	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.4	0.2	
<b>Gas Test Response</b>					
Zero Gas (0.00 PPB)	0	ppb	1.4	0.6	
Span Gas (400 PPB)	400	ppb	410.1	402.6	± 5% of Range

Calibrate By:

Sirir Poon.

Sirirat Poonlak

Date:

1-Sep-23

Approve By:

Sarawut Keawsrinual

Date:

1-Sep-23



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## CO Analyzer Verification Test Report

Calibration Report No.: ES-C6609003

Calibrated Date: 1-Sep-23

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Page: 1/2

### Instruments Information

Analyzer Type: CO Analyzer Model: CO12E	Manufacturer: Environnement SA., France S/N: ECOESACO12E203
--	--

### Calibration System

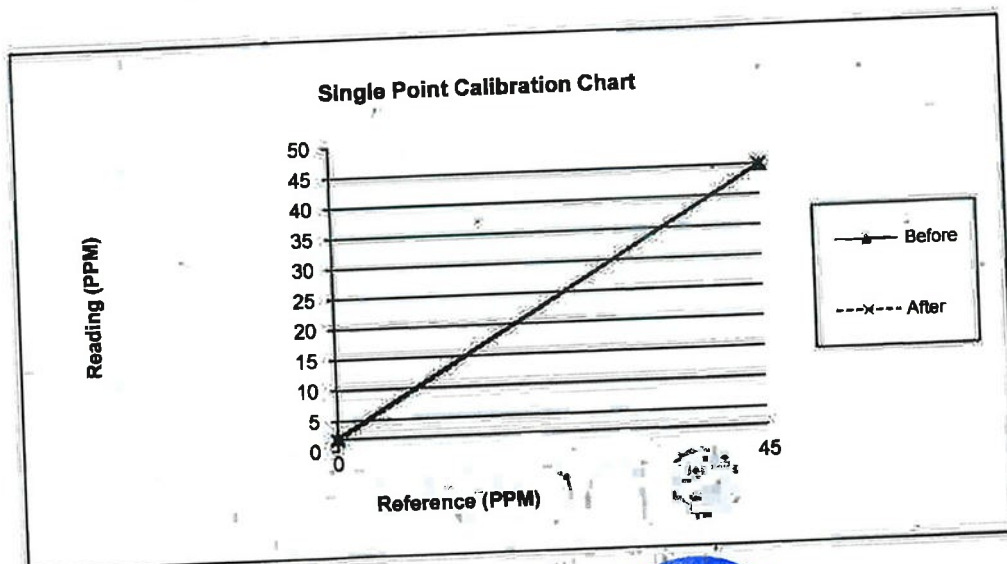
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 24.7 °C

Humidity: 51 %RH

### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	2.096	2.1	45.0	44.89	-0.1
After	0.0	1.783	1.8	45.0	45.00	0.0



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## CO Analyzer Verification Test Report

Calibration Report No.: ES-C6609003

Calibrated Date: 1-Sep-23

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Page: 2/2

Analyzer Signal Values					
Date	1-Sep-23	Time	10:09:00		
Power Supplies					
Option	0.0	mV	+5 V Sensor	5	V
+3.3 V	3.3	V	+24 V	24.2	V
+12 V	11.8	V	+5 V	5.1	V
+24 V	1.1	mV			
Optical Bench					
IR current ratio	884.7	mA	Pbse current	618.2	mV
Optical T:	46.0	deg.C	Pbse T:	-24.2	deg.C
Measure sig.	506.4	mV	Refer Sig.	456.4	mV
Min sig.	945.0	mV	Max Sig.	2840	mV
Sample					
inst. Ratio	1.109		Ratio	1.105	
Ref. ratio	1.109		Internal Temp.	28.9	deg.C
Source Temp.	46.0	deg.C	Gas Pressure	997	hPa
Up Pressure	947.0	hPa	Flow	59	l/h

Calibrate By:

Sirirak Poonlak

Sirirak Poonlak

Approve By:

Sarawut Keawsinual

Date:

1-Sep-23

Date:

1-Sep-23

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## NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6609004

Page:1/1

Calibrated Date: 1-Sep-23

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### Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer  
Model: T200

Manufacturer API  
S/N: ENOAIT20000108

### 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 25.1 °C

Humidity: 52 %RH

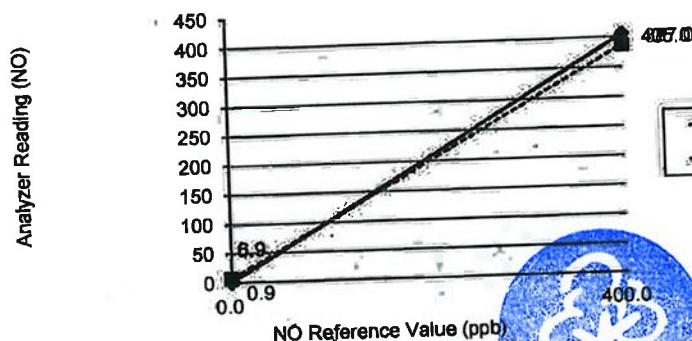
### Calibration Check ( Before adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	4.2	0.0	4.2	380.0	400.0	-2.6
NO <sub>2</sub>	2.7	0.0	2.7	7.0	0.0	0.9
NOx	6.9	0.0	6.9	387.0	400.0	-1.7

### 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	404.0	400.0	0.5
NO <sub>2</sub>	0.2	0.0	0.2	1.0	0.0	0.1
NOx	0.9	0.0	0.9	405.0	400.0	0.6

Single Point Calibration Chart



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## NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6609004

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Calibrated Date: 1-Sep-23

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Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Sep-23				
Time	10:10				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.5	0.2	
Sample Flow	500 +/- 50	cc/min	511	532	
Ozone Flow	60-90	cc/min	80	80	
PMT Detector	0-5000	mV	27.4	16.4	
AZERO	-20-150	mV	54.2	54.2	
HVPS	400-900 constant	V	819	819	
DCPS	2500 +/- 200	mV	-	-	
RCELL TEMP	50 +/- 1	Dreegee C	50	50	
BOX TEMP	20-35	Dreegee C	33.7	32.9	
PMT TEMP	7 +/- 1	Dreegee C	7.1	7.1	
IZS TEMP	50 +/- 4	Dreegee C	-	-	
MOLY Temp	315 +/- 5	Dreegee C	314.4	315.0	
RCEL PRES	4-10 contant	IN-Hg-A	10	10	
SAMP PRES	20-30 contant	IN-Hg-A	29.0	29.4	
NO Slope	1 +/- 0.3		0.820	0.801	
Nox Slope	1 +/- 0.3		0.848	0.813	
NO Offset	-10 to + 150	mV	10.2	15.3	
NOx Offset	-10 to + 150	mV	-2.0	-3.4	
Span and Cal Values					
Zero Value	NO	0	ppb	4.2	0.7
	NOx	0	ppb	6.9	0.9
Span Value	NO	400	ppb	380.0	404.0
	NOx	400	ppb	387.0	405.0

Calibrate By :

Sirirat Poonlak

Date:

Sirirat Poonlak  
1-Sep-23

Approve By :

Sarawut Keawsrinual  
1-Sep-23

Date:



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## SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6609003

Calibrated Date: 1-Sep-23

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Page:1/2

### Instruments Information

Analyzer Type: SO2 Analyzer Model: T100	Manufacturer API S/N: ESOAIT10002033
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### Calibration System

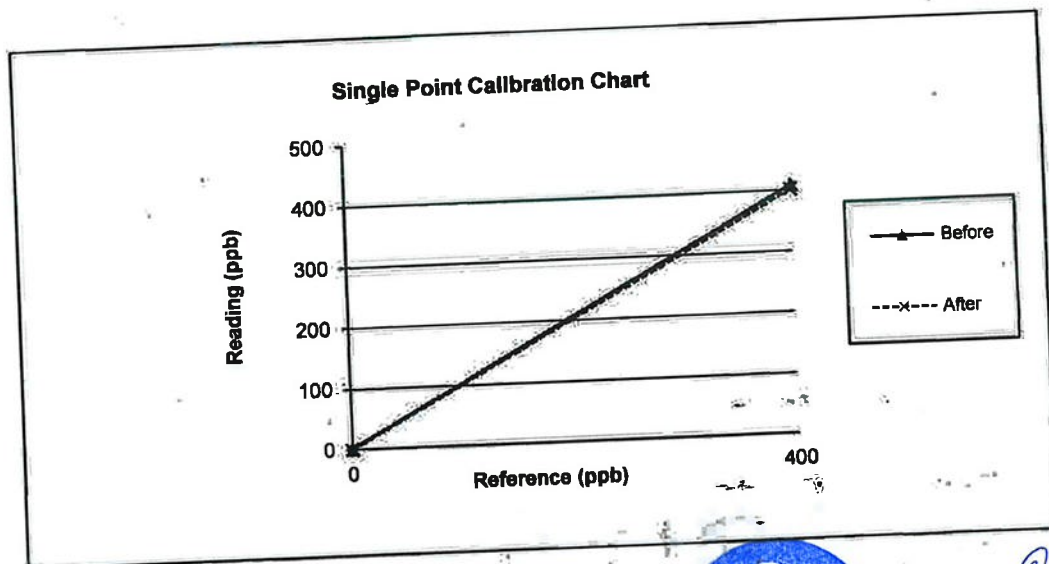
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 25.3 °C

Humidity: 51 %RH

### Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.9	0.9	400.0	408.0	1.0
After	0.0	0.5	0.5	400.0	402.0	0.2



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## SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6609003

Calibrated Date: 1-Sep-23

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Page: 2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Sep-23				
Time	13:10				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.6	0.2	
Sample Flow	650 (+/- 50)	cc/min	663	659	
PMT Detector	0 - 5000	mV	36.5	34.5	
Norm PMT Detector	0 - 5000	mV	34.1	32.8	
HVPS	400-900 constant	V	719	648	
DCPS	2500 (+/- 200)	mV			
RCCELL TEMP	50 (+/- 1)	Dreegee C	50	50	
BOX TEMP	20-40	Dreegee C	34.1	32.7	
PMT TEMP	7 (+/- 1)	Dreegee C	8.0	8.0	
UV lamp	1000-4900	mV	4034.0	4034.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR. Light (Zero Gas)	<100	PPB	29	29	
Dark PMT	(-50) - (+200)	mV	44.7	44.7	
Dark lamp	(-50) - (+200)	mV	5.1	5.1	
SAMP PRES	20-30 constant	IN-Hg-A	28.1	27.8	
<b>Electric Test/Optic Test</b>					
PMT Volts	2000 (+/- 500)	mV	2004	2020	
SO2 Conc	1000 (+/- 250)	PPB	1002	1010	
SO2 Slope	1 (+/- 0.3)	-	0.920	0.866	
SO2 Offset	< 250	mV	65	130.1	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.6	0.2	
<b>Gas Test Response</b>					
Zero Gas (0.00 PPB)	0	ppb	0.9	0.5	
Span Gas (400 PPB)	400	ppb	408.0	402.0	± 5% of Range

Calibrate By:

Sirirak Poonlak

Sirirak Poonlak

Date:

1-Sep-23

Approve By:

Sarawut Keawsrinual

Date:

1-Sep-23



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## CO Analyzer Verification Test Report

Calibration Report No.: ES-C6609006

Calibrated Date: 1-Sep-23

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### Instruments Information

Analyzer Type: CO Analyzer Model: CO12E	Manufacturer: Environnement SA., France S/N: ECOESA CO12E205
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### Calibration System

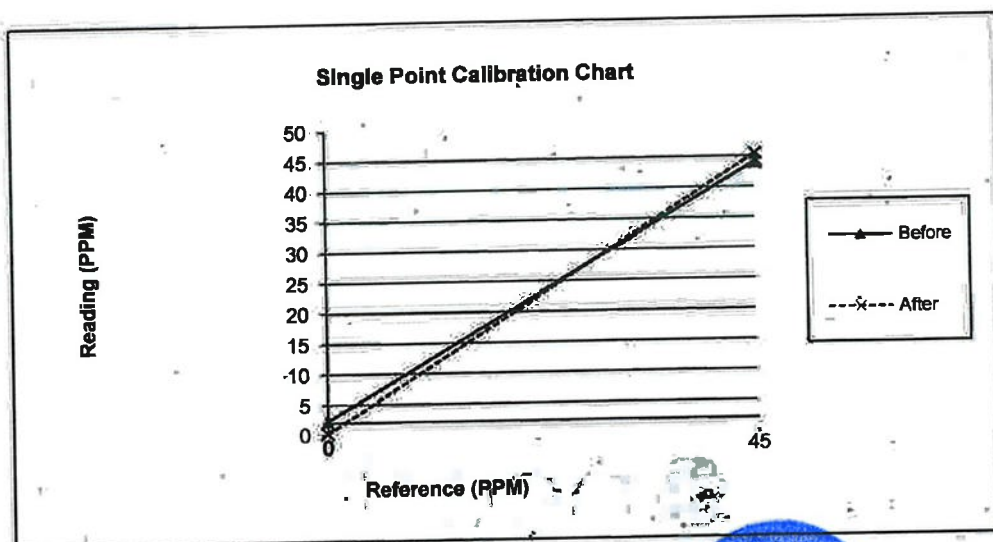
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 24.6 °C

Humidity: 51 %RH

### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	2.276	2.3	45.0	44.15	-1.0
After	0.0	0.205	0.2	45.0	45.46	0.5



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## CO Analyzer Verification Test Report

Calibration Report No.: ES-C6609006

Calibrated Date: 1-Sep-23

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Analyzer Signal Values					
Date	1-Sep-23	Time	10:09:00		
Power Supplies					
Option	0.0	mV	+5 V Sensor	5	V
+3.3 V	3.3	V	+24 V	24.2	V
+12 V	11.8	V	+5 V	5.1	V
+24 V	1.1	mV			
Optical Bench					
IR current ratio	884.7	mA	Pbse current	618.2	mV
Optical T.	46.0	deg.C	Pbse T.	-24.2	deg.C
Measure sig.	506.4	mV	Refer Sig.	456.4	mV
Min sig.	945.0	mV	Max Sig.	2840	mV
Sample					
inst. Ratio	1.109		Ratio	1.105	
Ref. ratio	1.109		Internal Temp.	28.9	deg.C
Source Temp.	46.0	deg.C	Gas Pressure	997	hPa
Up Pressure	947.0	hPa	Flow	59	l/h

Calibrate By:

*Sirir Poonlak*

Approve By:

*Sarawat Keawsrinal*

Sirir Poonlak

Sarawat Keawsrinal

Date:

1-Sep-23

Date:

1-Sep-23



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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.: AP-N6609001

Page:1/1

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

### Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: T200	Manufacturer API S/N: ENOAIT20003573
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### 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 24.4 °C

Humidity: 50 %RH

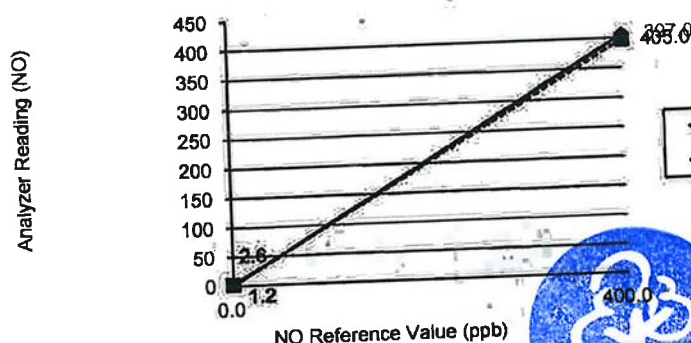
### Calibration Check ( Before adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	1.7	0.0	1.7	384.2	400.0	-2.0
NO <sub>2</sub>	0.9	0.0	0.9	12.8	0.0	1.6
NOx	2.6	0.0	2.6	397.0	400.0	-0.4

### Calibration Check ( After adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.9	0.0	0.9	402.1	400.0	0.3
NO <sub>2</sub>	0.3	0.0	0.3	2.9	0.0	0.4
NOx	1.2	0.0	1.2	405.0	400.0	0.6

Single Point Calibration Chart



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Tel. 02-802-3980-2 Fax. 02-802-3988 E.info@neediss.com**NOx Analyzer Verification Test Report**

Calibration Report No.: AP-N6609001

Page:1/1

Calibrated Date: 1-Sep-23



PM



Onsite

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Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Sep-23				
Time	9:25				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.5	0.2	
Sample Flow	500 +/- 50	cc/min	491	485	
Ozone Flow	80-90	cc/min	-80	80	
PMT Detector	0-5000	mV	85.0	25.0	
AZERO	-20-150	mV	94.1	14.5	
HVPS	400-900 constant	V	734	734	
DCPS	2500 +/- 200	mV	-	-	
RCELL TEMP	50 +/- 1	Dreegee C	50	50	
BOX TEMP	20-35	Dreegee C	34.7	33.6	
PMT TEMP	7 +/- 1	Dreegee C	7.0	7.0	
IZS TEMP	50 +/- 4	Dreegee C	-	-	
MOLY Temp	315 +/- 5	Dreegee C	314.0	314.0	
RCEL PRES	4-10 contant	IN-Hg-A	5.0	5.0	
SAMP PRES	20-30 contant	IN-Hg-A	28.8	27.9	
NO Slope	1 +/- 0.3		1.135	1.197	
Nox Slope	1 +/- 0.3		1.260	1.114	
NO Offset	-10 to + 150	mV	0.8	-3.6	
NOx Offset	-10 to + 150	mV	-2.6	6.1	
<b>Span and Cal Values</b>					
Zero Value	NO	0	ppb	1.7	0.9
	NOx	0	ppb	2.6	1.2
Span Value	NO	400	ppb	384.2	402.1
	NOx	400	ppb	397.0	405.0

Calibrate By:

Sirirat Poonlak

Date:

1-Sep-23

Approve By:

Sarawut Keawarinual

Date:

1-Sep-23

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Envilab Co., Ltd.

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## SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6609001

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

Page:1/2

### Instruments Information

Analyzer Type: SO2 Analyzer Model: T100	Manufacturer API S/N: ESOAIT10002032
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### Calibration System

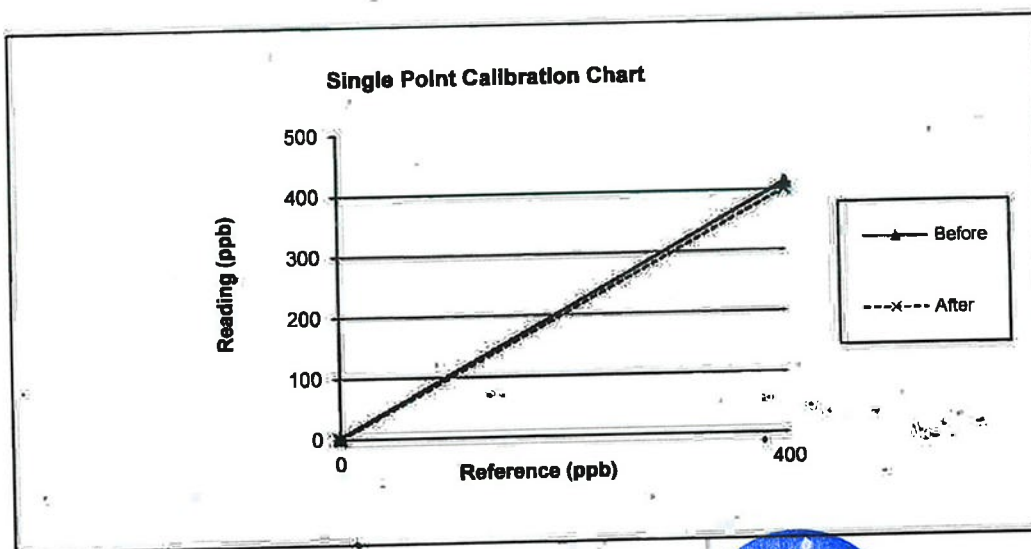
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 25.3 °C

Humidity: 51 %RH

### Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	2.1	2.1	400.0	412.2	1.5
After	0.0	0.5	0.5	400.0	401.0	0.1



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Tel. 02-802-3980-2 Fax. 02-802-3988 E-mail: neediss.com**SO2 Analyzer Verification Test Report**

Calibration Report No.: AP-S6609001

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

Page: 2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Sep-23				
Time	13:10				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.6	0.2	
Sample Flow	650 (+/- 50)	cc/min	663	659	
PMT Detector	0 - 5000	mV	36.5	34.5	
Norm PMT Detector	0 - 5000	mV	34.1	32.8	
HVPS	400-900 constant	V	719	648	
DCPS	2500 (+/- 200)	mV			
RCELL TEMP	50 (+/- 1)	Dreegee C	50	50	
BOX TEMP	20-40	Dreegee C	34.1	32.7	
PMT TEMP	7 (+/-1)	Dreegee C	8.0	8.0	
UV lamp	1000-4900	mV	4034.0	4034.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR. Light (Zero Gas)	<100	PPB	29	29	
Dark PMT	(-50) - (+200)	mV	44.7	44.7	
Dark lamp	(-50) - (+200)	mV	5.1	5.1	
SAMP PRES	20-30 constant	IN-Hg-A	28.1	27.8	
<b>Electric Test/Optic Test</b>					
PMT Volts	2000 (+/- 500)	mV	2004	2020	
SO2 Conc	1000 (+/- 250)	PPB	1002	1010	
SO2 Slope	1 (+/- 0.3)		0.920	0.866	
SO2 Offset	< 250	mV	65	130.1	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.6	0.2	
<b>Gas Test Response</b>					
Zero Gas (0.00 PPB)	0	ppb	2.1	0.5	
Span Gas (400 PPB)	400	ppb	412.2	401.0	± 5% of Range

Calibrate By:

Sirir Poonlak

Sirirat Poonlak

Date:

1-Sep-23

Approve By:

Sarawat Keawsrinal

Date:

1-Sep-23

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## CO Analyzer Verification Test Report

Calibration Report No.: AP-C6609008

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

### Instruments Information

Page:1/2

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

### Calibration System

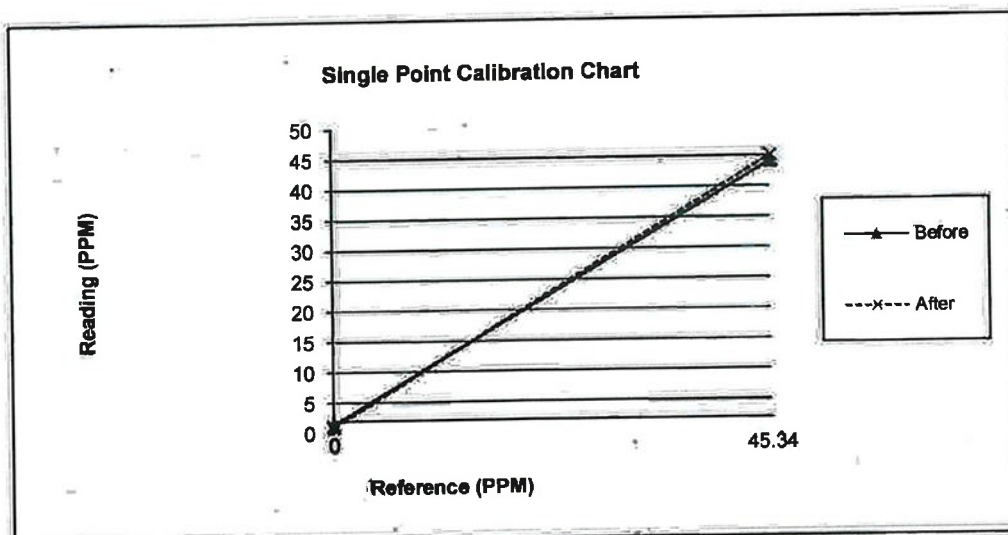
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 24.8 °C

Humidity: 52 %RH

### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	1.30	1.3	45.3	44.1	-1.4
After	0.0	0.98	1.0	45.0	45.0	0.0



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## CO Analyzer Verification Test Report

Calibration Report No.: AP-C6609008

Calibrated Date: 1-Sep-23

☒ PM ☐ Onsite

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Detail	Range	Unit	Before	After	Note
Date	1-Sep-23				
Time	11:00				
Range	0.1-1000 PPM	PPM	50	50	
Stability	(0.1-2PPB )	ppb	0.73	1.11	
CO Measure	2500 - 4800 MV <sub>2</sub>	mV	2913.3	2923.5	
CO Reference	2500 - 4800 MV <sub>2</sub>	mV	2444.3	2421.4	
MR Ratio	1.2 +/- 0.5		1.18	1.21	
Sample Pressure	26 - 30 in-Hg-A	in-Hg-A	29.1	29	
Sample Flow	720 - 880 cc/min	cc/min	890	886	
Sample Temp	44 - 52 deg.C	deg.C	50.3	50.4	
Bench Temp	47 - 49 deg.C	deg.C	48	48	
Wheel Temp	66 - 70 deg.C	deg.C	68.3	68.4	
Box Temp	27 - 50 deg.C	deg.C	35.2	35.1	
PHT drive	250 - 4750 mv <sub>2</sub>	mV	3323.4	3353.6	
Slope	0.800 - 1.200		1.051	1.112	
Offset	0.05 +/- 0.2		0.088	0.088	
<b>Gas Test Response</b>					
Zero Gas	0	PPM	0.2	0.0	
Span Gas	45	PPM	47.6	45.0	± 5% of Range

Calibrate By:

*Sirirat Poonlak*

Sirirat Poonlak

Approve By:

*Sarawat Keawsrinual*

Sarawat Keawsrinual

Date:

1-Sep-23

Date:

1-Sep-23

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## Verification Report of Ambient Air Sampling



PM



Onsite

Report No :

6609002

Validation Date:

1-Sep-23

Instrument :

PM-2.5 Sampler SINGLE

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

NP2TIWILBU0425

Environment :

Humidity(%RH): 58

Temperature (°C) : 26.1

Pressure (mmHg) : 745

### 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	25.0	24.9
Filter	-10.0	0.0	20.0	45.0	29.6	29.5

### 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	16.6 LPM	0.07 LPM



**needliss**

Engineer :

Sirir Poonlak

Sirir Poonlak

Sarawut Keawsrinual

Issu Date:

1-Sep-23

Date:

1-Sep-23

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## Verification Report of Ambient Air Sampling



PM



Onsite UTM

Report No :

6609003

Validation Date:

1-Sep-23

Instrument :

PM-2.5 Sampler SINGLE

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0426

Environment :

Humidity(%RH) :

55

Temperature (°C) :

26.5

Pressure (mmHg) :

745

### 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	25.0	24.9
Filter	-10.0	0.0	20.0	45.0	29.6	29.5

### 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	16.59 LPM	0.08 LPM

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Engineer :

Sirir Poonlak

Neediss Supply Instrument Co., Ltd.

Sarawut Keawsrinal

Issu Date:

1-Sep-23

Date:

1-Sep-23

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## Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6609004

Validation Date:

1-Sep-23

Instrument :

PM-2.5 Sampler SINGLE

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0451

Environment :

Humidity(%RH) : 60

Temperature (°C) : 26.2

Pressure (mmHg) : 745

### 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	25.0	24.9
Filter	-10.0	0.0	20.0	45.0	29.6	29.5

### 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	16.70 LPM	-0.03 LPM

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Engineer :

Sirirat Poonlak

Neediss Supply Instrument Co., Ltd.

Sarawut Keawsrinual

Issu Date:

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Date:

1-Sep-23

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## Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6609005

Validation Date:

1-Sep-23

Instrument :

PM-2.5 Sampler SINGLE

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0452

Environment :

Humidity(%RH) : 61

Temperature (°C) : 26.4

Pressure (mmHg) : 745

### 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	25.0	24.9
Filter	-10.0	0.0	20.0	45.0	29.6	29.5

### 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	16.62 LPM	0.05 LPM

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Engineer:

Sirirak Poonlak

Neediss Supply Instrument Co., Ltd.

Sarawat Keawsrinal

Issu Date:

1-Sep-23

Date:

1-Sep-23

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## Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6609006

Validation Date:

1-Sep-23

Instrument :

PM-2.5 Sampler SINGLE

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0479

Environment :

Humidity(%RH) : 62

Temperature (°C) : 26.4

Pressure (mmHg) : 745

### 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	25.0	24.9
Filter	-10.0	0.0	20.0	45.0	29.6	29.5

### 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	16.63 LPM	0.04 LPM

**neediss**

Engineer :

Sirirat Poonlak

Approve By:

Neediss Supply Instrument Co., Ltd.

Sarawut Keawsrinal

Issu Date:

1-Sep-23

Date:

1-Sep-23

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

**www.neediss.com**

We know the best thing to save environment

รับรองสำเนาถูกต้อง  
หน้า 54/129  
ผู้จัดการฝ่ายควบคุมคุณภาพ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0381

MTC No. EEL. BP. 70/0366

## CALIBRATION CERTIFICATE

Submitted by : Envilab Co.,Ltd.

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

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Sound Level Calibrator

Manufacturer : Bruel & Kjaer

Model : 4230

Serial No. : 1351075

### Ambient Environment

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

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

Ambient Pressure :  $(101.325 \pm 1.500) \text{ kPa}$

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
  2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
  3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
  4. Digital Multimeter Agilent 34401A S/N MY44005560.
  5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
  6. Audio Analyzer Keithley 2015-P S/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 : 14 Mar. 2023

Date of Calibration : 16 Mar. 2023



รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ

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 : rumpat@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  
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Office  
196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
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E-mail : sumalee@tistr.or.th





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0381

MTC No. EEL. BP. 70/0366

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

Nominal Output of Unit Under Test = 94 dB re 20 $\mu$ Pa at 1000 Hz

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

1. Sound Pressure Level

Standard Microphone 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	$\pm 0.10$	$\pm 0.40$ 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	999.0	-1.0	$\pm 1.5$	$\pm 1.0\%$

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.05	$\pm 0.50$	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr. Weerachai Deechaiyae)

Approved by :



Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration 16 Mar. 2023

Date of Issue 17 Mar. 2023

Ref : 2011266031401056001

End of Certificate

2 / 2

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Head Office

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Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
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E-mail : rumpat@tistr.or.th Website: www.tistr.or.th

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

Envilab Co., Ltd.

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  
ผู้จัดการฝ่ายควบคุมคุณภาพ

FM.BL.MTC.002 Rev.4

56/129



# THAI METEOROLOGICAL DEPARTMENT

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

## Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 21 February, 2023

Certification No. 064/23

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุณหภูมิตามวิทยุ

Manufacturer : DYACON

Type : Data Logger MS-100

Serial No. : 130148 ID No. : EWSDCMS1200148

Customer : Envilab Co.,Ltd.(Head Office)  
540.540/1 Soi Bangkhuae 7, Bangkhuae, Bangkhuae  
Bangkok 10160,Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1010.1 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

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

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

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

STANDARD THERMOMETER

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

: Thermoschneider No.918802

STANDARD BAROMETER

Digital Barometer Vaisala Type PTB220 No. 1220015

Calibrated by :

*Watchapol Subwat*

Signed :

Mr. Pisond Promsut

Mr. Watchapol Subwat

Mechanical Engineer

ภาคผนวก 4



Envilab Co.,Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ





# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor Wind Speed & Wind Direction Model WSD-1 F Certification No. 064/23

21 February, 2023

Serial No. 1222

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	7.0	0.04
9.02	-	-	-	9.0	0.02
11.01	-	-	-	10.9	0.11
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	

Calibrated by:

Watarapol

Mr. Watcharapol Subwat

Mechanical Engineer

ภาคผนวก 4



รับรองสำเนาถูกต้อง  
ผู้จัดทำ 58/129



# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor Pressure Model TPH-1 C

Serial No. 6273

Certification No. 064/23

21 February, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1015.44	1015.9	-0.46
1012.89	1013.3	-0.41
1012.60	1013.0	-0.40
1012.46	1012.9	-0.44
1011.79	1012.2	-0.41
1011.30	1011.8	-0.50
1009.87	1010.3	-0.43
1009.66	1010.1	-0.44
1009.40	1009.9	-0.50
1008.71	1009.2	-0.49
1009.00	1009.4	-0.40
1009.28	1009.7	-0.42
1009.94	1010.3	-0.36
1010.66	1011.1	-0.44
1011.21	1011.6	-0.39
1013.01	1013.4	-0.39
1013.40	1013.7	-0.30
1012.91	1013.2	-0.29
1012.44	1012.8	-0.36
1008.09	1008.5	-0.41

Average

Calibrated by :

*Watchapol*

Mr. Watchapol Subwat

Mechanical Engineer







# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor Temperature Model TPH-1 C

Certification No. 064/23

21 February, 2023

Serial No. 6273

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.1	45.0	0.1
30.2	30.1	0.1
15.6	15.6	0.0

Calibrated by :

*Watchapol*

Mr. Watchapol Subwat

Mechanical Engineer



รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ



# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor Humidity Model TPH-1 C

Certification No. 064/23

21 February, 2023

Serial No. 6273

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
88.5	82.2	6.3
61.4	57.4	4.0
41.2	38.6	2.6

Calibrated by :

*Watcharapol Subwat*

Mr. Watcharapol Subwat

Mechanical Engineer



รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ





Date of Issue 21 February, 2023

Certification No. 064/23

Page : 6 of 6

## ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis แบบ TIPPING BUCKET  
Model 7342.026 ID No.EWSDCMS1200148 ทำการสอบเทียบกับแก้วฝนแบบแก้วดวง  
GAUGE DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA LONDON No 71082  
และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ.....

นายวัชรพล ทรัพย์วัฒน์  
วิศวกรชำนาญการ



# THAI METEOROLOGICAL DEPARTMENT

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

## Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 21 February, 2023

Certification No. 068/23

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : NovaLynx

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

Serial No. : EWSNV110WS2501

Customer : ENVILAB Co.,Ltd. (Head Office)  
540, 540/1 Soi Bangkhuae 7, Bangkhuae,  
Bangkok 10160,Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1011.6 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563  
: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

: Ultrasonic Anemometer N.I.S.T. Test Reference Number 731/241460  
Model DA-650-3TV (sensor TR-90AH)  
Serial Number 110730029 (sensor 120629586)

STANDARD THERMOMETER JAPAN QUALITY ASSURANCE ORGANIZATION  
: Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94  
: Thermoschneider No.918802

STANDARD BAROMETER

Calibrated by :   
Mr. Watcharapol Subwat

Mechanical Engineer

Signed :   
Mr. Pisood Promsut

Digital Barometer Vaisala Type PVB220 No. 73220015

(Authorized Signatory)  
for the

Standard Instrument



Envilab Co.,Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ





# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor model

EWSNV110WS2501

Certification No. 068/23

21 February, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacumm	Velocity	Velocity	Correction
	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00				0.3	0.70
3.02				2.5	0.52
5.00				4.9	0.10
7.04				6.9	0.14
9.02				8.9	0.12
11.01				10.8	0.21
13.01				12.8	0.21
15.01				14.8	0.21
17.02				17.1	-0.08
20.02				21.0	-0.98

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRETION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	

Calibrated by:

Halatrapol

Mr. Watcharapol Subwat

Mechanical Engineer

ภาคผนวก 4



รับรองสำเนาถูกต้อง  
หน้า 164/129  
ผู้จัดการฝ่ายควบคุมคุณภาพ



# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor model

EWSNV110WS2501

Certification No. 068/23

Page : 3 of 6

21 February, 2023

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1015.44	1015.32	0.12
1012.89	1013.30	-0.41
1012.60	1012.71	-0.11
1012.46	1012.41	0.05
1011.79	1011.81	-0.02
1011.30	1011.21	0.09
1009.87	1009.71	0.16
1009.66	1009.42	0.24
1009.40	1009.12	0.28
1008.71	1008.52	0.19
1009.00	1008.82	0.18
1009.28	1009.12	0.16
1009.94	1009.71	0.23
1010.66	1010.61	0.05
1011.21	1011.21	0.00
1013.01	1013.60	-0.59
1013.40	1013.90	-0.50
1012.91	1013.30	-0.39
1012.44	1012.70	-0.26
1008.09	1007.92	0.17

Average

Calibrated by:

Watanaspa

Mr. Watcharapol Subwat

Mechanical Engineer



รับรองสำเนาถูกต้อง  
หน้า 65/129  
ผู้จัดการฝ่ายควบคุมคุณภาพ





# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor model EWSNV110WS2501 Certification No. 068/23  
21 February, 2023 Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.1	44.8	0.3
30.2	30.1	0.1
15.6	15.5	0.1

Calibrated by :

*Watchapol*

Mr. Watchapol Subwat  
Mechanical Engineer





# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor model EWSNV110WS2501 Certification No. 068/23

21 February, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
88.5	85.3	3.2
61.4	58.5	2.9
41.2	39.4	1.8

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer







Date of Issue 21 February, 2023

Certification No. 068/23

Page : 6 of 6

## ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis แบบ TIPPING BUCKET  
ID No.EWSNV110WS2501 ทำการสอบเทียบกับแก้วฝนแบบแก้วดวง GAUGE  
DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA LONDON No 71082 และ  
สามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 มม./TIP)



ลงชื่อ..... วัชรพล ทรัพย์วัฒน์

นายวัชรพล ทรัพย์วัฒน์

วิศวกรชำนาญการ



# THAI METEOROLOGICAL DEPARTMENT

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

## Calibration Certificate

Issued by : Calibration & Test Section Meteorological Instruments Bureau

Date of Issue 2 October, 2023

Certification No. 337/23

-Page : 1 of 6

Object เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer NovaLynx

Type Data Logger 110-WS-25DL-D

Serial No. EWSNV110WS2508

Customer : Envilab Co.,Ltd.(Head Office)  
540.540/1 Soi Bangkhuae 7, Bangkhuae, Bangkhuae  
Bangkok 10160,Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.5 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

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

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)


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

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

: Thermoschneider No.918802

STANDARD BAROMETER

: Digital Barometer Vaisala Type PTB220 No. 17220015

Calibrated by : 

Signed :   
Mr. Pisood Promsut

Mr. Watcharapol Subwat

Mechanical Engineer







## THAI METEOROLOGICAL DEPARTMENT

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

### The Result of Calibration

Sensor model

EWSNV110WS2508

Certification No. 337/23

2 October, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacumm	Velocity	Velocity	Correction
	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00				0.4	0.60
3.02				3.0	0.02
5.00				4.7	0.30
7.04				7.0	0.04
9.02				9.7	-0.68
11.01				11.1	-0.09
13.01				12.9	0.11
15.01				15.0	0.01
17.02				16.9	0.12
20.02				20.1	-0.08

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRETION	TESTED WIND DIRECTION
0	0
90	88
180	179
270	

Calibrated by

Watchapol

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section  
Meteorological Instruments Bureau





# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor model

EWSNV110WS2508

Certification No. 337/23

Page : 3 of 6

2 October, 2023

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1005.63	1005.12	0.51
1006.25	1005.85	0.40
1006.22	1005.81	0.41
1006.54	1006.00	0.54
1006.88	1006.30	0.58
1007.36	1006.80	0.56
1007.58	1007.12	0.46
1007.52	1007.13	0.39
1005.60	1005.16	0.44
1005.84	1005.41	0.43
1006.28	1005.85	0.43
1006.60	1006.18	0.42
1007.07	1006.67	0.40
1007.26	1006.86	0.40
1007.38	1006.92	0.46
1005.50	1004.98	0.52
1005.83	1005.43	0.40
1006.55	1006.17	0.38
1007.31	1006.86	0.45
1007.01	1006.64	0.37

Average

Calibrated by

Watcharapol

Mr. Watcharapol Subwat

Mechanical Engineer



รับจ้าง 129 ถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ





## THAI METEOROLOGICAL DEPARTMENT

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

### The Result of Calibration

Sensor model

EWSNV110WS2508

Certification No. 337/23

2 October, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45.4	-0.2
31.1	31.2	-0.1
15.8	15.9	-0.1

Calibrated by:

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





## THAI METEOROLOGICAL DEPARTMENT

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

### The Result of Calibration

Sensor model EWSNV110WS2508 Certification No. 337/23

2 October, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
86.2	81.6	4.6
62.4	59.2	3.2
45.6	42.8	2.8

Calibrated by :

Watchapol

Mr. Watchapol Subwat  
Mechanical Engineer



รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ





Date of Issue 2 October, 2023

Certification No. 337/23

Page: 6 of 6

### ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING  
BUCKET Product No. 7342.026 Mfg. Code. EWSNV110WS2508 ทำการสอบเทียบกับแก้ววัด  
ฝนแบบแก้วตวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON  
No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ วชิรพล ทรัพย์วัฒน์

(นายวชิรพล ทรัพย์วัฒน์)

วิศวกรชำนาญการ



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ



# THAI METEOROLOGICAL DEPARTMENT

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

## Calibration Certificate

Issued by : Calibration & Test Section Meteorological Instruments Bureau

Date of Issue 2 October, 2023

Certification No. 338/23

Page : 1 of 6

Object เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer NovaLynx

Type Data Logger 110-WS-25DL-D

Serial No. EWSNV110WS2509

Customer : Envilab Co.,Ltd.(Head Office)  
540.540/1 Soi Bangkhuae 7, Bangkhuae, Bangkhuae  
Bangkok 10160,Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.8 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563  
: HOOK GAGE NO 1425 : Wind Aloft Plotting Board  
N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec  
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)  
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec  
STANDARD THERMOMETER : Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94  
Thermoschneider No.918802

STANDARD BAROMETER

Calibrated by :   
Mr. Watcharapol Subwat  
Mechanical Engineer

Signed :   
Mr. Pisoot Promsut

Digital Barometer Vaisala Type PTB220 No. 1200015







# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor model

EWSNV110WS2509

Certification No. 338/23

2 October, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00				0.4	0.60
3.02				2.7	0.32
5.00				4.5	0.50
7.04				7.0	0.04
9.02				9.0	0.02
11.01				11.0	0.01
13.01				13.0	0.01
15.01				15.0	0.01
17.02				17.0	0.02
20.02				20.1	-0.08

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	89
180	175
270	266

Calibrated by

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Calibration & Test Section  
Meteorological Instruments Bureau





# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor model

EWSNV110WS2509

Certification No. 338/23

2 October, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1005.63	1005.12	0.51
1006.25	1005.65	0.60
1006.22	1005.72	0.50
1006.54	1006.00	0.54
1006.88	1006.30	0.58
1007.36	1006.80	0.56
1007.58	1007.04	0.54
1007.52	1007.02	0.50
1005.60	1005.02	0.58
1005.84	1005.35	0.49
1006.28	1005.72	0.56
1006.60	1006.06	0.54
1007.07	1006.54	0.53
1007.26	1006.73	0.53
1007.38	1006.86	0.52
1005.50	1004.98	0.52
1005.83	1005.34	0.49
1006.55	1006.04	0.51
1007.31	1006.86	0.45
1007.01	1006.51	0.50

Average

Calibrated by:

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer



รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ  
หน้า 77/129





## THAI METEOROLOGICAL DEPARTMENT

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

### The Result of Calibration

Sensor model EWSNV110WS2509 Certification No. 338/23  
2 October, 2023 Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45.3	-0.1
31.1	31.1	0.0
15.8	15.9	-0.1

Calibrated by ;

*Watchapol*

Mr. Watchapol Subwat  
Mechanical Engineer



รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ



# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor model EWSNV110WS2509 Certification No. 338/23

2 October, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
86.2	82.6	3.6
62.4	59.2	3.2
45.6	42.7	2.9

Calibrated by :

*Watchapol*

Mr. Watchapol Subwat

Mechanical Engineer







Date of Issue 2 October, 2023

Certification No. 338/23

Page: 6 of 6

## ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING  
BUCKET Product No. 7342.026 Mfg. Code. EWSNV110WS2509 ทำการสอบเทียบกับแก้ววัด  
ฝนแบบแก้วทรง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON  
No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.01 in/TIP)



ลงชื่อ วัชรพล ทรัพย์วัฒน์

(นายวัชรพล ทรัพย์วัฒน์)

วิศวกรชำนาญการ



รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ



# THAI METEOROLOGICAL DEPARTMENT

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

## Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 2 October, 2023

Certification No. 339/23

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : NovaLynx

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

Serial No. : EWSNV110WS2511

Customer : Envilab Co.,Ltd.(Head Office)  
540.540/1 Soi Bangkhae 7, Bangkhae, Bangkhae  
Bangkok 10160,Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1007.1 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

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

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

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

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

: Thermoschneider No.918802

STANDARD BAROMETER

: Digital Barometer Vaisala Type PTB220 No. 14230015

Calibrated by : 

Signed :

Mr. Pisood Promsut

Mr. Watcharapol Subwat

Mechanical Engineer







## THAI METEOROLOGICAL DEPARTMENT

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

### The Result of Calibration

Sensor model

EWSNV110WS2511

Certification No. 339/23

2 October, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacumm inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00				0.4	0.60
3.02				2.7	0.32
5.00				4.9	0.10
7.04				7.0	0.04
9.02				8.9	0.12
11.01				11.0	0.01
13.01				12.9	0.11
15.01				15.0	0.01
17.02				16.9	0.12
20.02				20.0	0.02

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRETION	TESTED WIND DIRECTION
0	0
90	91
180	179
270	270

Calibrated by :

*Watcharapol*

Mr. Watcharapol Subwat

Mechanical Engineer



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ



# THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Sensor model EWSNV110WS2511

Certification No. 339/23

2 October, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1005.63	1004.80	0.83
1006.25	1005.42	0.83
1006.22	1005.40	0.82
1006.54	1005.68	0.86
1006.88	1006.13	0.75
1007.36	1006.53	0.83
1007.58	1006.79	0.79
1007.52	1006.81	0.71
1005.60	1004.83	0.77
1005.84	1005.04	0.80
1006.28	1005.44	0.84
1006.60	1005.82	0.78
1007.07	1006.21	0.86
1007.26	1006.37	0.89
1007.38	1006.54	0.84
1005.50	1004.62	0.88
1005.83	1004.98	0.85
1006.55	1005.68	0.87
1007.31	1006.42	0.89
1007.01	1006.13	0.88

Average

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer







## THAI METEOROLOGICAL DEPARTMENT

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

### The Result of Calibration

Sensor model

EWSNV110WS2511

Certification No. 339/23

2 October, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45.4	-0.2
31.1	31.0	0.1
15.8	15.9	-0.1

Calibrated by :

*Watchapol*

Mr. Watchapol Subwat

Mechanical Engineer





## THAI METEOROLOGICAL DEPARTMENT

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

### The Result of Calibration

Sensor model EWSNV110WS2511 Certification No. 339/23

2 October, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
86.2	82.1	4.1
62.4	58.5	3.9
45.6	43.8	1.8

Calibrated by :

*Watchapol*

Mr. Watchapol Subwat

Mechanical Engineer







Date of Issue 2 October, 2023

Certification No. 339/23

Page: 6 of 6

## ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING  
BUCKET Product No. 7342.026 Mfg. Code. EWSNV110WS2511 ทำการสอบเทียบกับแก้ววัด  
ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON  
No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ.....

(นายวัชรพล ทรัพย์วัฒน์)

วิศวกรชำนาญการ

# 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



NSO-TISI-TIS17025  
CALIBRATION 0030

## Certificate of Calibration

Page : 1 of 2

**Certificate No. :** 64-300152-5

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

**Equipment :** Cylinder  
**Manufacturer :** PYREX **Class :** A  
**Capacity :** 500 ml **Graduation :** 5 ml  
**ID No. :** C-WW-031/19

**Environment :** Ambient Temperature :  $(23 \pm 2)$  °C  
Relative Humidity :  $(50 \pm 15)$  %  
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

The Uncertainties are for a confidence probability of approximately 95%

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





# CAL

Calibratech Co.,Ltd.

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

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

## Certificate of Calibration

Page : 2 of 2

Certificate No. : 64-300152-5

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 )
250	249.55
500	499.70

Uncertainty of measurement with in  $\pm$  0.12 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 -



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. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23CHO128  
Page.: 1 of 3

## Certificate of Calibration

Equipment :	Spectrophotometer
Manufacturer :	Agilent
Model :	Cary60 (G6860A)
Serial No. :	MY17490026
ID No. :	ELABSPECTRO002
Condition As-Received:	Used Item
Received Date :	09 March 2023
Calibration Date :	09 March 2023
Reference :	2303-0046ON-1
Submitted by :	Envilab Co.,Ltd (Head office) 540, 540/1 Sol Bangkhao 7, Bangkhao, Bangkhao, Bangkok 10160
Calibration Place :	B301 CO-THC ROOM
Ambient Temperature :	( 23.6 - 22.5 ) °C (On-Site)
Relative Humidity :	( 75 - 77 ) % (On-Site)
Calibration Procedure :	In - house method : CP-OCH4 based on ASTM E 275-01

Calibrated by : Uthen Kankawi

Approved by :

*Malee*

Approved Signatory

- ( / ) Malee Butkruea  
( ) Salthip Meangmai  
( ) Warakorn Lerngagtrakul

Issue Date :

15 March 2023

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.



รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ

A 0052680





Cert. No. : 23CHO128

Page : 2 of 3

**Condition of calibration result****1. Reference Standard Material :**

<u>Material</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1. Absorbance Standard set	32588	103225	08 July 2024
2. Absorbance Standard set	32592	104226	04 Aug 2024
3. Absorbance Standard set	39130	106269	10 Oct 2024
4. Wavelength Standard set	29829	94776	02 Sep 2023
5. Wavelength Standard set	29829	94777	02 Sep 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certificate is traceable to the International System of Unit maintained at :

- National Physical Laboratory (NPL), The United Kingdom of Great Britain and Northern Ireland
- National Institute of Standards and Technology (NIST), The United States of America

4. Spectral BandWidth : 1.5 nm  
Scan Speed : 18 nm/min

**Calibration Results : without adjustment****Wavelength Accuracy**

<b>Certified Values of Reference Material ( nm )</b>	<b>UUC Reading ( nm )</b>	<b>Uncertainty of Measurement ( <math>\pm</math> nm )</b>	<b>Coverage Factor <i>k</i></b>
241.72	242.0	0.13	2.00
360.93	360.5	0.13	2.00
538.59	538.6	0.15	2.05
740.72	741.3	0.16	2.05
879.28	879.2	0.16	2.05



รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ

a 1152950



Cert. No. : 23CHO128

Page : 3 of 3

**Calibration Results : without adjustment****Photometric Accuracy**

Wavelength (nm)	Certified Values of Reference Material ( Abs )	UUC Reading ( Abs )	Uncertainty of Measurement ( $\pm$ Abs )	Coverage Factor k
350.0	Zero	0.0000	0.0046	2.00
	0.4253	0.4249	0.0051	2.00
	Zero	0.0000	0.0050	2.00
	0.6389	0.6388	0.0056	2.00
420.0	Zero	0.0000	0.0028	2.00
	0.5796	0.5790	0.0028	2.00
	0.7105	0.7102	0.0028	2.00
	1.0186	1.0171	0.0028	2.00
546.1	Zero	0.0000	0.0028	2.00
	0.5281	0.5277	0.0028	2.00
	0.6962	0.6963	0.0028	2.00
	0.9984	0.9978	0.0028	2.00

**Remark**

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- The Potassium Dichromate filled cells are measured against a Perchloric acid blank.

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 %.

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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



## Certificate of Calibration

**Certificate No. :** 66-400477-1

**Page : 1 of 2**

**Submitted by :** Envilab Co.,Ltd.

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

**Equipment :** Water Bath

**Manufacturer :** LAUDA

**Model :** A 24

**Range :** N/A °C

**Resolution :** 0.1 °C

**Serial No. :** CN21001882

**ID No. :** ELABWBALPHA241

**Environment :** On site calibration was carried out at the Laboratory,ENVILAB CO.LTD

**Ambient Temperature :** (22.5 to 23.0) °C

**Relative Humidity :** (40 to 45) %

**Line Voltage :** (228.0 to 230.1)V

**Date of Received :** 25 August 2023

**Date of Calibration :** 25 August 2023

**Date of Issue :** 25 August 2023

**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>
400046 & 400024	66-400184-2	06 Oct 2023	National Institute of Metrology Thailand (NIMT)

Approved by :

( Bunjerd Masri )

Supervisor



รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ

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

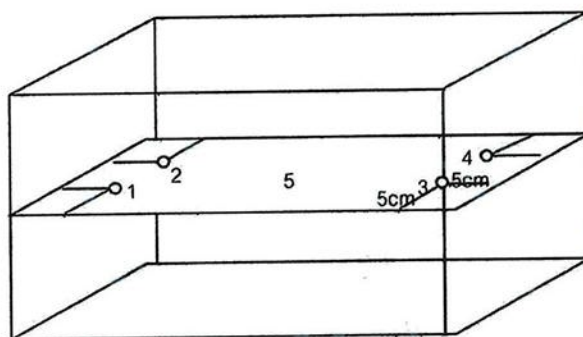
**Certificate No. : 66-400477-1**

**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					Uncertainty ( ± ° C )	Measured Uniformity ( ° C )	Measured Stability ( ° C )
			No.							
			1	2	3	4	5			
44.5	44.5	44.5	44.52	44.50	44.50	44.50	44.50	0.18	0.06	0.01

**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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EnviLab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ





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NSC-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

Certificate No. : 66-420026-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : pH Meter with electrode

pH meter

Manufacturer : Horiba

Model : F-74BW-G

Range : N/A pH

Resolution : 0.001 pH

Serial No. : B41J0001

ID No. : ELABPHHB74BW01

Electrode

Model : 9615S

Serial No. : 9X1K0003

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

Ambient Temperature : (23.8 to 24.8)°C

Relative Humidity : (54 to 57) %

Date of Received : 23 March 2023

Date of Calibration : 23 March 2023

Date of Issue : 24 March 2023

Calibrated by : Bunjerd Masri

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

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

### 1. Multiproduct Calibrator

ID No.	Cert. No.	Due Date	Traceability
400005	SG-E-00473/64	27 Aug 2023	National Institute of Metrology Thailand (NIMT)

### 2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61270213	879344	13 Mar 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.986	61267169	879345	13 Mar 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.010	61260481	879346	13 Mar 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :

( Bunjerd Masri )

Supervisor



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## Certificate of Calibration

Certificate No. : 66-420026-1

Page : 2 of 2

### Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

Performing standard curve by Multiproduct Calibrator at pH (4,7,10)

Adjustment Curve at nominal pH	Applied Voltage ( mV )	Nominal Value ( pH )	UUC Reading		Correction ( mV )	Uncertainty ( ± mV )
			( pH )	( mV )		
4, 7, 10	177.4800	4	4.00	177.5	0.0	0.12
	0.0000	7	7.00	0.0	0.0	0.086
	-177.4800	10	10.00	-177.6	0.1	0.12

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	4.008	4.006	0.002	0.0084
	6.986	7.000	-0.014	0.0094
	10.010	10.008	0.002	0.014

### 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.

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NSC-TISI-TIS17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 66-400546-1

**Page : 1 of 2**

**Submitted by :** Envilab Co., Ltd.

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

**Equipment :** Air Chamber (Incubator)

**Manufacturer :** M-LAB

**Model :** BIC-140

**Range :** N/A °C

**Resolution :** 0.1 °C

**Serial No. :** 100613-1

**ID No. :** ELABBODC140N01

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

**Ambient Temperature :** (25.0 to 26.0) °C

**Relative Humidity :** (50 to 55) %

**Line Voltage :** (224.0 to 225.0) V

**Date of Received :** 03 October 2023

**Date of Calibration :** 03 October 2023

**Date of Issue :** 06 October 2023

**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 RTD Probe

ID No.

Cert. No.

Due Date

Traceability

400029 & 400048

66-400454-1

05 Feb 2024

National Institute of Metrology Thailand (NIMT)

Approved by :

( Surachai Promthong )

Laboratory Manager



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ

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## Certificate of Calibration

Certificate No. : 66-400546-1

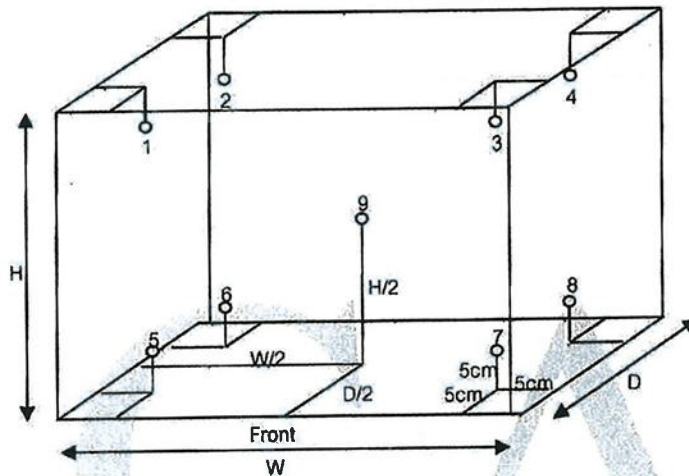
Page : 2 of 2

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 m<sup>3</sup>

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	20.18	19.98	20.08	19.97	20.39	20.36	20.20	20.18	20.28	0.30

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
20.0	20.0	20.0	0.35	0.03	0.47

**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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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.: 23TW79  
Page.: 1 of 2

## Certificate of Testing

Equipment :	DO Meter
Manufacturer :	Hanna
Model :	HI9146-04
Serial No. :	G00007931
ID No. :	ELABDOHI914601
Received Date :	17 March 2023
Test Date :	20 March 2023
Reference :	2303-0651DN-1
Submitted by :	Envilab Co.,Ltd (Head office) 540, 540/1 Soi Bangkhæ 7, Bangkhæ, Bangkhæ, 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
Tested by :	Walalak Sirithean
Approved by :	 Approved Signatory
	( / ) Malee Butkruea ( ) Saithip Meangmai ( ) Warakorn Lernagtrakul
Issue Date :	23 March 2023



รับรองสำเนาถูกต้อง  
ผู้จัดการฝ่ายควบคุมคุณภาพ

B 0310344



Cert.No.: 23TW79  
Page.: 2 of 2

**Condition of this result of calibration**

**1. Reference Standard Instruments :**

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Burette	-	130BU10	21CG1389	25 Mar 2023
2) Balance	1126143764	140RC004	22MM50	20 Sep 2023

**2. Standard Material :-**

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

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

Dissolved Oxygen Probe No.: KC1A01TAF

<u>Titration Method</u> (Azide Modification Method) (mg/L)	<u>DO Meter</u> <u>Reading</u> (mg/L)	<u>Standard Deviation</u> (mg/L)
8.14	8.16	0.0084

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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## Certificate of Calibration

Page : 1 of 2

**Certificate No. :** 66-400156-1

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

**Equipment :** Water Bath  
Manufacturer : Memmert Model : WNB 14  
Range : N/A °C Resolution : 0.1 °C  
Serial No. : L412.2222 ID No. : ELABWBWNB14N01

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

Ambient Temperature : (25.5 to 26.0) °C

Relative Humidity : (40 to 45) %

Line Voltage : (224.2 to 225.2) V

**Date of Received :** 23 March 2023

**Date of Calibration :** 23 March 2023

**Date of Issue :** 25 March 2023

**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

65-400549-1

22 Apr 2023

National Institute of Metrology Thailand (NIMT)

Approved by :

( Bunjerd Masri )

Supervisor



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## Certificate of Calibration

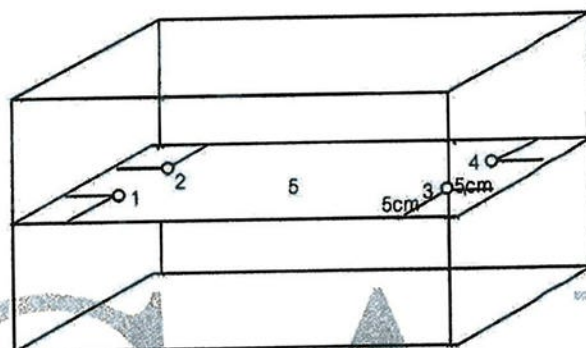
Certificate No. :66-400056-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UVC Condition As-Received : Good

Function : Temperature measurement



Front:

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor					Uncertainty (± °C)	Measured Uniformity (°C)	Measured Stability (°C)
			No.							
			1	2	3	4	5			
95.0	95.0	95.0	95.41	95.41	95.68	95.62	95.57	0.22	0.33	-0.10

**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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Envilab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ





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NSC-TISI-TIS17025  
CALIBRATION 0030

## Certificate of Calibration

Page : 1 of 2

**Certificate No. :** 66-400156-2

**Submitted by :** Envilab Co., Ltd.

540, 540/1 Soi Bangkhao 7, Bangkhao, 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. :** ELABHAOVEN0600

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

**Ambient Temperature :** (30.0 to 30.8) °C

**Relative Humidity :** (60 to 65) %

**Line Voltage :** (224.2 to 225.2) V

**Date of Received :** 23 March 2023

**Date of Calibration :** 23 March 2023

**Date of Issue :** 25 March 2023

**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 & 400030 65-400548-1

26 Apr 2023

National Institute of Metrology Thailand (NIMT)

Approved by :

( Bunjerd Masri )

Supervisor

รับรองสำเนาถูกต้อง



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## Certificate of Calibration

Certificate No. : 66-400156-2

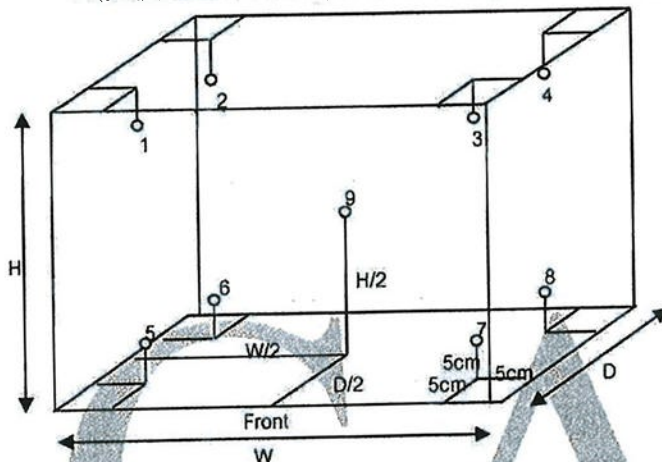
Page : 2 of 2

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 m<sup>3</sup>

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	104.3	104.3	104.3	104.2	104.3	104.1	103.7	104.0	104.3	0.70
110.0	109.5	109.5	110.3	110.3	110.3	110.3	110.3	110.1	109.7	110.0	110.3	0.71
180.0	179.0	179.0	179.4	180.1	180.3	180.1	180.6	179.9	179.2	179.6	180.4	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	0.7	0.1	0.8
110.0	109.5	109.5	0.8	0.1	1.0
180.0	179.0	179.0	1.4	0.2	1.5

**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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NSO-TISI-TIS17025  
CALIBRATION 0030

## Certificate of Calibration

Certificate No. :

66-200066-2

Page : 1 of 2

Submitted by :

Envilab Co., Ltd.

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

Equipment :

Electronic Balance

Manufacturer : METTLER TOLEDO Model : XSR205DU

Serial No. : B911363567 ID No. : ELABBALANCEN06

Capacity : 220 g Resolution : 0.00001g/81g, 0.0001g/220g

Environment :

On site calibration was carried out at the B304 Balance Room, Envilab Co., Ltd.

Ambient Temperature : (24.6 to 24.9) °C

Relative Humidity : (57.0 to 67.8) %

Air Pressure : 1015.0 mbar

Date of Received :

01 March 2023

Date of Calibration :

01 March 2023

Date of Issue :

04 March 2023

Calibrated by :

Akaradath Thippichai

Calibration Method :

In-house method CAL-M2001 based on UKAS Publication ref : LAB 14

Edition 7 - November 2022

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

Standard Weights

ID No.

Cert. No.

Due Date

Traceability

E261-E2624

C02222345

10 Nov 2023

National Institute of Metrology (Thailand), (NIMT)

Approved by

(Surachai Promthong)

Laboratory Manager

Envilab Co., Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ

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## Certificate of Calibration

Certificate No. : 66-200066-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty $\pm$ (g)
0.1	0.00000	0.000014
0.5	0.00002	0.000022
1	0.00000	0.000026
2	0.00001	0.000034
5	-0.00001	0.000043
10	0.00000	0.000053
50	0.00004	0.00011
100	-0.0001	0.00020
150	-0.0001	0.00038
200	-0.0002	0.00038

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2.07$ , providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g  
A B C D E  
0.00000 0.00000 0.00001 0.00001 0.00000 g

C	D
E	
B	A

Repeatability

Load test : 200 g  
Stddev. : 0.000042 g

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ผู้จัดการฝ่ายควบคุมคุณภาพ





## Certificate of Calibration

**Page : 1 of 2**

**Certificate No. : 66-200066-1**

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 :** 0.0001 g

**Environment :** On site calibration was carried out at the B304 Balance Room, Envilab Co., Ltd.

Ambient Temperature : (21.7 to 22.0) °C

Relative Humidity : (47.0 to 47.1) %

**Air Pressure :** (1015.0 to 1016.0) mbar

**Date of Received :** 01 March 2023

**Date of Calibration :** 01 March 2023

**Date of Issue :** 04 March 2023

**Calibrated by :** Akaradath Thippichai

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

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

### Standard Weights

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
E261-E2624	C02222345	10 Nov 2023	National Institute of Metrology (Thailand), (NIMT)

Approved by

( Surachai Promthong )

Laboratory Manager

Envilab Co., Ltd.

ry Manager  
ผู้จัดการฝ่ายควบคุมคุณภาพ

The Uncertainties are for a confidence probability of approximately 95%

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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

Page : 2 of 2

**Certificate No. : 66-200066-1**

**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	0.0000	0.000083
0.5	0.0000	0.000084
1	0.0000	0.000085
2	0.0000	0.000099
5	0.0000	0.000110
10	0.0000	0.000092
20	0.0000	0.000120
50	0.0000	0.00012
100	0.0000	0.00020
120	-0.0001	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  $k =$  providing a level of confidence of approximately 95%

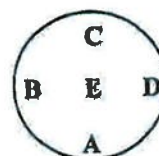
2.00.

### Eccentric error

**Load test :** 20 g

**A            B            C            D            E**

0.0001 0.0001 0.0000 0.0000 0.0000 g



### Repeatability

Load test : 100 g

Stdev. : 0.00004 g

- o o -



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## Certificate of Calibration

Page : 1 of 2

Certificate No. : 66-300140-2

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-003/23

Environment : Ambient Temperature :  $(23 \pm 2)$  °C  
Relative Humidity :  $(50 \pm 15)$  %  
Air Pressure : 1009.9 mbar

Date of Received : 15 March 2023

Date of Calibration : 20 March 2023

Date of Issue : 20 March 2023

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

65-200370-1

02 Jun 2023

National Institute of Metrology (Thailand) (NIMT)

Approved by :

( Wipa Tovadee )

Supervisor



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## Certificate of Calibration

**Certificate No. :** 66-300140-2

**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	29.98
50	50.12

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 -

D.



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NSQ-TISI-TIS17025  
CALIBRATION 0030

## Certificate of Calibration

Certificate No. : 66-300140-6

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 : 1000 ml

Graduation : 10 ml

ID No. : C-WW-006/23

Environment : Ambient Temperature :  $(23 \pm 2)$  °C

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

Air Pressure : 1009.9 mbar.

Date of Received : 15 March 2023

Date of Calibration : 20 March 2023

Date of Issue : 20 March 2023

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	65-200370-1	02 Jun 2023	National Institute of Metrology (Thailand) (NIMT)

Approved by :

( Wipa Tovadce )

Supervisor



รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

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## Certificate of Calibration

Certificate No. : 66-300140-6

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	499.57
1000	999.89

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 -

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NSC-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

Certificate No. : 66-300140-3

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 : 100 ml Graduation : 1 ml  
ID No. : C-WW-002/22

Environment : Ambient Temperature :  $(23 \pm 2)$  °C  
Relative Humidity :  $(50 \pm 15)$  %  
Air Pressure : 1009.9 mbar.

Date of Received : 15 March 2023  
Date of Calibration : 20 March 2023  
Date of Issue : 20 March 2023  
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	65-200370-1	02 Jun 2023	National Institute of Metrology (Thailand) (NIMT)

Approved by :

( Wipa Tovadee )

Supervisor



Envilab Co.,Ltd.

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## Certificate of Calibration

**Certificate No. :** 66-300140-3

**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 )
50	49.82
100	99.84

Uncertainty of measurement with in  $\pm$  0.063 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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## Certificate of Calibration

**Certificate No. :** 65-300656-1

**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

**Delivery Time :** 2.19 sec.

Nominal Volume ( ml )	Measuring Volume ( ml )
5	5.0011
15	14.9694
25	24.9866

Uncertainty of measurement with in  $\pm$  0.0067 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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# AIRFLOW CALIBRATION CO.,LTD.

## CERTIFICATION OF TEST REPORT

Equipment : Biological Safety Cabinet (Class II)  
Manufacturer : Heal Force  
Model : Hfsafe 1200LC  
Serial Number : EX042012LC5497  
Identification Number : ELABMICROBSC01  
Report Number : B223337  
Issued Date : 9 March 2023  
Job Number : B223337  
Page : 1 of 7 Pages

Customer : ENVILAB CO.,LTD. (HEAD OFFICE)  
540, 540/1 Soi Bangkhao 7, Bangkhao, Bangkhao, Bang 10160

Environment Condition : Temperature: 24.9 °C ± 0.8 °C  
Humidity: 51.9 %RH ± 0.6 %RH  
Voltage: 221.5 VAC ± 0.3 VAC

Test Place : ENVILAB CO.,LTD. (HEAD OFFICE) Laboratory Floor 3

Test By : Mr.Achira Kaewpaatoom

Test Date : 1 March 2023

Due Date : 1 March 2024

Test Procedure : EN 12469: 2000 Biotechnology performance criteria for microbiological safety cabinet  
AS 1807.23: 2000 Determination of intensity of radiation from germicidal ultraviolet lamp

Traceability : Velocity test is traceable to TAT Certificate Number :TTH-0-59155  
Leak test of HEPA filter is traceable to NIST Certificate Number :ST673/0922  
Illumination test is traceable to TIC Certificate Number :E-2302026  
Ultraviolet Radiation test is traceable to EEI Certificate Number :CO20220115EA  
Sound test is traceable to SP Certificate Number :SPR22030177-1

This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).

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Mr. Watcharin Tavera

Authorized Signatory

AIR FM - SV - 08 : 01 Sep 2021

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<http://www.airflowcalibration.com> E-mail : [bm.airflow@gmail.com](mailto:bm.airflow@gmail.com) , [nop.airflow@gmail.com](mailto:nop.airflow@gmail.com)  
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# AIRFLOW CALIBRATION CO., LTD.

Continuation of the Certificate of Test Report Number: B223337

Page 2 of 7 Pages

## Primary Test Results

### 1. Downflow Velocity Test

#### Test equipment used

- Thermo anemometer
- Brand: Testo
- Model: 425
- Serial number: 3101751
- Calibration due: 31-Oct-2023

**Instruction:** Work opening in normal positions. With the anemometer inside the MSC, make air velocity measurements in horizontal plane 50 mm to 100 mm above the top edge of the front aperture. Make measurements over a period of at least 1 min in each position. Measure in 2 rows along a line 1/4 of the depth of the working space forward of the rear wall and along a line the same distance behind the

Back

0.36	0.35	0.36	0.37
0.37	0.37	0.36	0.37

Front

#### Characteristic of downflow velocities

• Mean downflow velocity to achieve product protection : 0.25 m/s - 0.50 m/s. All measurements should be within $\pm 20\%$ % of mean values.	0.37	0.37	0.35	0.29	-	0.44
--	------	------	------	------	---	------

Result Summary : Pass



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# AIRFLOW CALIBRATION CO.,LTD.

Continuation of the Certificate of Test Report Number : B223337

Page 3 of 7 Pages

## 2. Inflow Velocity Test

### Test equipment used

- Thermo anemometer ● Brand: Testo ● Model: 425
- Serial number: 3101751 ● Calibration due: 31-Oct-2023

### Exhaust Measurement

**Instruction:** The alternative procedure to determine inflow velocity uses a thermoanemometer in a constricted window access opening of 3 inches (76mm) with the armrest removed. Inflow air velocity is measured in the center of the constricted opening 1-1/2 inches (38mm) blow the top of the work access opening on the following specified grid. Use the correction factor table to calculate the inflow velocity.

1.39	1.35	1.37	1.38	1.37	1.39	1.38	1.39	1.35	1.38	1.38
------	------	------	------	------	------	------	------	------	------	------

### Characteristic of air velocities in the work opening

• Mean Inflow velocity to achieve product protection : $\geq 0.40$ m/s.	0.53
---	------

Result Summary : Pass

### Adjustments Required

Fan speed

✓

No Change

Damper

✓

No Change



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http://www.airflowcalibration.com E-mail : bm.airflow@gmail.com , nop.airflow@gmail.com

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AIR FM - SV - 08 : 01 Sep 2021  
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Continuation of the Certificate of Test Report Number : B223337

Page 4 of 7 Pages

## 3. Leak Test of HEPA Filters

### Test equipment used

- Aerosol Photometer    ● Brand: ATI    ● Model: 2H
- Serial number: 20627    ● Calibration due: 23-Sep-2023

### Test equipment used:

- Aerosol Generator    ● Brand: ATI    ● Model: 6C
- Serial number: 20554    ● Calibration date: -

**Instruction:** The aerosol through the "Challenge" valve to the backside of HEPA filter and maximum local penetration: 0.01 % of upstream concentration. (PAO test substitute for DOP test)

### Characteristic of PAO test

	22	µg/l
	0.001	%
	0.001	%

## Main HEPA Filter

### Leak position



☐ : 10 cm. x 10 cm.    X : Media leak position    G : Gasket leak position    M : Maximum leak position



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Continuation of the Certificate of Test Report Number : B223337

Page 5 of 7 Pages

## Exhaust HEPA Filter

Leak position


☐ : 10 cm x 10 cm    X : Media leak position    G : Gasket leak position    M : Maximum leak position

Result Summary : Pass

### 4. Airflow Patterns

Test equipment used

Smoke Generator

**Instruction :** The purpose of the test is to verify that no smoke escapes from the working space to the room, and that smoke will be drawn into the working space from the room.

Pass the smoke in an easy movement along the front opening outside the cabinet. The smoke must be drawn into the cabinet without visible turbulence.

Test the laminarity of the downflow and along the side and back wall. No smoke must come out in the room and only small Turbulence must be observed.

Result Summary :

Downflow Pattern Test

Pass

View Screen Retention Test

Pass

Work Opening Edge Retention Test

Pass

Sash/Window Seal Test

Pass



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Continuation of the Certificate of Test Report Number : B223337

Page 6 of 7 Pages

## 5. Site Installation

5.1 Sash Alarm	Pass
5.2 Interlocks	N/A
5.3 Exhaust System Alarm	Pass

## 6. Soap Solution

**Instruction:** Comprising 25g/l soft soap in tepid distilled water prepared in grease free vessel.

**Result Summary :** Absence of soap bubbles. Pass

## Secondary Test Results

### 7. Illumination Test

**Instruction:** Take readings at approximately 300 mm centres across the full front width of the work floor surface, starting approximately 150 mm in from each side.

#### Test equipment used

- Lux meter
- Brand: Digicon
- Model: LX-73
- Serial number: T.034913
- Calibration due: 9-Feb-2024

Back

1050	1214	1225	1025
797	910	867	847

Front

Lighting should be adequate for safe working within the cabinet. Illumination measured at the work surface should be at least 750 lux.

**Result Summary :** Pass



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# AIRFLOW CALIBRATION CO.,LTD.

Continuation of the Certificate of Test Report Number : B223337

Page 7 of 7 Pages

## 8. Ultraviolet Radiation Test

**Instruction:** Take readings at approximately 300 mm centres across the full front width of the work floor surface, starting approximately 150 mm in from each side.

### Test equipment used

- UVC Light Meter
- Brand: SPER SCIENTIFIC
- Model: 850010
- Serial number: 0908314302
- Calibration due: 1-Sep-2023



Back

2020	2420	2720	1970
1990	2680	2230	2130

Front

Ultraviolet radiation where UV lamps are fitted, the intensity of radiation at a wave length of 254 nm shall be not less than 400 mW/m<sup>2</sup> when measured at the work floor surface.

**Result Summary :** Pass

## 9. Sound levels Test

**Instruction:** Sound levels in a cabinet should be low enough not to distract a worker. When tested in accordance with EN ISO 3744 using a sound level meter situated 1.0 m from the centre of the front aperture of the cabinet, or 1.0 m from any part of the installation within the laboratory, the A-weighted sound pressure level generated by the cabinet should not exceed 65 dB when the A-weighted sound pressure level of the background is less than 55 dB. If the background noise exceeds 55 dB then the corrected cabinet A-weighted sound pressure level should not exceed 65 dB.

### Test equipment used

- Sound Meter
- Brand: Daiichi
- Model: SL332
- Serial number: 130108517
- Calibration due: 14-Mar-2023

\* Sound pressure level of the background: 49.6 dBA

\* Sound levels: 60.4 dBA

**Result Summary :** Pass

**End of Certificate of Test Report**



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## Certificate of Calibration

**Certificate No. :** 66-400056-2

**Page : 1 of 2**

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

**Equipment :** Autoclave  
**Manufacturer :** Tomy  
**Model :** SX-500  
**Range :** N/A °C  
**Resolution :** 1 °C  
**Serial No. :** 55133094  
**ID No. :** N/A

**Environment :** On site calibration was carried out at the Laboratory,  
**Ambient Temperature :** (26.0 to 28.0) °C  
**Relative Humidity :** (50 to 55) %  
**Line Voltage :** (224.0 to 225.0) V

**Date of Received :** 02 February 2023

**Date of Calibration :** 02 February 2023

**Date of Issue :** 04 February 2023

**Calibrated by :** Permpon Chanpu

**Calibration Method :** This instrument was calibrated by In-house method CAL-M4007 based on  
BS 2646 Part5 : 1993

The temperature scale used was based on ITS-90

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

Standard Temperature Data Logger with RTD pt 100

ID No.	Cert. No.	Due Date
400039	66-400026-1	19 Jul 2023
400040	66-400026-2	19 Jul 2023
400041	66-400026-3	19 Jul 2023

### Traceability

National Institute of Metrology Thailand (NIMT)  
National Institute of Metrology Thailand (NIMT)  
National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Marsi)

@ 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

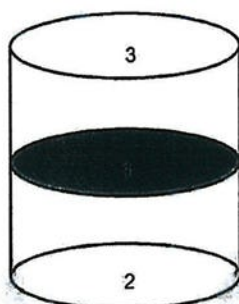
Certificate No. 66-400056-2

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)	Sterilizing Time (minute)	Pressure Gauge Reading (MPa)
			1	2	3					
121	121	121	121.8	121.4	121.3	0.82	1.0	0.3	15	0.11

### Remark

1. UUC : Unit Under Calibration
2. Pressure Gauge reading are out of accreditation's scope.

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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ผู้จัดการฝ่ายควบคุม





# CAL

Calibratech Co., Ltd.

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NSC-TISI-TIS17025  
CALIBRATION 0030

## Certificate of Calibration

Certificate No. : 66-300030-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Piston Pipette

Manufacturer : sartorius

Model : N/A

Serial No. : 4538900217

ID No. : N/A

Capacity : 100 µl to 1000 µl

Resolution: 5 µl

Environment : Ambient Temperature :  $(23 \pm 2)$  °C  
Relative Humidity :  $(50 \pm 15)$  %  
Air Pressure :  $(1013.7 \text{ to } 1013.9)$  mbar

Date of Received : 18 January 2023

Date of Calibration : 24 January 2023

Date of Issue : 24 January 2023

Calibrated by : Wipa Tovadee

Calibration Method : In-house method CAL-M3002 base on ISO 8655-6 : 2002-09-15

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

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241003	65-200370-2	02 Jun 2023	National Institute of Metrology (Thailand) (NIMT)

Approved by:

D.

( Wipa Tovadee )

Supervisor



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 66-300030-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Test Volume ( $\mu$ l)	Measuring Volume at 20 °C ( $\mu$ l)	Systematic error ( $e_s$ %)	Coeff. of Variation (CV%)	Uncertainty ( $\pm \mu$ l)
100	99.92	0.01	0.05	0.69
500	500.09	0.01	0.02	0.69
1000	1000.17	0.02	0.01	0.69

$e_s$  : Systematic error (%)

CV : Coefficient of variation (%)

UUC Calibrated by : White Tip

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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NSO-TISI-TIS17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 66-400101-1

**Page : 1 of 2**

**Submitted by :** Envilab Co., Ltd.

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

**Equipment :** Air Chamber (Incubator)

**Manufacturer :** Memmert

**Model :** IF 110

**Range :** N/A °C

**Resolution :** 0.1 °C

**Serial No. :** D419.0525

**ID No. :** ELABINCUBATOR1

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

**Ambient Temperature :** (24.0 to 24.6) °C

**Relative Humidity :** (55 to 60) %

**Line Voltage :** (224.5 to 226.0) V

**Date of Received :** 21 February 2023

**Date of Calibration :** 21 February 2023

**Date of Issue :** 21 February 2023

**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 RTD Probe

**ID No.**

**Cert. No.**

**Due Date**

**Traceability**

400046 & 400042

66-400066-1

02 Aug 2023

National Institute of Metrology Thailand (NIMT)

Approved by :

( Bunjerd Masri )

Supervisor



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 66-400101-1

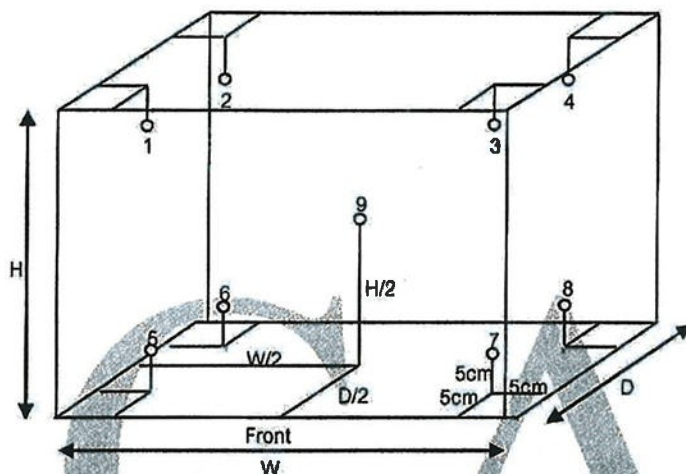
Page : 2 of 2

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 = 0.56 m

D = 0.48 m

H = 0.40 m

Capacity = 0.11 m<sup>3</sup>

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		
35.0	35.0	35.0	35.01	35.09	35.15	35.13	35.16	35.11	34.98	35.03	35.12	0.30	
37.0	37.0	37.0	37.04	37.11	37.17	37.16	37.18	37.14	36.99	37.04	37.14	0.30	

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
35.0	35.0	35.0	0.16	0.02	0.2
37.0	37.0	37.0	0.18	0.03	0.2

**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%

- o0o -



EnviLab Co.,Ltd.

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