



รายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
โครงการทำเทียบเรือแม่น้ำป่าสัก ของบริษัท ธนวิชัยพัฒนมงคลขนส่ง จำกัด
ฉบับประจำเดือนมกราคม-มิถุนายน 2567

ภาคผนวก 4

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 is a leading supply instrument

TSP High Volume Sampler Calibration

Verification Report No.

AO2300035-E003 -TSP 01

☐ PM ☒ Onsite

Site: หน้าท่าเทียบเรือแม่น้ำป่าสัก

UTM : 47P N 1597158 E 672591

Sampler: ETSP#34

Recorder: ECRDCPR4169240

Date: 7 Apr 24

Technical: Wuttipong K.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1002.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 751.6

Temperature (deg K): 305.0

Corrected Avg.Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

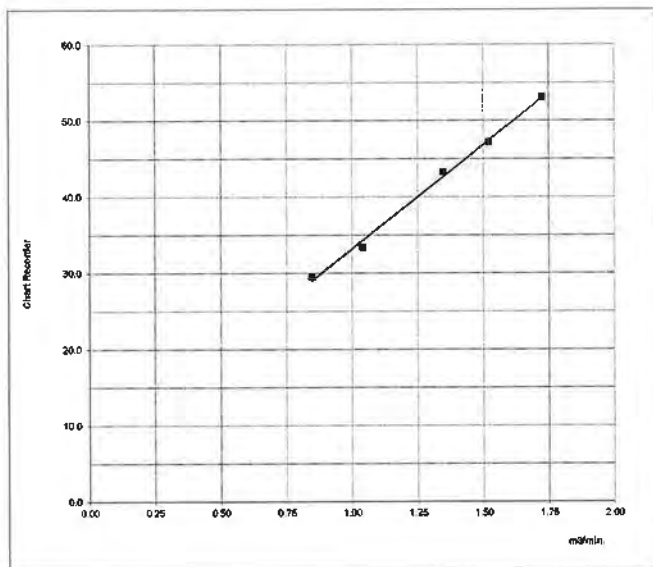
Qstd Slope: 2.02024

Qstd Intercept: -0.02667

Date Certified: 9 Feb 24

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION Slope = 27.3626 Intercept = 5.8094 Corr. coeff. = 0.9982 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 37 53
1	12.38	1.725	54.0	53.08	
2	9.61	1.522	48.0	47.18	
3	7.52	1.347	44.0	43.25	
4	4.46	1.041	34.0	33.42	
5	2.94	0.847	30.0	29.49	



Calibrated by :

(Wuttipong Klangprapun)
7 April 2024

Approved by :

(Wisan Ritthikamon)
7 April 2024

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FE-MNT-29 Rev.00.01/08/63



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ผู้จัดการฝ่ายควบคุมคุณภาพ



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Envilab & Needles Supply Instrument

TSP High Volume Sampler Calibration

Verification Report No.

AO2300035-E003 -TSP 02

☐ PM ☒ Onsite

Site: หลังท่าเทียบเรือแม่น้ำป่าสัก

UTM : 47P N 1597133 E 672332

Sampler: ETSP#27

Recorder: ECRANG15315224

Date: 7 Apr 24

Technical: Wutipong K.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1002.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 751.6

Temperature (deg K): 305.0

Corrected Avg.Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

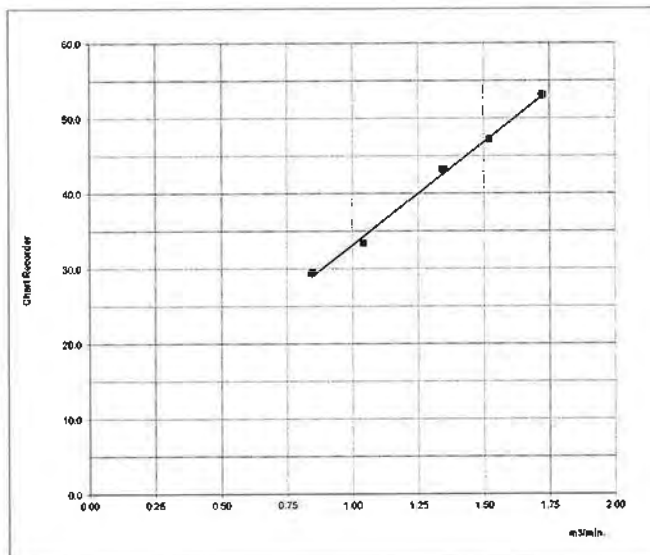
Qstd Slope: 2.02024

Qstd Intercept: -0.02667

Date Certified: 9 Feb 24

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
1	12.15	1.709	54.0	53.08	Slope = 31.2531 Intercept = 0.9015 Corr. coeff. = 0.9955 # of Observations: 5	
2	9.35	1.501	50.0	49.15		
3	7.37	1.334	44.0	43.25		
4	4.62	1.059	34.0	33.42		
5	3.01	0.857	28.0	27.52		
					Range of Chart at 1.1 - 1.7 m3/min.	36 54



Calibrated by :

(Wutipong Klangprapun)
7 April 2024

Approved by :

(Wisan Ratanakamon)
7 April 2024

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ผู้จัดการฝ่ายควบคุมคุณภาพ
หน้า 2/170



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



Envilab & Evltest Supply Instruments

TSP High Volume Sampler Calibration

Verification Report No.

AO2300035-E003 -TSP 03

<input type="checkbox"/> PM	<input checked="" type="checkbox"/> Onsite
Site: โรงเรียนวัดลพ	
UTM : 47P N 1597414 E 672616	
Sampler: ETSP#39	
Recorder: ECRANG15315228	
Date: 7 Apr 24	
Technical: Wuttipong K.	
Approval: Wisan R.	

CONDITIONS

Barometric Press. (hPa): 1006.0	Corrected Pressure (mm Hg): 754.6
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg.Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

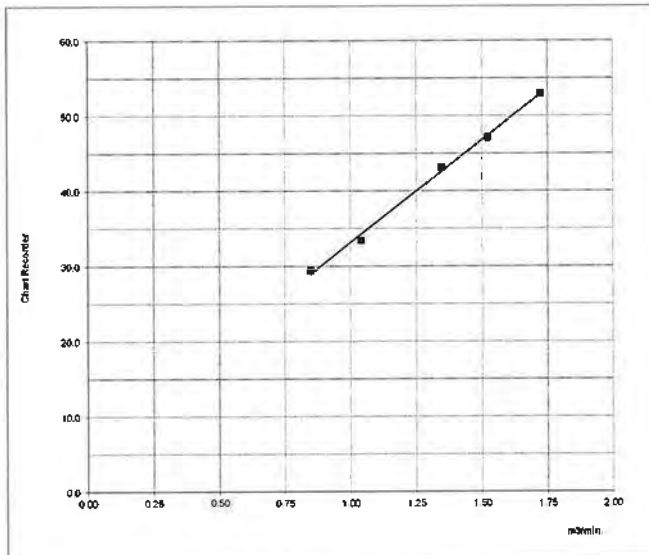
CALIBRATION ORIFICE

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

Qstd Slope: 2.02024
Qstd Intercept: -0.02667
Date Certified: 9 Feb 24

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	12.12	1.710	54.0	53.19	
2	10.25	1.574	50.0	49.25	Slope = 29.9074 Intercept = 2.1508 Corr. coeff.= 0.9930 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 36 53
3	8.28	1.416	46.0	45.31	
4	4.51	1.049	32.0	31.52	
5	3.11	0.873	30.0	29.55	



Calibrated by :

(Wuttipong Klangprapun)
7 April 2024

Approved by :

(Wisan Ritthikamon)
7 April 2024

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ผู้จัดการฝ่ายควบคุมคุณภาพ



TSP High Volume Sampler Calibration

Verification Report No.

AQ2300035-E003 -TSP 04

<input type="checkbox"/> PM	<input checked="" type="checkbox"/> Onsite
Site: บริเวณชุมชนหมู่ที่ 6 บ้านหัวโคก	
UTM : 47P N 1596867 E 671686	
Sampler: NTSP#21	
Recorder: ECRANG15315274	
Date: 7 Apr 24	
Technical: Wutipong K.	
Approval: Wisan R.	

CONDITIONS

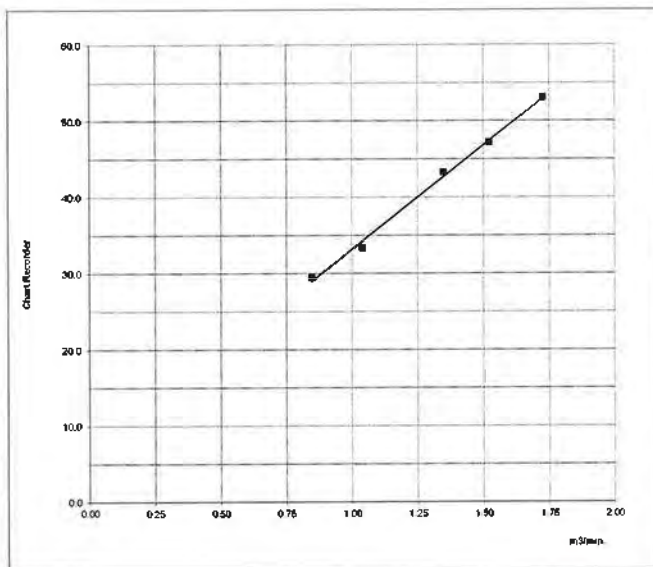
Barometric Press. (hPa): 1008.0	Corrected Pressure (mm Hg): 756.1
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg.Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Qstd Slope: 2.02024
Model: TE-5025A	Qstd Intercept: -0.02667
Serial#: 5411	Date Certified: 9 Feb 24

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	12.52	1.740	56.0	55.21	
2	10.43	1.589	50.0	49.29	Slope = 30.1235 Intercept = 1.7893 Corr. coeff. = 0.9965 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 36 53
3	8.35	1.423	44.0	43.38	
4	4.37	1.033	34.0	33.52	
5	3.46	0.921	30.0	29.58	



Calibrated by :

(Wutipong Klangprapun)
7 April 2024

Approved by :

(Wisan Ratanakom)
7 April 2024

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FE-MNT-29 Rev. 80/01/08/03



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



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TSP High Volume Sampler Calibration

Verification Report No.

AO2300035-E003 -TSP 05

<input checked="" type="checkbox"/> PM	<input type="checkbox"/> Onsite
Site: บริเวณหมู่ที่ 5 บ้านดาบทอง	
UTM: 47P N 1597348 E 672179	
Sampler: ETSP#36	
Recorder: ECRANG15315321	
Date: 7 Apr 24	
Technical: Wuttipong K.	
Approval: Wisan R.	

CONDITIONS

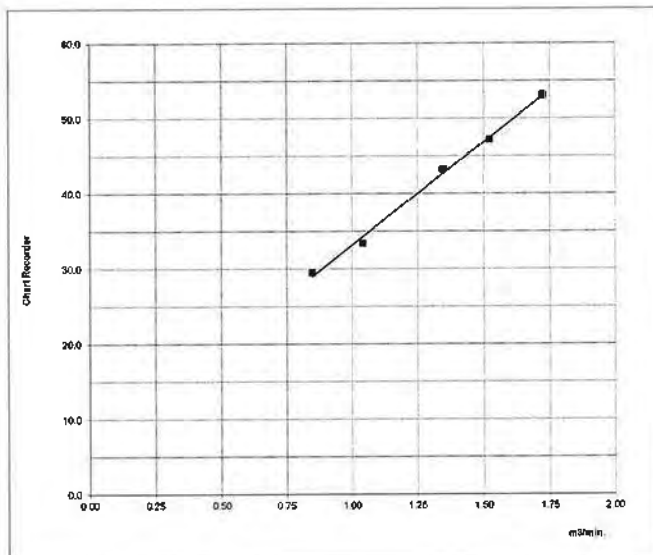
Barometric Press. (hPa): 1001.0	Corrected Pressure (mm Hg): 750.8
Temperature (deg C): 34.0	Temperature (deg K): 307.0
Average Press. (hPa): 1013.0	Corrected Avg.Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0


CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Qstd Slope: 2.02024
Model: TE-5025A	Qstd Intercept: -0.02667
Serial#: 5411	Date Certified: 9 Feb 24

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION Slope = 26.9698 Intercept = 6.9537 Corr. coeff.= 0.9964 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 38 53
1	11.73	1.673	54.0	52.88	
2	10.41	1.577	50.0	48.96	
3	7.85	1.371	44.0	43.09	
4	4.98	1.095	38.0	37.21	
5	3.42	0.910	32.0	31.34	



Calibrated by : 
(Wuttipong Klangprapun)
7 April 2024

Approved by : 
(Wisan Rattanasorn)
7 April 2024

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FE-MNT-29 Rev.00/01/06/63



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ผู้จัดการฝ่ายควบคุมคุณภาพ
วันที่ 3/4/20



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PM10 High Volume Sampler Calibration

Verification Report No.

AO2300035-E003 -PM 01

☐ PM

☒ Onsite

Site: หน้าท่าเทียบเรือแม่น้ำป่าสัก

UTM : 47P N 1597158 E 672591

Sampler: EPM#25

Recorder: ECRDS01618124

Date: 7 Apr 24

Technical: Wutipong K.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1002.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 751.6

Temperature (deg K): 305.0

Corrected Avg.Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

Slope: 1.26504

Intercept: -0.01677

Date Certified: 9 Feb 24

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	11.89	1.750	54.0	34.40
2	9.65	1.578	52.0	33.13
3	7.74	1.414	44.0	28.03
4	4.91	1.129	36.0	22.93
5	3.22	0.917	28.0	17.84

LINEAR REGRESSION

Slope = 20.5306

Intercept = -0.6048

Corr. coeff. = 0.9920

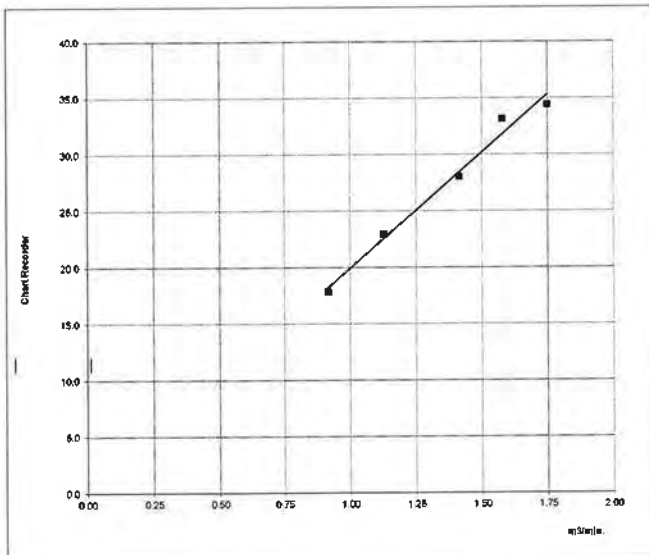
SFR = 1.150

SSP = 36.11

of Observations: 5

Range of Chart 33

at SFR $\pm 10\%$ 39



Calibrated by :

(Wutipong Klangrapun)

7 April 2024

Approved by :

(Wisan Ritthikamon)

7 April 2024

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PE-ENV-23 Rev.00/01/06/03



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หน้า 6/170



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



Envilab & Needs Supply Instruments

PM10 High Volume Sampler Calibration

Verification Report No.

AO2300035-E003 -PM 02

L PM

Onsite

Site: หลังท่าเทียบเรือแม่น้ำป่าสัก

UTM : 47P N 1597133 E 672332

Sampler: EPM#26

Recorder: ECRDS01618125

Date: 7 Apr 24

Technical: Wutipong K.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1004.0

Temperature (deg C): 34.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.1

Temperature (deg K): 307.0

Corrected Avg.Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

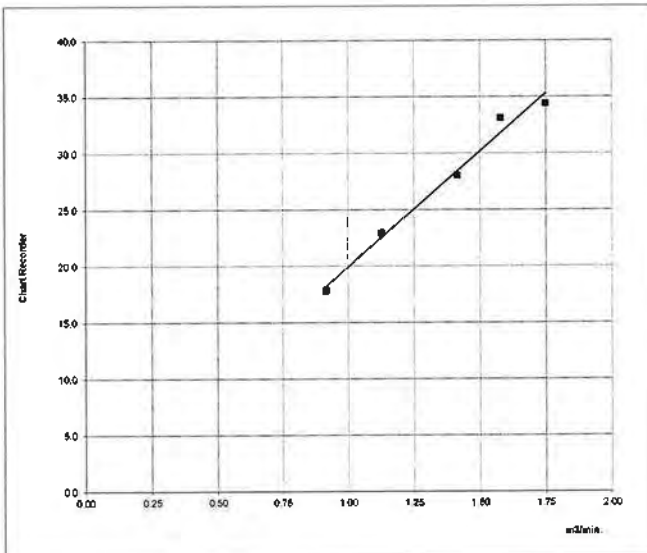
Slope: 1.26504

Intercept: -0.01677

Date Certified: 9 Feb 24

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	12.03	1.764	52.0	33.20	Slope = 16.3954
2	9.52	1.571	50.0	31.92	Intercept = 5.1415
3	7.57	1.402	44.0	28.09	Corr. coeff = 0.9923
4	4.36	1.067	36.0	22.99	SFR = 1.155
5	2.98	0.885	30.0	19.15	SSP = 37.72
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					36
					40



Calibrated by :

(Wutipong Klangrapun)

Approved by :

(Wisan Ritthikamon)

7 April 2024

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PM10 Cal. Rev.07 / 1st Date Mar 17,2020

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Onsite & Network Supply Instrument

PM10 High Volume Sampler Calibration

Verification Report No.

AO2300035-E003 -PM 03

L PM

☒ Onsite

Site: โรงเรียนวัดหนอง

UTM : 47P N 1597414 E 672616

Sampler: EPM#27

Recorder: ECRAN000004599

Date: 7 Apr 24

Technical: Wutipong K.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1006.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 754.6

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

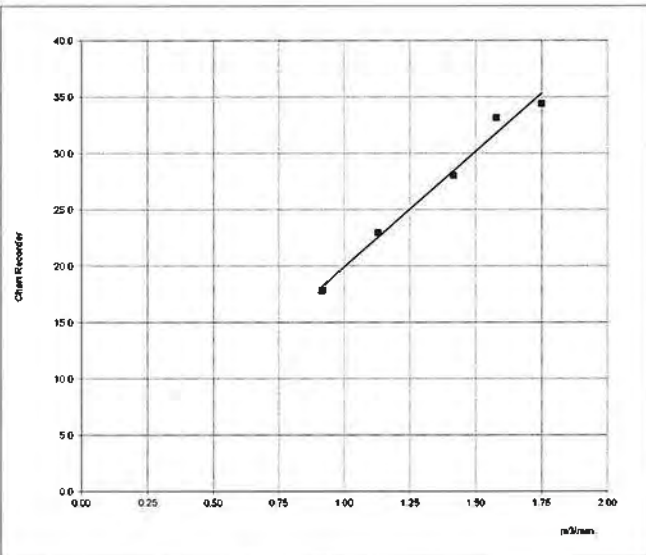
Slope: 1.26504

Intercept: -0.01677

Date Certified: 9 Feb 24

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	11.35	1.706	52.0	33.06	Slope = 16.3396
2	9.75	1.583	48.0	30.52	Intercept = 4.9120
3	7.02	1.345	42.0	26.70	Corr. coeff. = 0.9988
4	3.86	1.001	34.0	21.62	SFR = 1.145
5	2.96	0.878	30.0	19.07	SSP = 37.16
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					35
					39



Calibrated by :

(Wutipong Klangprapun)

Approved by :

(Wisan Ritthikamon)

7 April 2024

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



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ผู้จัดการฝ่ายควบคุมคุณภาพ



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



Envilab & Needed Supply Instrument

PM10 High Volume Sampler Calibration

Verification Report No.

AO2300035-E003 -PM 04

☐ PM

☒ Onsite

Site: บริเวณชุมชนหมู่ที่ 6 บ้านหัวโคก

UTM : 47P N 1596867 E 671686

Sampler: NPM#18

Recorder: ECRDS016187180

Date: 7 Apr 24

Technical: Wutipong K.

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#: 5411

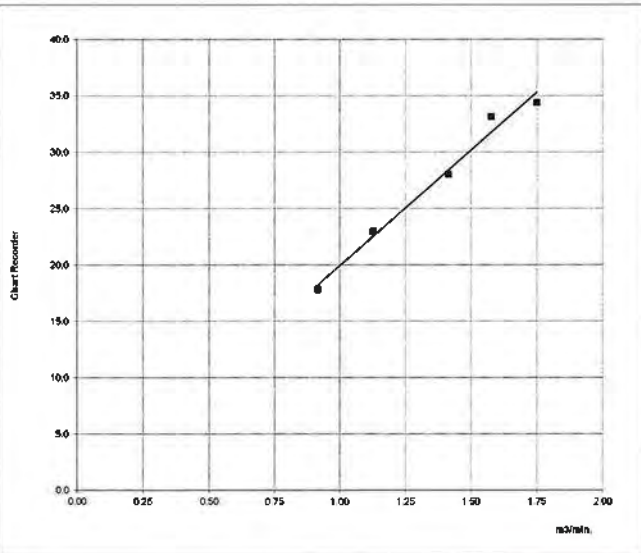
Slope: 1.26504

Intercept: -0.01677

Date Certified: 9 Feb 24

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	11.94	1.748	54.0	34.30	Slope = 18.6878
2	9.29	1.544	48.0	30.49	Intercept = 1.9461
3	7.77	1.413	46.0	29.22	Corr. coeff. = 0.9972
4	4.25	1.048	34.0	21.59	SFR = 1.143
5	2.87	0.864	28.0	17.78	SSP = 36.70
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					34
					39



Calibrated by :

(Wutipong Klangprapun)

Approved by :

(Wisan Ritthikamon)

7 April 2024

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

Environmental responsibility with accuracy measurement

FE-AMT-20 Rev.00-01/06/03



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
หน้า 9/170



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 & Evltest Supply Instrument

PM10 High Volume Sampler Calibration

Verification Report No.

AO2300035-E003 -PM 05

L PM

E Onsite

Site: บริเวณหมู่ที่ 5 บ้านดงทอง

UTM : 47P N 1597348 E 672179

Sampler: EPM#37

Recorder: ECRDS016187168

Date: 7 Apr 24

Technical: Amonthep K.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1001.0

Temperature (deg C): 34.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 750.8

Temperature (deg K): 307.0

Corrected Avg.Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

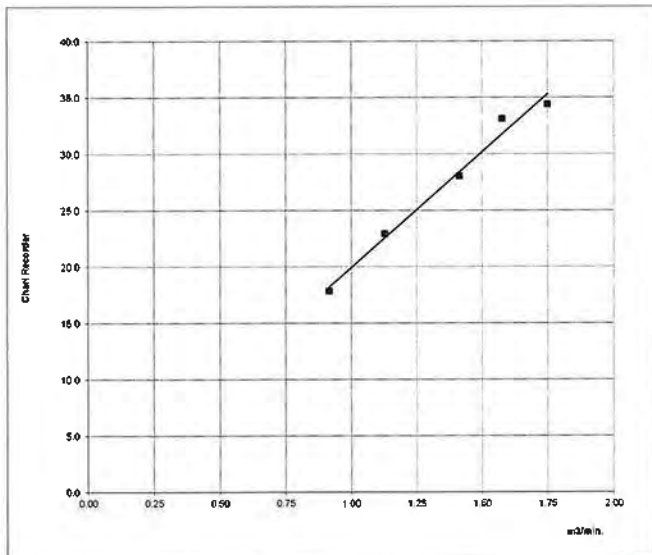
Slope: 1.26504

Intercept: -0.01677

Date Certified: 9 Feb 24

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	11.67	1.740	54.0	34.53	Slope = 17.5365
2	9.54	1.575	50.0	31.97	Intercept = 3.9043
3	8.02	1.445	44.0	28.14	Corr. coeff. = 0.9916
4	4.70	1.109	38.0	24.30	SFR = 1.159
5	3.04	0.895	30.0	19.18	SSP = 37.88
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					36
					40



Calibrated by :

(Wutipong Klangprapun)

7 April 2024

Approved by :

7 April 2024

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Environmental responsibility with accuracy measurement

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

FE-MNT-29 Rev.04/03/09/63



Envilab Co., Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ



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



Envilab & Needless Supply Instrument

Verification Test Report

Report No.:

AO2300035-E003 -SLM 01

☐ PM

☒ Onsite UTM :

47P N 1597158 E 672591

Calibrated Date: 7 April 2024

Site : หน้าท่าเทียบเรือแม่น้ำป่าสัก

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 45

Serial : 0034

Environment: Temperature 25 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 103,Pulsar

Serial No. 98971

Date of Calibration : 18 Dec 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
94.10	94.00	-0.10	94.10

Calibrated By:

Date:

7 April 2024

Approve By:

Date:

7 April 2024

(Wisan Ritthikamon)

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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@evitesting.com



Envilab & Needs Supply Instrument

Verification Test Report

Report No.:

AO2300035-E003 -SLM 02

☐ PM

☒ Onsite UTM :

47P N 1597414 E 672616

Calibrated Date: 7 April 2024

Site : โรงเรียนวัดละมุด

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 45

Serial : 0013

Environment: Temperature 25 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 103,Pulsar

Serial No.98971

Date of Calibration : 18 Dec 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
94.10	94.30	0.20	94.10

Calibrated By:

(Wuttipong Klangprapun)

Date:

7 April 2024

Approve By:

(Wisan Ritthikamon)

Date:

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ผู้จัดการฝ่ายควบคุมคุณภาพ



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



Envilab & Headless Supply Instrument

Verification Test Report

Report No.:

AO2300035-E003 -SLM 02

☒ PM

☐ Onsite UTM :

47P N 1596867 E 671586

Calibrated Date: 7 April 2024

Site : บริเวณชุมชนหมู่ที่ 6 บ้านหัวโคก

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 45

Serial : 0022

Environment: Temperature 25 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 103,Pulsar

Serial No. 98971

Date of Calibration : 18 Dec 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
94.10	94.30	0.20	94.10

Calibrated By:

(Wuttipong Kiangpraporn)

Date:

7 April 2024

Approve By:

(Wisan Ritthikamon)

Date:

7 April 2024

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RECALIBRATION
DUE DATE:
February 9, 2025

Certificate of Calibration

Calibration Certification Information

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

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

Data Tabulation

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

Calculations

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

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

RECALIBRATION

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

Tisch Environmental, Inc.
45 South Miami Avenue
Cleveland, OH 44102

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



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ผู้จัดการฝ่ายควบคุมคุณภาพ
หน้า 14/170

Certificate of Calibration

Certificate No. : 67-200034-1

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 : (22.8 to 23.6) °C

Relative Humidity : (44.6 to 45.3) %

Air Pressure : 1014.0 mbar

Date of Received : 01 February 2024

Date of Calibration : 01 February 2024

Date of Issue : 06 February 2024

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	C02232088	08 Nov 2024	National Institute of Metrology (Thailand), (NIMT)

Approved by

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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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. : 67-200034-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

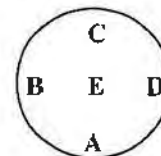
Nominal Value (g)	Correction (g)	Uncertainty \pm (g)
0.01	0.0001	0.00012
0.1	0.0001	0.00012
1	0.0000	0.00013
2	0.0001	0.00013
5	0.0000	0.00013
10	0.0000	0.00013
20	-0.0001	0.00014
50	-0.0001	0.00015
100	-0.0001	0.00020
200	-0.0001	0.00038

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 $k = 2.06$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g
A B C D E
-0.0001 -0.0001 -0.0001 0.0001 0.0000 g



Repeatability

Load test : 200 g
Stdev. : 0.00005 g

- o O o -



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ผู้จัดการฝ่ายควบคุมคุณภาพ



**neediss**บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.536 ซอยบางพลี 7 แขวงบางพลี เขตภาษีเจริญ กรุงเทพมหานคร 10160 536 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3988 E-mail: info@neediss.com

Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6704016

Validation Date:

1-Apr-24

Instrument :

PM-2.5 Sampler SINGLE

Manufacturer :

Met one

Model :

E-FRM PM 2.5

Serial/ID No. :

NP2MOEFRM16425

Environment :

Humidity(%RH) :

56

Temperature (°C) :

27.9

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	16.57 LPM	0.1 LPM

Engineer :

Sirirat Poonlak

neediss

Neediss Supply Instrument Co., Ltd.

Sarawut Keawsrinal

Issu Date:

1-Apr-24

Date:

1-Apr-24



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ผู้จัดการฝ่ายควบคุมคุณภาพ



neediss

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

535 ซอยบางเขน 7 แขวงบางเขน เขตบางเขน กรุงเทพมหานคร 10160 535 Soi Bangkhen 7 Bangkok 10160
Tel. 02-802-0780-2 Fax. 02-802-0988 E-mail: info@neediss.com



Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6704015

Instrument :

PM-2.5 Sampler SINGLE

Validation Date:

1-Apr-24

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0482

Environment :

Humidity(%RH) :

56

Temperature (°C) :

27.9

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	16.52 LPM	0.15 LPM



neediss

Neediss Supply Instrument Co., Ltd.

Engineer :

Sirirat Poonlak

Sarawut Keawsrinual

Issu Date:

1-Apr-24

Date:

1-Apr-24





neediss

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Neediss Supply Instrument Co., Ltd.

536 ซอยบางแคว 7 แขวงบางแคว เขตบางแคว กรุงเทพฯ 10160 536 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel: 02-502 0980-2 Fax: 02-502 0988 E: info@neediss.com



Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6704014

Instrument :

PM-2.5 Sampler SINGLE

Validation Date:

1-Apr-24

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0481

Environment :

Humidity(%RH) :

57

Temperature (°C) :

28

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	16.74 LPM	-0.07 LPM

neediss

Neediss Supply Instrument Co., Ltd.

Engineer :

Sirirat Poonlak

Sarawut Keawsrinual

Issu Date:

1-Apr-24

Date:

1-Apr-24



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ผู้จัดการฝ่ายควบคุมคุณภาพ
หน้า 19/170

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

Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6704013

Instrument :

PM-2.5 Sampler SINGLE

Validation Date:

1-Apr 24

Manufacturer :

Rupprecht Patashnick

Model :

200 H

Serial/ID No. :

EP2RP200039702

Environment :

Humidity(%RH) :

56

Temperature (°C) :

28

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	16.58 LPM	0.09 LPM

**neediss**

Neediss Supply Instrument Co., Ltd.

Engineer :

Approve By:

Sarawut Keawsrinual

Issu Date:

1-Apr-24

Date:

1-Apr-24



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

หน้า 20/170

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Tel. 02-602-3980-2 Fax. 02-602-3988 E-mail: info@neediss.com

Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6704012

Instrument :

PM-2.5 Sampler SINGLE

Validation Date:

1-Apr-24

Manufacturer :

Rupprecht Patashnick

Model :

200-H

Serial/ID No. :

EP2RP200029702

Environment :

Humidity(%RH) : 57

Temperature (°C) : 28.1

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	16.54 LPM	0.13 LPM

neediss

Neediss Supply Instrument

Approve By:

Engineer :

Sarawut Keawsrinual

Issu Date:

1-Apr-24

Date:

1-Apr-24



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
หน้า 21/170



Certificate of Calibration

Certificate Number : SPR23050051-1

Page : 1 of 3

Customer : Envilab Co., Ltd.

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

Equipment Name : Primary Flow Meter (Drycal)

Manufacturer : MesaLabs

Model : Defender 520-H

Serial Number : 164578

ID. Number : N/A

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 04 May 2023

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

Calibration Date : 04 May 2023

Location of Calibration : In-Lab

Recommend Due Date : 04 May 2024

Calibration Procedure : SP-CPM-04-13

Date of Issue : 05 May 2023

Method of Calibration

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

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Jirasak Pumbut

Approved by :

Calibration Officer

(Mr.Prayoon Topart)

Authorized Signatory



รับรองสำหรับลูกค้า
ผู้จัดการฝ่ายควบคุมคุณภาพ



Calibration Report

Certificate Number : SPR23050051-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Mass Flow Calibrator	AFC-COMPLETE-10	12532	AD2207-177-0001	17 Jul 2023
Standard Flow Meter	520-H	200353	MW-0071-22	25 Aug 2023

Traceability

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

MIT - Miracle International Technology Co.,Ltd.

MesaLabs - Mesa Laboratories, Inc.NVLEP Lab Code 200661-0 (ISO17025)



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
SP-FM-04-15 rev.0



Result of Calibration

Certificate No. : SPR23050051-1

Page : 3 of 3

Range : 0 to 30 L/Min

Resolution : 0.0001 L/Min

Function : Air Flow Measurement

Unit : L/Min

Calibration Point	UUC Reading	Standard Reading	UUC Error	K Factor Value	Uncertainty (±)
5.0	4.9722	4.9752	-0.0030	1.00060	0.050
10.0	10.296	10.325	-0.029	1.00282	0.10
15.0	15.076	15.037	0.039	0.99741	0.20
20.0	20.331	20.274	0.057	0.99720	0.20

Note:

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

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2$, providing a level of confidence approximately 95 %

- End of Certificate -





MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkae Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Certificate No. : L202306169-001

Date Issued : 30-Jun-23

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

Equipment : Temperature Calibrator

Manufacturer : Digicon

Model : CC-VTR-SH

Serial No. : 091109269

ID No./Tag No. : -

Date Received : 21-Jun-23

Date Calibrated : 24-Jun-23

Calibrated by : Ms. Sunisa Pinklao

Calibration Method or Calibration Procedure Used

In-house method : CP-126 base on EURAMET/cg-11 by direct measurement with Reference Multi Meter

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

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by:



(Mr. Sarayuth Tochua)



Page 1 of 2



Certificate No. : L202306169-001

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

Function : Temperature Simulate (Thermocouple Type K)

Calibration Point	Standard Value	Error	\pm Uncertainty	tolerance limit
-18.0 $^\circ\text{C}$	-17.71 $^\circ\text{C}$	-0.29 $^\circ\text{C}$	0.29 $^\circ\text{C}$	-18.75 $^\circ\text{C}$ ~ -17.25 $^\circ\text{C}$
0.0 $^\circ\text{C}$	0.24 $^\circ\text{C}$	-0.24 $^\circ\text{C}$	0.29 $^\circ\text{C}$	-0.75 $^\circ\text{C}$ ~ 0.75 $^\circ\text{C}$
50.0 $^\circ\text{C}$	50.25 $^\circ\text{C}$	-0.25 $^\circ\text{C}$	0.29 $^\circ\text{C}$	49.25 $^\circ\text{C}$ ~ 50.75 $^\circ\text{C}$
500.0 $^\circ\text{C}$	500.21 $^\circ\text{C}$	-0.21 $^\circ\text{C}$	0.38 $^\circ\text{C}$	499.25 $^\circ\text{C}$ ~ 500.75 $^\circ\text{C}$
1100.0 $^\circ\text{C}$	1100.19 $^\circ\text{C}$	-0.19 $^\circ\text{C}$	0.52 $^\circ\text{C}$	1099.25 $^\circ\text{C}$ ~ 1100.75 $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

NA Cal. Certificate No. E1U224859 for Multi-Product Calibrator Serial No. 9115027, Due 24-Oct-23

End of Certificate

Page 2 of 2

Certificate of Calibration

Certificate No. : 66-200094-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Electronic Balance

Manufacturer : METTLER TOLEDO **Model :** XPR2

Serial No. : C011158261 **ID No. :** ELABBALANCEN07

Capacity : 2.1 g **Resolution :** 0.000001 g

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

Ambient Temperature : (22.7 to 22.9) °C

Relative Humidity : (49.3 to 51.6) %

Air Pressure : 1011.0 mbar

Date of Received : 23 March 2023

Date of Calibration : 23 March 2023

Date of Issue : 24 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
E211-E2114	C02201475	11 Jun 2023	National Institute of Metrology (Thailand), (NIMT)
E231-E2312	C02201476	12 Jun 2023	National Institute of Metrology (Thailand), (NIMT)

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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



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. : 66-200094-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty \pm (g)
0.001	-0.000001	0.0000053
0.005	0.000000	0.0000054
0.01	0.000001	0.0000071
0.02	0.000001	0.0000089
0.05	0.000001	0.000011
0.1	0.000000	0.000014
0.5	-0.000002	0.000022
1	-0.000001	0.000026
1.5	-0.000003	0.000037
2	0.000002	0.000034

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

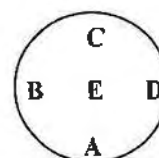
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 1 g

A B C D E

0.000000 0.000001 0.000001 0.000000 0.000000 g



Repeatability

Load test : 2 g

Stdev. : 0.0000007 g

- o0o -



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: BANGKOK INDUSTRIAL
GAS CO LTD
Part Number: E04NI99E15A00V3
Cylinder Number: EB0160267
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO,NO,NOX,SO2,BALN

Reference Number: 160-402685487-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Mar 31, 2023

Expiration Date: Mar 31, 2026

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

ANALYTICAL RESULTS

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

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	210607-22	CC708067	48.41 PPM NITRIC OXIDE/NITROGEN	+/- 1.2%	Sep 21, 2025
PRM	12395	D887660	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 22, 2022
GMIS	124206889104	CC322509	4.326 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 21, 2025
NTRM	160610-01	CC473196	49.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Mar 22, 2028
GMIS	07212022B109	EB0141209	50.08 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Dec 21, 2026
CO	220608	CC744766	2501.8 PPM CARBON MONOXIDE/NITROGEN	+/-0.5%	Sep 30, 2028

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

ANALYTICAL EQUIPMENT

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

Triad Data Available Upon Request

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



Approved for Release



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
วันที่ 29/1/20

**neediss**บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.536 ซอยนาคร 7 แขวงนาคร 5 เขตคลองเตย กรุงเทพมหานคร 10110 536 Soi Nakhon 7 Bangkok Bangkok Bangkok
Tel : 02-862-6760-6761 Fax : 02-862-2936 Email : info@neediss.com

SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6704006

Calibrated Date: 1-Apr-24

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Page:1/2

Instruments Information

Analyzer Type: SO2 Analyzer Model: 100A	Manufacturer API S/N: ESOAI100E01002
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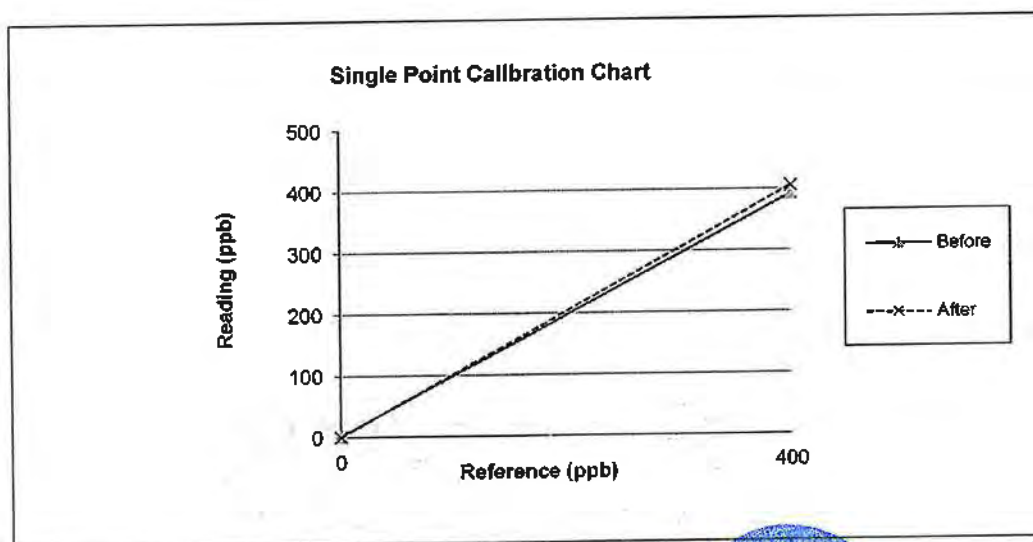
Calibration System

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

Environment: Temperature 27.3 °CHumidity: 59 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	1.7	1.7	400.0	392.0	-1.0
After	0.0	0.5	0.5	400.0	405.0	0.6

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**neediss**บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.536 ซอยบงกช 7 แขวงบงกช เขตบึงกุ่ม กรุงเทพฯ 10160 536 Soi Bongkoe 7 Bongkoe Bangkok Bangkok
Tel: 02-802-45750-2 Fax: 02-802-3986 E-mail: neediss@neediss.com

SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6703001

Calibrated Date: 1-Mar-24

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Instruments Information

Page:1/2

Analyzer Type: SO2 Analyzer Model: AF22e	Manufacturer Environnement SA, France S/N: ESOESAF22E2485
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Calibration System

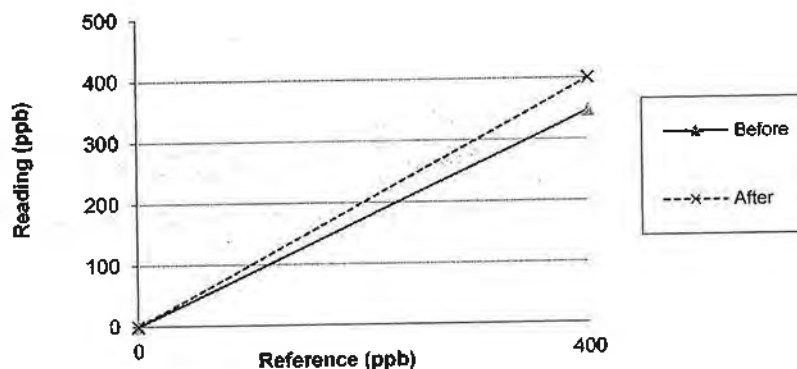
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NOx Conc 46.50 PPM NO Conc 46.50 PPM SO2 Conc 45.59 PPM CO Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267

Environment: Temperature 24.2 °CHumidity: 57 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.0	0.0	400.0	347.0	-7.1
After	0.0	0.1	0.1	400.0	400.1	0.0

Single Point Calibration Chart

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SO2 Analyzer Verification Test Report


Calibration Report No.: ES-S6703001

Calibrated Date: 1-Mar-24

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Page:2/2

Analyzer Signal Values					
Date	1-Mar-24	Time	13:11:00		
Power Supplies					
Option	0.00	mV	+5 V Sensor	5	V
+4 V	4068	mV	+3.3 V	3.3	V
+24 V	24.1	V	+12 V	11.9	V
+5 V	5	V	I UV lamp	44.3	mA
I+24 V	1.2	A			
Optical Bench					
Dark UV sig.	0	mV	Dark PM sig.	88	mV
UV ref.	0	mV	PM ref.	0	mV
UV sig.	24.1	mV	PM sig.	138.6	mV
Ref.ratio	0		Meas ratio	0.34	
Mean sig.	0.7		Raw trend	11	
Raw sig.	24.4	ppb	inst.meas.	22.8	ppb
I UV Lamp	44.7	mA	HV PM	2626.60	mV
Sample					
Internal Temp.	31.9	deg.C	Chamber T.	50	deg.C
Gas Pr.	970	hPa	Pump Pr.	355.5	hPa
Flow	18.7	l/h			

Calibrate By : 

Sirirat Poonlak

Date:

1-Mar-24

Approve By : 

Sarawut Keawsrinual

Date:

1-Mar-24


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 Neediss Supply Instrument Co.,Ltd



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**neediss**บริษัท นีดิส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.505 ซอยสุขุมวิท 7 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
Tel : 02-802-6780-2 Fax : 02-802-6788 E-mail : info@neediss.com

SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6704004

Calibrated Date: 1-Apr-24

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Page: 1/2

Instruments Information

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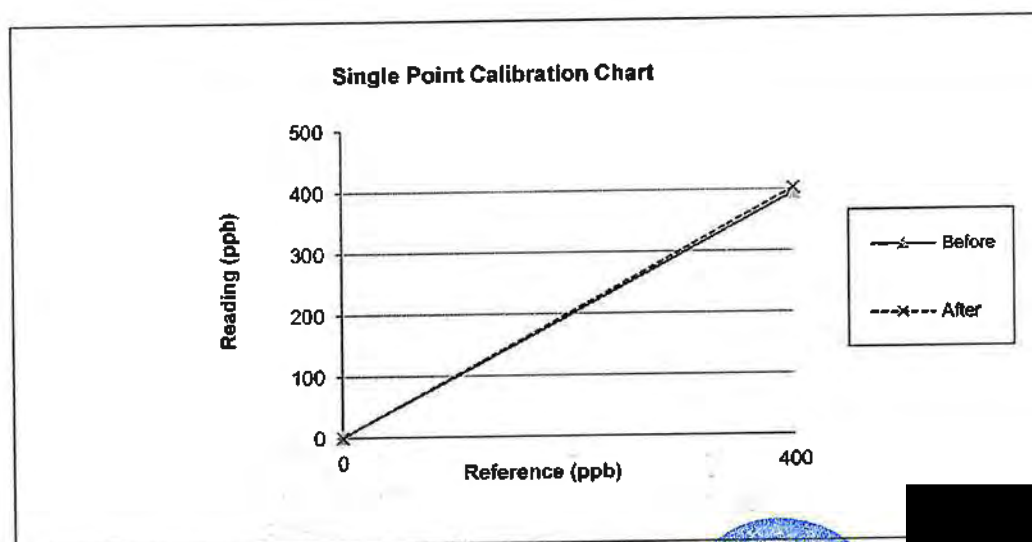
Calibration System

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

Environment: Temperature 27.4 °CHumidity: 60 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.3	0.3	400.0	395.0	-0.6
After	0.0	0.2	0.2	400.0	402.1	0.3

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

516 หมู่ 7 ต.บ้านใหม่ อ.เมือง จ.นนทบุรี 11000 - 505 หมู่ 7 ต.บางคูเวียง อ.เมือง จ.นนทบุรี
T: 02-942-3211, 02-942-3268 F: 02-942-3269 E: info@neediss.com



SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6704004

Calibrated Date: 1-Apr-24

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Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Apr-24				
Time	13:10				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.6	0.2	
Sample Flow	650 (+/- 50)	cc/min	663	659	
PMT Detector	0 - 5000	mV	36.5	34.5	
Norm PMT Detector	0 - 5000	mV	34.1	32.8	
HVPS	400-900 constant	V	719	648	
DCPS	2500 (+/- 200)	mV	-	-	
RCELL TEMP	50 (+/- 1)	Dreegee C	50	50	
BOX TEMP	20-40	Dreegee C	34.1	32.7	
PMT TEMP	7 (+/- 1)	Dreegee C	8.0	8.0	
UV lamp	1000-4900	mV	4034.0	4034.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR. Light (Zero Gas)	<100	PPB	29	29	
Dark PMT	(-50) - (+200)	mV	44.7	44.7	
Dark lamp	(-50) - (+200)	mV	5.1	5.1	
SAMP PRES	20-30 constant	IN-Hg-A	28.1	27.8	
Electric Test/Optic Test					
PMT Volts	2000 (+/- 500)	mV	2004	2020	
SO2 Conc	1000 (+/- 250)	PPB	1002	1010	
SO2 Slope	1 (+/- 0.3)	-	0.920	0.866	
SO2 Offset	< 250	mV	65	130.1	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.6	0.2	
Gas Test Response					
Zero Gas (0.00 PPB)	0	ppb	0.3	0.2	
Span Gas (400 PPB)	400	ppb	395.0	402.1	± 5% of Range

Calibrate By :

Sirirat Poonlak

Date:

1-Apr-24

Approve By :

Sarawut Keawsrinual

Date:

1-Apr-24

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Neediss Supply Instrument Co., Ltd.



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

**neediss**บริษัท นีดิส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.53 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร 10130 กรุงเทพฯ ประเทศไทย
Tel: 02-502-1100-2 Fax: 02-502-3980 E-mail: info@neediss.com

SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6704005

Calibrated Date: 1-Apr-24

☒ PM ☐ Onsite

Page:1/2

Instruments Information

Analyzer Type: SO2 Analyzer Model: 100E	Manufacturer API S/N: ESOA100E01225
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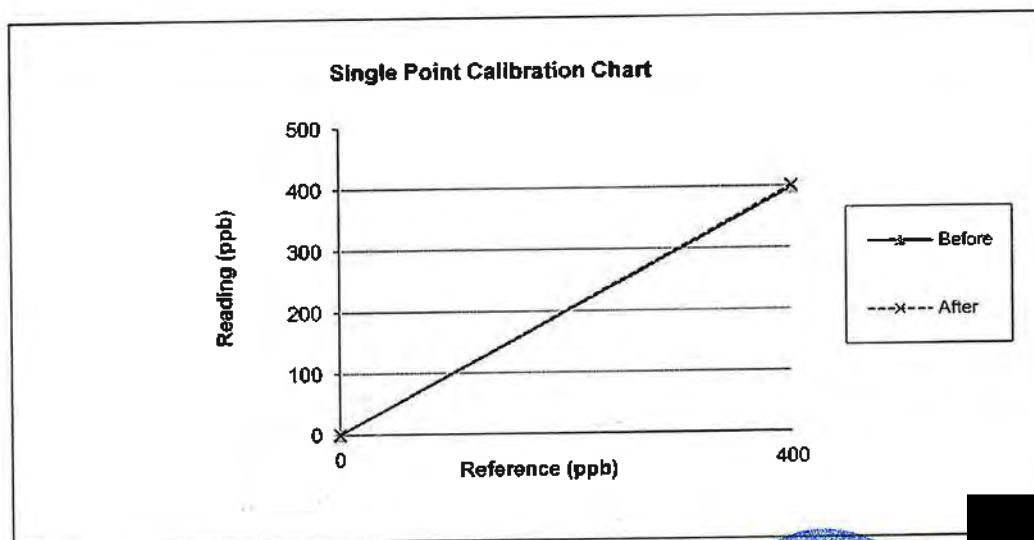
Calibration System

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

Environment: Temperature 27.3 °CHumidity: 60 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.3	0.3	400.0	398.0	-0.3
After	0.0	0.1	0.1	400.0	401.0	0.1

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SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6704005

Calibrated Date: 1-Apr-24

☒ PM ☐ Onsite

Page:2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Apr-24				
Time	13:10				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.6	0.2	
Sample Flow	650 (+/- 50)	cc/min	663	659	
PMT Detector	0 - 5000	mV	36.5	34.5	
Norm PMT Detector	0 - 5000	mV	34.1	32.8	
HVPS	400-900 constant	V	719	648	
DCPS	2500 (+/- 200)	mV	-	-	
RCELL TEMP	50 (+/- 1)	Dreegee C	50	50	
BOX TEMP	20-40	Dreegee C	34.1	32.7	
PMT TEMP	7 (+/- 1)	Dreegee C	8.0	8.0	
UV lamp	1000-4900	mV	4034.0	4034.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR. Light (Zero Gas)	<100	PPB	29	29	
Dark PMT	(-50) - (+200)	mV	44.7	44.7	
Dark lamp	(-50) - (+200)	mV	5.1	5.1	
SAMP PRES	20-30 contant	IN-Hg-A	28.1	27.8	
Electric Test/Optic Test					
PMT Volts	2000 (+/- 500)	mV	2004	2020	
SO2 Conc	1000 (+/- 250)	PPB	1002	1010	
SO2 Slope	1 (+/- 0.3)	-	0.920	0.866	
SO2 Offset	< 250	mV	65	130.1	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.6	0.2	
Gas Test Response					
Zero Gas (0.00 PPB)	0	ppb	0.3	0.1	
Span Gas (400 PPB)	400	ppb	398.0	401.0	± 5% of Range

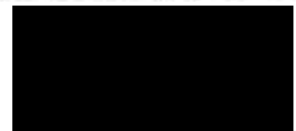
Calibrate By :


Sinrat Poonlark

Date:

1-Apr-24

Approve By :


Sarawut Keawsrinual

Date:

1-Apr-24

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SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6703002

Calibrated Date: 1-Mar-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

Analyzer Type: SO2 Analyzer Model: AF22e	Manufacturer: Environnement SA., France S/N: ESOESAF22E2506
---	--

Calibration System

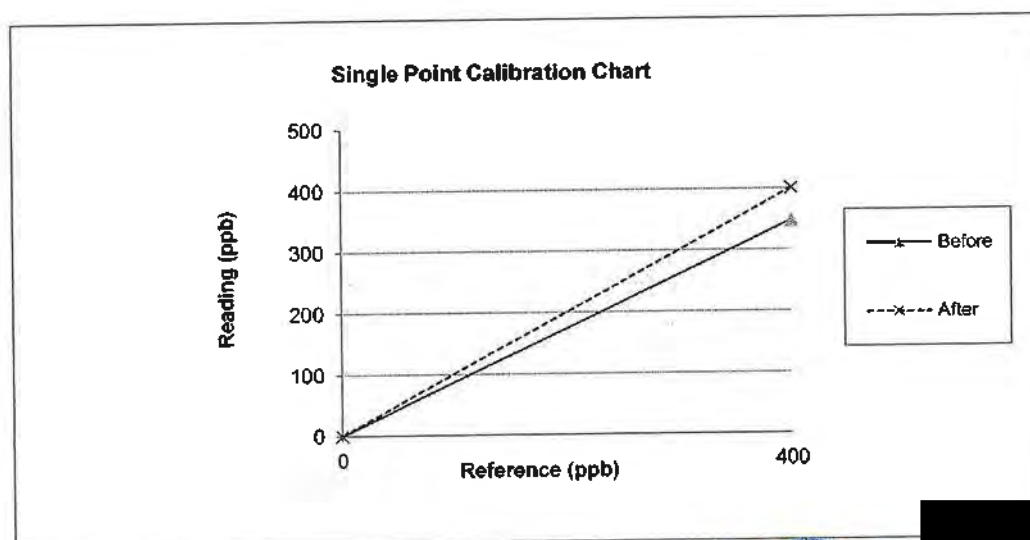
Calibrator Unit	Standard Gas
Dilutor Model: ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NOx Conc: 46.50 PPM NO Conc: 46.50 PPM SO2 Conc: 45.59 PPM CO Conc: 4507 PPM Expire Date: Mar 31, 2026 EB0160267

Environment: Temperature: 24.4 °C

Humidity: 56 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.0	0.0	400.0	347.9	-7.0
After	0.0	0.0	0.0	400.0	400.6	0.1



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หน้า 38/170



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SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6703002

Calibrated Date: 1-Mar-24

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Page:2/2

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

Calibrate By :


Sinita Poomak

Date:

1-Mar-24

Approve By :


Sarawut Keawsrinual

Date:

1-Mar-24



Neediss Supply Instrument Co.,Ltd



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Tel : 02-307-0760-2113 02-601-3955 Email : info@neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6704007

Page:1/1

Calibrated Date: 1-Apr-24

☒ PM ☐ Onsite

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 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NOx Conc 46.50 PPM NO Conc 46.50 PPM So2 Conc 45.59 PPM Co Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267

Environment: Temperature 27.5 °C

Humidity: 62 %RH

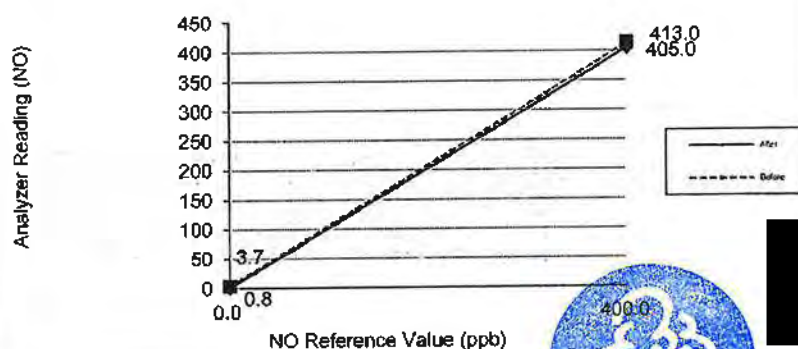
Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	3.0	0.0	3.0	409.0	400.0	1.1
NO ₂	0.7	0.0	0.7	4.0	0.0	0.5
NOx	3.7	0.0	3.7	413.0	400.0	1.6

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.6	0.0	0.6	402.0	400.0	0.2
NO ₂	0.2	0.0	0.2	3.0	0.0	0.4
NOx	0.8	0.0	0.8	405.0	400.0	0.6

Single Point Calibration Chart





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530 ซ.4 บางใหญ่ 7 แขวง/ตำบล บางใหญ่ กรุงเทพมหานคร 10260
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NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6704007

Page:1/1

Calibrated Date: 1-Apr-24

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Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Apr-24				
Time	10:10				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.5	0.2	
Sample Flow	500± 50	cc/min	511	532	
Ozone Flow	60-90	cc/min	80	80	
PMT Detector	0-5000	mV	27.4	16.4	
AZERO	-20-150	mV	54.2	54.2	
HVPS	400-900 constant	V	819	819	
DCPS	2500 ± 200	mV	-	-	
RCELL TEMP	50± 1	Dreegee C	50	50	
BOX TEMP	20-35	Dreegee C	33.7	32.9	
PMT TEMP	7 ± 1	Dreegee C	7.1	7.1	
IZS TEMP	50± 4	Dreegee C	-	-	
MOLY Temp	315 ± 5	Dreegee C	314.4	315.0	
RCEL PRES	4-10 constant	IN-Hg-A	10	10	
SAMP PRES	20-30 constant	IN-Hg-A	29.0	29.4	
NO Slope	1 ± 0.3		0.820	0.801	
Nox Slope	1 ± 0.3		0.848	0.813	
NO Offset	-10 to + 150	mV	10.2	15.3	
NOx Offset	-10 to + 150	mV	-2.0	-3.4	
Span and Cal Values					
Zero Value	NO	0	ppb	3.0	0.6
	NOx	0	ppb	3.7	0.8
Span Value	NO	400	ppb	409.0	402.0
	NOx	400	ppb	413.0	405.0

Calibrate By :



Sirirat Poonlark

Date:

1-Apr-24

Approve By :



Sarawut Keawsrinual

Date:

1-Apr-24



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Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ



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NOx Analyzer Verification Test Report

Calibration Report No.: ES-N6703002

Page:1/1

Calibrated Date: 1-Mar-24

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: AC32e	Manufacturer Environnement SA., France S/N: ENOESAC32E2404
---	---

Calibration System

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

Environment: Temperature 24.1 °C

Humidity: 54 %RH

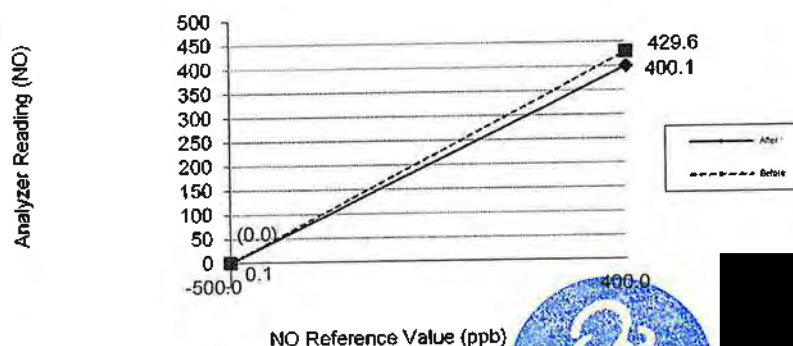
Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.550	0.0	0.6	422.3	400.0	2.7
NO ₂	-0.565	0.0	-0.6	7.3	0.0	0.9
NO _x	-0.015	0.0	0.0	429.6	400.0	3.6

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	-0.015	0.0	0.0	400.1	400.0	0.0
NO ₂	0.149	0.0	0.1	0.0	0.0	0.0
NO _x	0.134	0.0	0.1	400.1	400.0	0.0

Single Point Calibration Chart



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ผู้จัดทำ: 12/170



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NOx Analyzer Verification Test Report

Calibration Report No.: ES-N6703002

Page:1/1

Calibrated Date: 1-Mar-24

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Page:2/2

Analyzer Signal Values					
Date	1-Mar-24	Time	14:14		
Power Supplies					
Option	-13.52	mV	+5 V Sensor	4.99	V
+3.3 V	3.3	V	+24 V	23.96	V
+12 V	11.88	V	+5 V	4.99	V
+4 V	3974.3	mV	+ 24V	2.4	A
I O3	82.74	mA			
Optical Bench					
Dark PM sig.	0.0	mV	PM NO sig.	84.28	mV
PM Nox sig.	107.0	mV	PM Ny sig.	86.71	mV
Sample					
Chamber T	60	deg.C	Internal Temp.	33.33	deg.C
Chamber P	1720.8	hPa	PM T.	1.46	deg.C
Flow	47.21	NI/h	Sample Pr.	993.2	hPa

Calibrate By :

Approve By :

Date:

1-Mar-24

Date:

1-Mar-24

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รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



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NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6704006

Page:1/1

Calibrated Date: 1-Apr-24

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Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: T200	Manufacturer API S/N: ENOAIT20002470
---	---

Calibration System

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

Environment: Temperature 27.7 °C

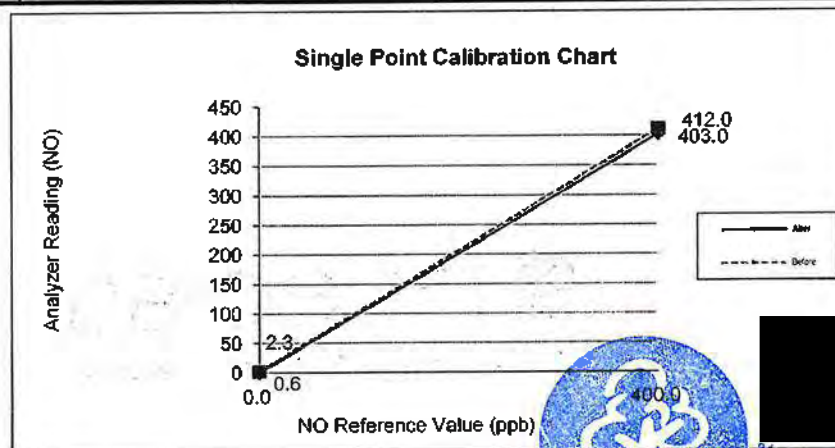
Humidity: 62 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	1.5	0.0	1.5	410.0	400.0	1.2
NO ₂	0.8	0.0	0.8	2.0	0.0	0.2
NOx	2.3	0.0	2.3	412.0	400.0	1.5

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.3	0.0	0.3	399.6	400.0	-0.1
NO ₂	0.3	0.0	0.3	3.4	0.0	0.4
NOx	0.6	0.0	0.6	403.0	400.0	0.4



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ผู้จัดการฝ่ายเทคนิค Page 2/2



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NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6704006

Page:1/1

Calibrated Date: 1-Apr-24

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Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Apr-24				
Time	10:10				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.5	0.2	
Sample Flow	500+/- 50	cc/min	511	532	
Ozone Flow	60-90	cc/min	80	80	
PMT Detector	0-5000	mV	27.4	16.4	
AZERO	-20-150	mV	54.2	54.2	
HVPS	400-900 constant	V	819	819	
DCPS	2500 +/- 200	mV	-	-	
RCELL TEMP	50+/- 1	Dreegee C	50	50	
BOX TEMP	20-35	Dreegee C	33.7	32.9	
PMT TEMP	7 +/-1	Dreegee C	7.1	7.1	
IZS TEMP	50+/- 4	Dreegee C	-	-	
MOLY Temp	315 +/- 5	Dreegee C	314.4	315.0	
RCEL PRES	4-10 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	1.5	0.3
	NOx	0	ppb	2.3	0.6
Span Value	NO	400	ppb	410.0	399.6
	NOx	400	ppb	412.0	403.0

Calibrate By :

Date:

Sirrat Poonlak

1-Apr-24

Approve By :

Date:

Sarawut Keawsrinnul

1-Apr-24



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NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6704002

Page:1/1

Calibrated Date: 1-Apr-24

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Instruments Information

Analyzer Type: NO/NO2/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	NOx Conc 46.50 PPM NO Conc 46.50 PPM So2 Conc 45.59 PPM Co Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267

Environment: Temperature 24.9 °C

Humidity: 64 %RH

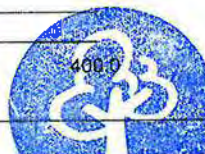
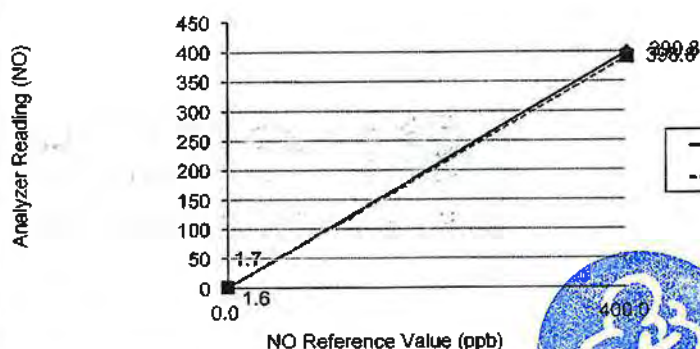
Calibration Check (Before adjust)

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	397.3	400.0	-0.3
NO ₂	0.0	0.0	0.0	-6.5	0.0	-0.8
NOx	1.7	0.0	1.7	390.8	400.0	-1.2

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	1.7	0.0	1.7	396.1	400.0	-0.5
NO ₂	-0.1	0.0	-0.1	2.7	0.0	0.3
NOx	1.6	0.0	1.6	398.8	400.0	-0.2

Single Point Calibration Chart



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NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6704002

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Calibrated Date: 1-Apr-24

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Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Apr-24				
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	1.7	1.7
	NOx	0	ppb	1.7	1.6
Span Value	NO	400	ppb	397.3	396.1
	NOx	400	ppb	390.8	398.8

Calibrate By :

Approve By :

Sarawut Keawsrinual
1-Apr-24

Date:

1-Apr-24

Date:


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Sarawut Keawsrinual

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Neediss Supply Instrument Co., Ltd.

536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Bangkok Bangkok
Tel: 02-802-5980-2 Fax: 02-602-2936 E-mail: info@neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: ES-N6703003

Page:1/1

Calibrated Date: 1-Mar-24

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: AC32e	Manufacturer: Environnement SA., France S/N: ENOESAC32E2401
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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 _x Conc 46.50 PPM NO Conc 46.50 PPM SO ₂ Conc 45.59 PPM CO Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267

Environment: Temperature 24.2 °C

Humidity: 49 %RH

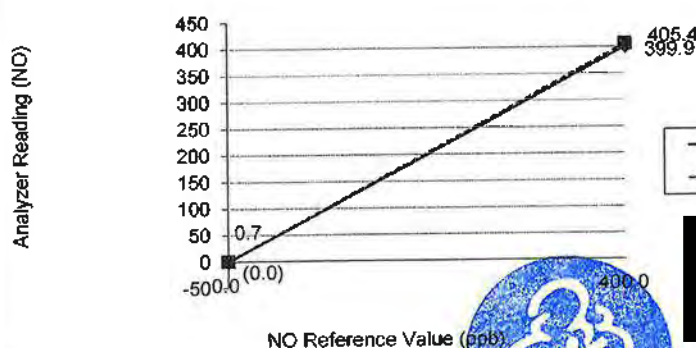
Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.557	0.0	0.6	399.0	400.0	-0.1
NO ₂	0.102	0.0	0.1	6.4	0.0	0.8
NO _x	0.659	0.0	0.7	405.4	400.0	0.7

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	-0.059	0.0	-0.1	399.9	400.0	0.0
NO ₂	0.048	0.0	0.0	0.0	0.0	0.0
NO _x	-0.011	0.0	0.0	399.9	400.0	0.0

Single Point Calibration Chart



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Neediss Supply Instrument Co., Ltd.536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Rangkhoe Bangkok
Tel. 02-302-5980-2 Fax. 02-602-3988 E-mail: neediss@neediss.com**NOx Analyzer Verification Test Report**

Calibration Report No.: ES-N6703003

Page:1/1

Calibrated Date: 1-Mar-24

☒ PM ☐ Onsite

Page:2/2

Analyzer Signal Values					
Date	1-Mar-24	Time	14:14		
Power Supplies					
Option	-13.52	mV	+5 V Sensor	4.99	V
+3.3 V	3.3	V	+24 V	23.96	V
+12 V	11.88	V	+5 V	4.99	V
+4 V	3974.3	mV	+ 24V	2.4	A
I O3	62.74	mA			
Optical Bench					
Dark PM sig.	0.0	mV	PM NO sig.	84.28	mV
PM Nox sig.	107.0	mV	PM Ny sig.	86.71	mV
Sample					
Chamber T	60	deg.C	Internal Temp.	33.33	deg.C
Chamber P	1720.8	hPa	PM T.	1.46	deg.C
Flow	47.21	NI/h	Sample Pr.	993.2	hPa

Calibrate By : 
Date: 1-Mar-24

Approve By : 
Date: 1-Mar-24

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รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

**neediss**บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.590 ซอยบางพลี 7 แขวงบางพลี เขตภาษีเจริญ กรุงเทพมหานคร 10160 590 Soi Bangplai 7 Bangplai Bangkok Bangkok
Tel : 02-302-6980-2 Fax : 02-630-3938 E-mail : info@neediss.com

CO Analyzer Verification Test Report

Calibration Report No.: AP-C6704001

Calibrated Date: 1-Apr-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

Analyzer Type: CO Analyzer Model: 300E	Manufacturer API S/N: ECOAI300E01034
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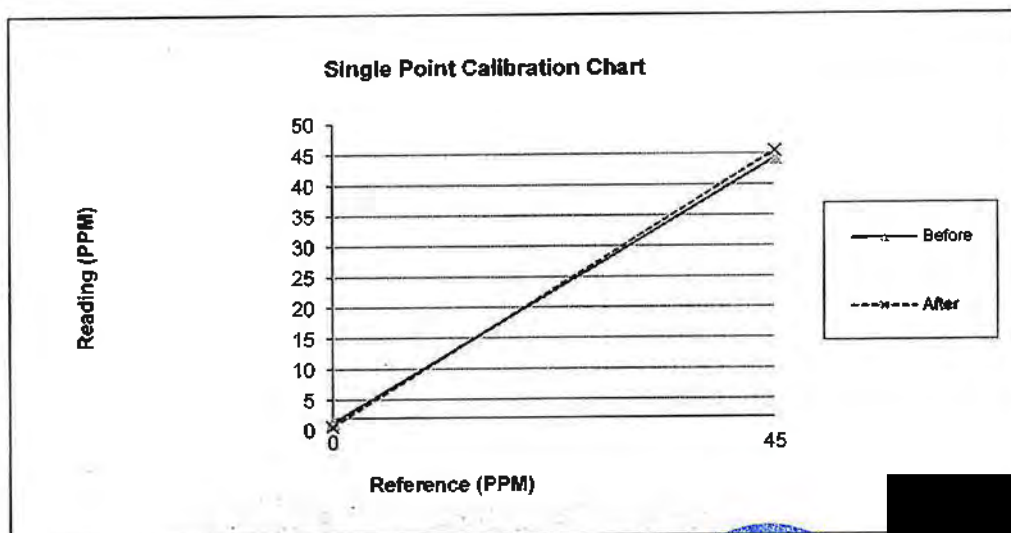
Calibration System

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

Environment: Temperature 24.7 °CHumidity: 57 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	1.2	1.2	45.0	44.3	-0.8
After	0.0	0.6	0.6	45.0	45.5	0.6

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

**neediss**บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.533 ซอยบางนาซอย 7 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110 533 Soi Bangna Soi 7 Bangkhong Bangkhu Bangkok
Tel : 02-807-5760-2 Fax : 02-807-3936 E-mail : info@neediss.com**CO Analyzer Verification Test Report**

Calibration Report No.: AP-C6704001

Calibrated Date: 1-Apr-24

☒ PM ☐ Onsite

Page:2/2

Detail	Range	Unit	Before	After	Note
Date	1-Apr-24				
Time	16:06				
Range	0.1-1000 PPM	PPM	50	50	
Stability	(0.1-2PPB)	ppb	0.01	0.06	
CO Measure	2500 - 4800 MV.	mV	3426.3	3401.3	
CO Reference	2500 - 4800 MV.	mV	2850.7	2832.1	
MR Ratio	1.2 +/- 0.5		1.21	1.21	
Sample Pressure	26 - 30 in-Hg-A	in-Hg-A	26.5	28.4	
Sample Flow	720 - 880 cc/min	cc/min	790	783	
Sample Temp	44 - 52 deg.C	deg.C	48.2	48.2	
Bench Temp	47 - 49 deg.C	deg.C	48	48	
Wheel Temp	66 - 70 deg.C	deg.C	68	68	
Box Temp	27 - 50 deg.C	deg.C	35.2	35.4	
PHT drive	250 - 4750 mv.	mV	3114.8	3106.5	
Slope	0.800 - 1.200		0.972	0.981	
Offset	0.05 +/- 0.2		0.01	0.009	
Gas Test Response					
Zero Gas	0	PPM	1.2	0.6	
Span Gas	45	PPM	44.3	45.5	± 5% of Range

Calibrate By :

Sirirat Poonlak

Date:

1-Apr-24

Approve By :

Sarawut Keawsrinal

Date:

1-Apr-24

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Neediss Supply Instrument Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



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

535 ซอยปทุมมา 7 แขวงปทุมมา เขตปทุมธานี 11050 535 Soi Puthuma 7 Bangpathum Bangpathum Bangkok
Tel: 02-867-0340-0341 Fax: 02-867-0998 Email: info@neediss.com



CO Analyzer Verification Test Report

Calibration Report No.: AP-C6704005

Calibrated Date: 1-Apr-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

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

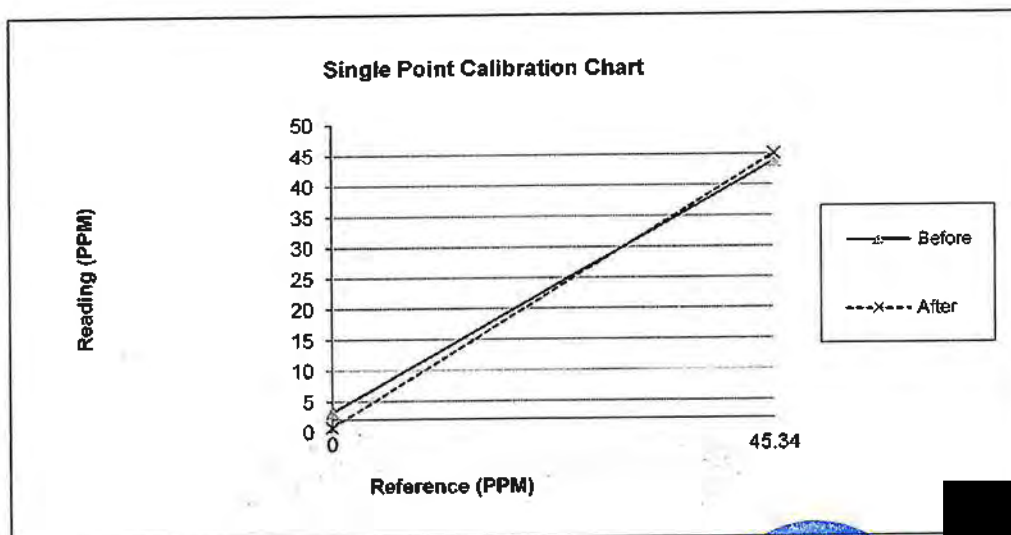
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NOx Conc 46.50 PPM NO Conc 46.50 PPM So2 Conc 45.59 PPM Co Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267

Environment: Temperature 24.7 °C

Humidity: 58 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	3.20	3.2	45.3	43.9	-1.6
After	0.0	0.76	0.8	45.0	45.1	0.1



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CO Analyzer Verification Test Report

Calibration Report No.: AP-C6704005

Calibrated Date: 1-Apr-24

☒ PM ☐ Onsite

Page:2/2

Detail	Range	Unit	Before	After	Note
Date	1-Apr-24				
Time	11:00				
Range	0.1-1000 PPM	PPM	50	50	
Stability	(0.1-2PPB)	ppb	0.73	1.11	
CO Measure	2500 - 4800 MV.	mV	2913.3	2923.5	
CO Reference	2500 - 4800 MV.	mV	2444.3	2421.4	
MR Ratio	1.2 +/- 0.5		1.18	1.21	
Sample Pressure	26 - 30 in-Hg-A	in-Hg-A	29.1	29	
Sample Flow	720 - 880 cc/min	cc/min	890	886	
Sample Temp	44 - 52 deg.C	deg.C	50.3	50.4	
Bench Temp	47 - 49 deg.C	deg.C	48	48	
Wheel Temp	66 - 70 deg.C	deg.C	68.3	68.4	
Box Temp	27 - 50 deg.C	deg.C	35.2	35.1	
PHT drive	250 - 4750 mv.	mV	3323.4	3353.6	
Slope	0.800 - 1.200		1.051	1.112	
Offset	0.05 +/- 0.2		0.088	0.088	
Gas Test Response					
Zero Gas	0	PPM	3.2	0.8	
Span Gas	45	PPM	43.9	45.1	± 5% of Range

Calibrate By : _____

Approve By : _____

Date:

1-Apr-24

Date:

1-Apr-24


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Neediss Supply Instrument Co., Ltd.



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

5/5 ซอยบางนาซอย 7 แขวงบางนาแสด เขตสวนหลวง กรุงเทพฯ 10760 535 Soi Bangna Soi 7 Bang Na Sub District Bangkok 10760
Tel: 02-807-4700-3 Fax: 02-807-3788 E-mail: info@neediss.com



CO Analyzer Verification Test Report

Calibration Report No.: ES-C6704007

Calibrated Date: 1-Apr-24

☒ PM ☐ Onsite

Page:1/2

Instruments Information

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

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

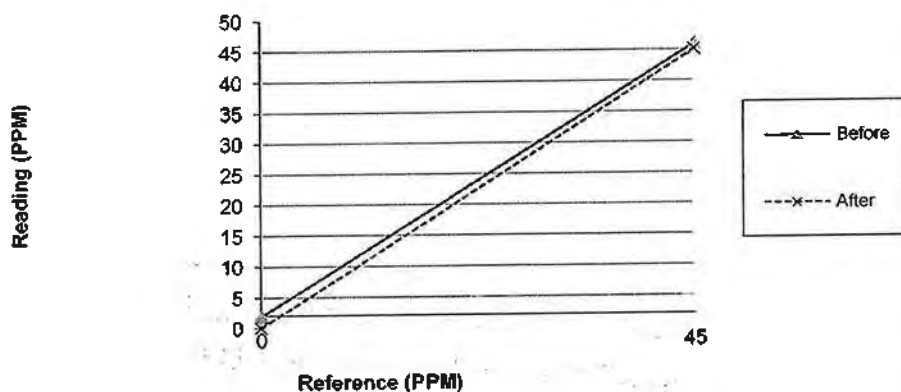
Environment: Temperature 27.2 °C

Humidity: 58 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	1.887	1.9	45.0	45.98	1.1
After	0.0	0.050	0.1	45.0	45.05	0.1

Single Point Calibration Chart



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ผู้จัดการฝ่ายควบคุมคุณภาพ



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

548 ซอย 7 แขวงบางนาแค เขตภาษีเจริญ กรุงเทพฯ 10763 548 Soi Bangkhuae 7 Bangkhuae Surasak Bangkok
Tel : 02-807-0701 Fax : 02-807-0705 E-mail : info@neediss.com



CO Analyzer Verification Test Report

Calibration Report No.: ES-C6704007

Calibrated Date: 1-Apr-24

☒ PM ☐ Onsite

Page:2/2

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

Calibrate By :



Sirirat Poonlak

Date:

1-Apr-24

Approve By :



Sarawut Keawsrinal

Date:

1-Apr-24

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Neediss Supply Instrument Co.,Ltd



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

**neediss**บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.53 ซอยทองหล่อ 7 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
Tel: 02-507-8074-5 Fax: 02-507-8075 E-mail: info@neediss.com

CO Analyzer Verification Test Report

Calibration Report No.: ES-C6704006

Calibrated Date: 1-Apr-24

☒ PM ☐ Onsite

Page:1/2

Instruments Information

Analyzer Type: CO Analyzer Model: CO12E	Manufacturer Environnement SA., France S/N: ECOESACO12E202
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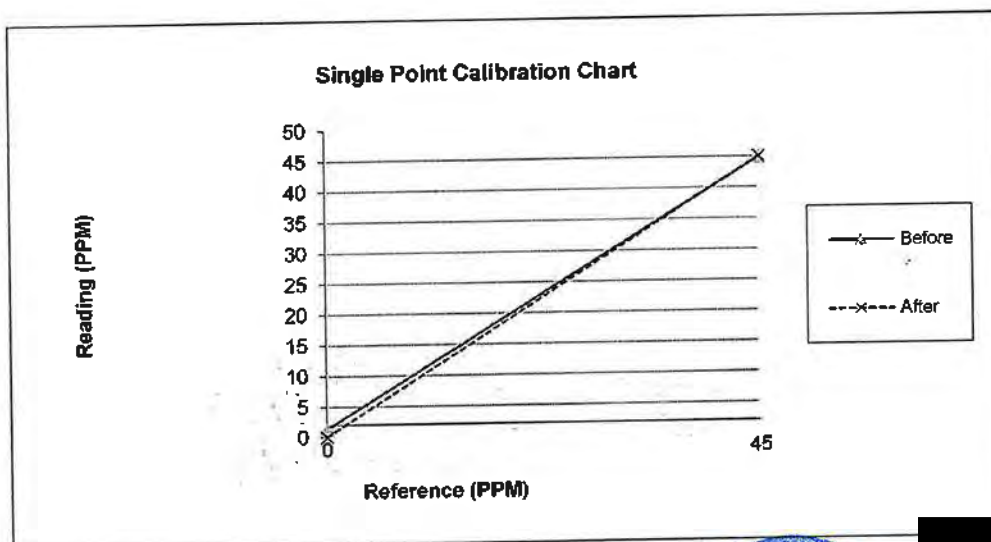
Calibration System

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

Environment: Temperature 27.2 °CHumidity: 59 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	1.342	1.3	45.0	44.89	-0.1
After	0.0	0.078	0.1	45.0	45.02	0.0

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



CO Analyzer Verification Test Report

Calibration Report No.: ES-C6704006

Calibrated Date: 1-Apr-24

☒ PM ☐ Onsite

Page:2/2

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

Calibrate By :


Sirirat Poonlak

Date:

1-Apr-24

Approve By :


Sarawut Keawsrinual

Date:

1-Apr-24

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



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



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

536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Bangkok Bangkok
Tel: 02-502-5960-2 Fax: 02-502-3935 E-mail: neediss@neediss.com



CO Analyzer Verification Test Report

Calibration Report No.: ES-C6703006

Calibrated Date: 1-Mar-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

Analyzer Type: CO Analyzer Model: CO12E	Manufacturer Environnement SA., France S/N: NCOESACO12E356
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Calibration System

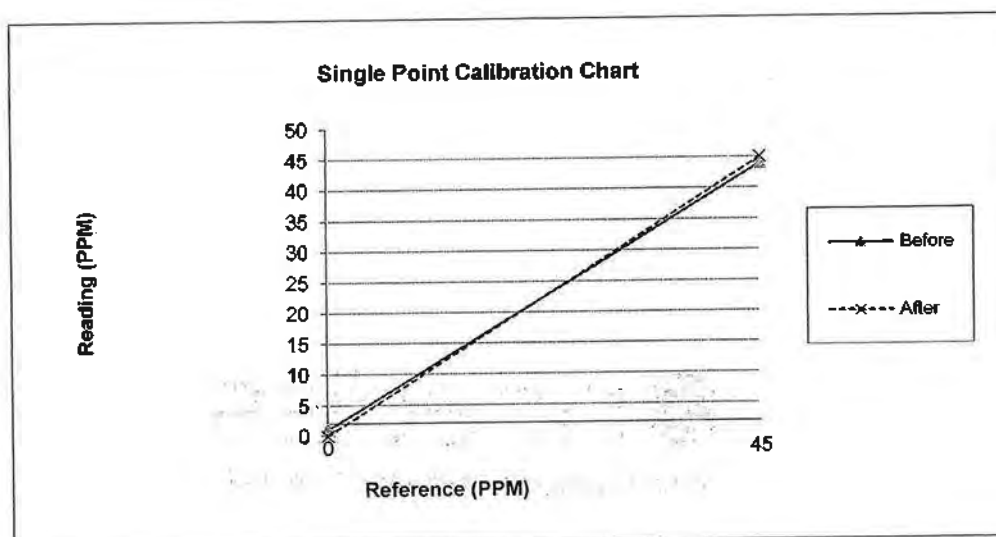
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 24.9 °C

Humidity: 62 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	1.007	1.0	45.0	43.99	-1.1
After	0.0	0.023	0.0	45.0	45.01	0.0



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

**neediss**บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 536 Soi Bangkhae 7 Bangkhae Bangkok Bangkok
Tel: 02-802-3960-2 Fax: 02-802-3996 E: info@neediss.com**CO Analyzer Verification Test Report**

Calibration Report No.: ES-C6703006

Calibrated Date: 1-Mar-24

☒ PM ☐ Onsite

Page:2/2

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

Calibrate By :



Sirirat Poonrak

Date:

1-Mar-24

Approve By :



Sarawut Keawsrinal

Date:

1-Mar-24



Neediss Supply Instrument Co.,Ltd



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 31 August, 2023

Certification No. 305/23

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : NovaLynx

Type : Data Logger NDWD100

Serial No. : EWSNV110WS2505

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 1007.5 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

Thermocoupler No.918802

STANDARD

Calibrated by

Mr. Watchan

Mechanic

aisala Type PTB220 No. 1220015

(Authorized Signatory)

for the Chief

Sub-Station



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Sensor model

EWSNV110WS2505

Certification No. 305/23

31 August, 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	-	-	-	2.9	0.12
5.00	-	-	-	4.7	0.30
7.04	-	-	-	6.9	0.14
9.02	-	-	-	8.7	0.32
11.01	-	-	-	10.9	0.11
13.01	-	-	-	12.7	0.31
15.01	-	-	-	14.9	0.11
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.1	-0.08

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

Calibrated by :

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 EWSNV110WS2505

Certification No. 305/23

31 August, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1010.30	1011.56	-1.26
1010.57	1011.92	-1.35
1010.38	1011.64	-1.26
1010.23	1011.54	-1.31
1009.93	1011.21	-1.28
1009.66	1010.83	-1.17
1009.41	1010.56	-1.15
1009.13	1010.32	-1.19
1008.96	1010.26	-1.30
1008.58	1009.92	-1.34
1008.25	1009.55	-1.30
1007.57	1008.76	-1.19
1007.27	1008.51	-1.24
1007.04	1008.36	-1.32
1006.63	1007.94	-1.31
1010.02	1011.28	-1.26
1008.77	1009.98	-1.21
1008.67	1009.84	-1.17
1008.54	1009.81	-1.27
1008.23	1009.52	-1.29

Average

Calibrated by :

Mr. Watchapol Subwat

Mechanical Engineer



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดทำ 102/170 คุณคุณภาพ



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Sensor model

EWSNV110WS2505

Certification No. 305/23

31 August, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.6	46.0	-0.4
30.2	30.4	-0.2
15.8	15.9	-0.1

Calibrated by



Mr. Watcharapol Subwat

Mechanical Engineer



EnviLab Co., Ltd.



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
หน้า 63/170



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Sensor model EWSNV110WS2505 Certification No. 305/23

31 August, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
86.2	79	7.2
65.4	61	4.4
46.4	43	3.4

Calibrated by :



Mr. Watcharapol Subwat
Mechanical Engineer



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Date of Issue 31 August, 2023

Certification No. 305/23

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 7342.026 Mfg. Code. EWSNV110WS2505 ทำการสอบเทียบกับแก้ววัด
ฝนแบบแก้วตวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON
No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ..

(นายวัชรพล ทรัพย์วัฒน์)

วิศวกรชำนาญการ



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
หน้า 65/170



THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 6 April, 2024

Certification No. 171/24

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุณหภูมิ

Manufacturer : NovaLynx

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

Serial No. : EWSNV110WS2501

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1008.9 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aloft Plotting Board

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

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

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

Serial Number 110730029 (sensor 120629586)

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

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

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

STANDARD : [REDACTED] sala Type PTB220 No. V1220015

Calibrated by :

Mr. Watchara

Mechanical

(Authorised Signatory)

Chief

Standard Instrument



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Sensor model

EWSNV110WS2501

Certification No. 171/24

6 April, 2024

Page : 2 of 6

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

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

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau



EnviLab Co., Ltd.

รับรองว่าถูกต้อง
วันที่ 6/7/170
ผู้จัดการฝ่ายควบคุมคุณภาพ



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Sensor model EWSNV110WS2501

Certification No. 171/24

6 April, 2024

Page : 3 of 6

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

Average

Calibrated by :

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

EWSNV110WS2501

Certification No. 171/24

6 April, 2024

Page : 4 of 6

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

Calibrated by :

Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

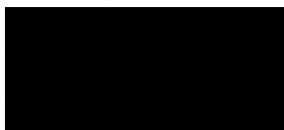
Sensor model EWSNV110WS2501 Certification No. 171/24

6 April, 2024

Page : 5 of 6

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

Calibrated by :



Mr. Watcharapol Subwat
Mechanical Engineer



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Date of Issue 6 April, 2024

Certification No. 171/24

Page: 6 of 6

ใบรับรอง

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



ลงชื่อ

(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. 340/23

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุณหภูมิมหาวิทยาลัย

Manufacturer : DYACON

Type : Data Logger CM-1

Serial No. : 130129 ID No. : NWSDCMS1200129

Customer : Neediss Supply Instrument Co.,Ltd.
536 Soi Bangkhao 7, Bangkhao, Bangkhao,
Bangkok 10160, Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1008.7 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

Calibrated by :

Mr. Watchara

Mechanica

Vaisala Type RTB220 No. V1220015

(Authorised Signatory)

for the Chief

SIIB-Standard

THAI METEOROLOGICAL DEPARTMENT

EnviLab Co.,Ltd.



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Sensor model

NWSDCMS1200129

Certification No. 340/23

2 October, 2023

Serial No. 1198

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacumm inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	2.9	0.12
5.00	-	-	-	5.0	0.00
7.04	-	-	-	6.9	0.14
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	-	-	-	20.0	0.02

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

Calibrated by :

Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instrument

Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้ตรวจฝ่ายควบคุมคุณภาพ
หน้า 73/170



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. 6235

Certification No. 340/23

2 October, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1005.63	1005.30	0.33
1006.25	1005.90	0.35
1006.22	1005.90	0.32
1006.54	1006.20	0.34
1006.88	1006.50	0.38
1007.36	1007.00	0.36
1007.58	1007.20	0.38
1007.52	1007.20	0.32
1005.60	1005.30	0.30
1005.84	1005.50	0.34
1006.28	1005.90	0.38
1006.60	1006.30	0.30
1007.07	1006.70	0.37
1007.26	1006.90	0.36
1007.38	1007.00	0.38
1005.50	1005.20	0.30
1005.83	1005.50	0.33
1006.55	1006.20	0.35
1007.31	1007.00	0.31
1007.01	1006.70	0.31

Average

0.34

Calibrated by :

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. 340/23

2 October, 2023

Serial No. 6235

Page : 4 of 6

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

Calibrated by

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 Humidity Model TPH-1 C

Certification No. 340/23

2 October, 2023

Serial No. 6235

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
86.2	85.6	0.6
62.4	62.1	0.3
45.6	45.4	0.2

Calibrated by :



Mr. Watcharapol Subwat
Mechanical Engineer



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
หน้า 76/170



Date of Issue 2 October, 2023

Certification No. 340/23

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 7342.026 Mfg. Code. NWSDCMS1200129 ทำการสอบเทียบกับแก้ววัด
ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON
No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ.

(นายวัชรพล ทรัพย์วัฒน์)

วิศวกรชำนาญการ



EnviLab Co., Ltd.



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. 341/23

Page : 1 of 5

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : DYACON

Type : Data Logger MS-100

Serial No. : 130152 ID No. : NWSDCMS1200152

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1008.9 hPa

NATIONAL STANDARD WIND TUNNEL : Micromanometer Theodor Friedrichs FC014 Serial.9310119

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

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

: Thermochneider No.918802

STANDA

Calibrated

Mr. Wat

Mech





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. 341/23

2 October, 2023

Serial No. 1226

Page : 2 of 5

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H ₂ O	Vacuum inches H ₂ O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.7	0.30
3.02	-	-	-	2.9	0.12
5.00	-	-	-	5.0	0.00
7.04	-	-	-	7.0	0.04
9.02	-	-	-	9.1	-0.08
11.01	-	-	-	11.0	0.01
13.01	-	-	-	13.1	-0.09
15.01	-	-	-	14.9	0.11
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	270

Calibrated by :

Mr. Watcharaporn Suwan

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. 341/23

2 October, 2023

Serial No. 6277

Page : 3 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45.2	0.0
31.1	31.2	-0.1
15.8	15.8	0.0

Calibrated by

Mr. Watcharapol 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. 341/23

2 October, 2023

Serial No. 6277

Page : 4 of 5

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
86.2	82.4	3.8
62.4	59.8	2.6
45.6	44.2	1.4

Calibrated by :



Mr. Watcharapol Subwat
Mechanical Engineer



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
หน้า 81/170



Date of Issue 2 October, 2023

Certification No. 341/23

Page: 5 of 5

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 7342.026 Mfg. Code. EWSDCMS1200152 ทำการสอบเทียบกับแก้ววัด
ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON
No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ

(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. 340/23

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : DYACON

Type : Data Logger CM-1

Serial No. : 130129 ID No. : NWSDCMS1200129

Customer : Neediss Supply Instrument Co.,Ltd.
536 Soi Bangkhae 7, Bangkhae, Bangkhae,
Bangkok 10160, Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1008.7 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

STANDARD B

Calibrated by :

Mr. Watcharap

Mechanical

No.918802

Vaisala Type RM32 No. V4220015

(Authorised Signatory)

for the Chief

Silb-Standard



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Sensor model

NWSDCMS1200129

Certification No. 340/23

2 October, 2023

Serial No. 1198

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacumm	Velocity	Velocity	Correction
	inches H2O	inches H2O	mm/sec	m/sec	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	2.9	0.12
5.00	-	-	-	5.0	0.00
7.04	-	-	-	6.9	0.14
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	-	-	-	20.0	0.02

Wind Aloft Plotting Board.	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	91
180	180

Calibrated by :

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 Pressure Model TPH-1 C

Serial No. 6235

Certification No. 340/23

2 October, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1005.63	1005.30	0.33
1006.25	1005.90	0.35
1006.22	1005.90	0.32
1006.54	1006.20	0.34
1006.88	1006.50	0.38
1007.36	1007.00	0.36
1007.58	1007.20	0.38
1007.52	1007.20	0.32
1005.60	1005.30	0.30
1005.84	1005.50	0.34
1006.28	1005.90	0.38
1006.60	1006.30	0.30
1007.07	1006.70	0.37
1007.26	1006.90	0.36
1007.38	1007.00	0.38
1005.50	1005.20	0.30
1005.83	1005.50	0.33
1006.55	1006.20	0.35
1007.31	1007.00	0.31
1007.01	1006.70	0.31

Average

0.34

Calibrated by :

Mr. Watchapol 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 Temperature Model TPH-1 C

Certification No. 340/23

2 October, 2023

Serial No. 6235

Page : 4 of 6

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

Calibrated by :



Mr. Watcharapol Subwat
Mechanical Engineer



Envilab Co., Ltd.



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
หน้า 86/170



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. 340/23

2 October, 2023

Serial No. 6235

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
86.2	85.6	0.6
62.4	62.1	0.3
45.6	45.4	0.2

Calibrated by :



Mr. Watcharapol Subwat
Mechanical Engineer





Date of Issue 2 October, 2023

Certification No. 340/23

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 7342.026 Mfg. Code. NWSDCMS1200129 ทำการสอบเทียบกับแก้ววัด
ฝนแบบแก้วดวง 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 31 August, 2023

Certification No. 304/23

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุณหภูมิตามวิทยา

Manufacturer : NovaLynx

Type : Data Logger NDWD100

Serial No. : EWSNV110WS2506

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 1008.1 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 : Vaisala Type PWB220 No. 31220015

Calibrated by :

Mr. Watcharapong

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Sensor model

EWSNV110WS2506

Certification No. 304/23

31 August, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure Inches H ₂ O	Vacuum Inches H ₂ O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.8	0.20
3.02	-	-	-	2.9	0.12
5.00	-	-	-	4.9	0.10
7.04	-	-	-	7.1	-0.06
9.02	-	-	-	9.1	-0.08
11.01	-	-	-	10.1	0.91
13.01	-	-	-	13.1	-0.09
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	90
180	180
270	

Calibrated by :

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

EWSNV110WS2506

Certification No. 304/23

31 August, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1010.30	1011.12	-0.82
1010.57	1011.35	-0.78
1010.38	1011.16	-0.78
1010.23	1011.03	-0.80
1009.93	1010.85	-0.92
1009.66	1010.61	-0.95
1009.41	1010.36	-0.95
1009.13	1009.95	-0.82
1008.96	1009.74	-0.78
1008.58	1009.46	-0.88
1008.25	1009.13	-0.88
1007.57	1008.41	-0.84
1007.27	1008.15	-0.88
1007.04	1007.91	-0.87
1006.63	1007.42	-0.79
1010.02	1010.86	-0.84
1008.77	1009.57	-0.80
1008.67	1009.48	-0.81
1008.54	1009.32	-0.78
1008.23	1009.06	-0.83

Average

Calibrated by :

Mr. Watchapol 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

EWSNV110WS2506

Certification No. 304/23

31 August, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.6	45.9	-0.3
30.2	30.4	-0.2
15.8	15.7	0.1

Calibrated by :

Mr. Watchapol Subwat
Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

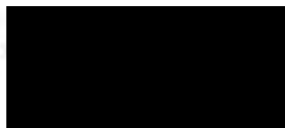
Sensor model EWSNV110WS2506 Certification No. 304/23

31 August, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
86.2	82	4.2
65.4	62	3.4
46.4	44	2.4

Calibrated by :



Mr. Watcharapol Subwat
Mechanical Engineer



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
หน้า 93/170



Date of Issue 31 August, 2023

Certification No. 304/23

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 7342.026 Mfg. Code. EWSNV110WS2506 ทำการสอบเทียบกับแก้ววัด
ฝนแบบแก้วทรง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON
No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ...

(นายวัชรพล ทรัพย์วัฒน์)

วิศวกรชำนาญการ





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0148

MTC No. EEL. BP. 28/1266

CALIBRATION CERTIFICATE

Submitted by : Neediss Supply Instrument Co.,Ltd.

Address : 536 Soi Bangkhuae 7, Bangkhuae, Bangkok 10160 Thailand.

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

Instrument Calibrated :

Description : Acoustic Calibrator

Manufacturer : Pulsar

Model : 103

Serial No. : 98971

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 Panasonic VP-7722A S/N 041477D122.
7. Condenser Microphone B&K 4180 S/N 2889871.

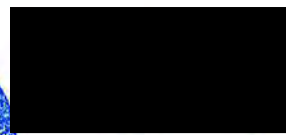
Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

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 Dec. 2023

Date of Calibration : 18 Dec. 2023



13

The results relate only to the items tested/calibrated of value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governing authority.

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E-mail : rumpai@tistr.or.th Website:www.tistr.or.th
ภาคผนวก 4

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

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

FM.BL.MTC.002 Rev.4

หน้า 95/170



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0148

MTC No. EEL. BP. 28/1266

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

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	94.10	0.10	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1000.5	0.5	± 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	1.65	± 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.

Date of Calibration : 18 Dec. 2023

2 / 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

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FM.BL.MTC.002 Rev.4

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ภาคผนวก 4

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หน้า 96/170



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0148

MTC No. EEL. BP. 28/1266

Nominal Output of Unit Under Test = 114 dB re 20 μ Pa at 1000 HzAcoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0 °C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	114.19	0.19	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1000.3	0.3	± 1.5	$\pm 1.0\%$

3. Total Distortion

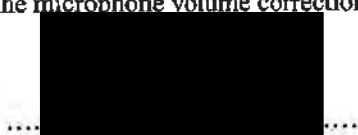
Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.12	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :



(Mr. Weerachai Deechaiyae)

Approved by :



(Mr. Prawate Khuaipya)

TISTR

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 18 Dec. 2023

Date of Issue : 20 Dec. 2023

End of Certificate

Ref : 20112661



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FM.BL.MTC.002 Rev.4

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ภาคผนวก 4

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Thailand

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

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

หน้า 97/170



neediss

55/1 หมู่บ้าน 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160 Tel.02-802-3980-2 e-mail: info@neediss.com

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



Verification Test Report

Report No.: OP01-6704001

Calibrated Date: 2-Apr-2024

☒ PM ☐ Onsite UTM :

Site: Neediss Supply Instrument

Equipment: Smoke Opacity

Manufacturer: Wager

Model: 8500

Serial or ID No. EOPWA850015944

Environment: Temperature 23 °C

Humidity: 60 %RH

Reference Standard: Natural Density Verification Filter Standard

Result of Calibration

Reference Standard (% Opacity)	Instrument reading (% Opacity)	Error (% Opacity)	Result (dB)
0.00	0.00	0.00	PASS
31.50	30.28	1.22	PASS

Calibrated By: 

Thanakorn Arantawanthana

Date: 2-Apr-24



Neediss Supply Instrument Co.,Ltd

Approve By: 

Lak

Date: 2

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www.neediss.com

all about environmental services

รับรองสำเนาถูกต้อง
ควบคุมคุณภาพ

Certificate of Calibration

Certificate No. : 67-420034-1

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 : (22.0 to 23.0)° C

Relative Humidity : (50 to 55) %

Date of Received : 20 March 2024

Date of Calibration : 20 March 2024

Date of Issue : 23 March 2024

Calibrated by : Permpoon Chanpu

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-00307/66	23 Aug 2025	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61293328	944535	27 Nov 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.986	61281486	944537	17 Nov 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
9.997	61281073	944536	17 Nov 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by

(Surachai Promthong)

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.



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Certificate of Calibration

Certificate No. : 67-420034-1

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	3.998	177.5	0.0	0.12
	0.0000	7	7.000	0.0	0.0	0.086
	-177.4800	10	10.000	-177.4	-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	4.009	-0.001	0.0084
	6.986	7.000	-0.014	0.0092
	9.997	10.008	-0.011	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.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Certificate of Calibration

Certificate No. : 67-400167-1

Page : 1 of 2

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

Equipment : Temperature Indicator with Thermistor Probe
Temperature Indicator

Manufacturer :	Horiba	Model :	F-74BW-G
Range :	N/A °C	Resolution :	0.1 °C
Serial No. :	B41J0001	ID No. :	ELABPHHB74BW01
Thermistor probe			
Model :	9615S	Sheath Material :	Glass
Diameter :	12 mm.	Length :	151 mm.
Serial No. :	9X1K0003	ID No. :	ELABPHHB74BW01

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

Ambient Temperature : (22.0 to 23.0) °C
Relative Humidity : (50 to 55) %
Line Voltage : (220.0 to 223.0) VAC

Date of Received : 20 March 2024

Date of Calibration : 20 March 2024

Date of Issue : 23 March 2024

Calibrated by : Perinpon Chanpu

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4003 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400002	TT-0074-22	20 Jun 2024	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400003/400004	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)

Approved by

(achai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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รับรองสำเนาถูกต้อง

Envilab Co.,Ltd. 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. : 67-400167-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
130	25.002	25.0	0.0	0.19

Remark

UUC : Unit Under Calibration

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

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

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Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 66-400546-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Incubator)

Manufacturer : M-LAB

Model : BIC-140

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 100613-1

ID No. : ELABBODCI40N01

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 : Pernpon 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

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
400029 & 400048	66-400454-1	05 Feb 2024	National Institute of Metrology Thailand (NIMT)

Approved

urachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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รับรองสำเนาถูกต้อง



Certificate of Calibration

Certificate No. : 66-400546-1

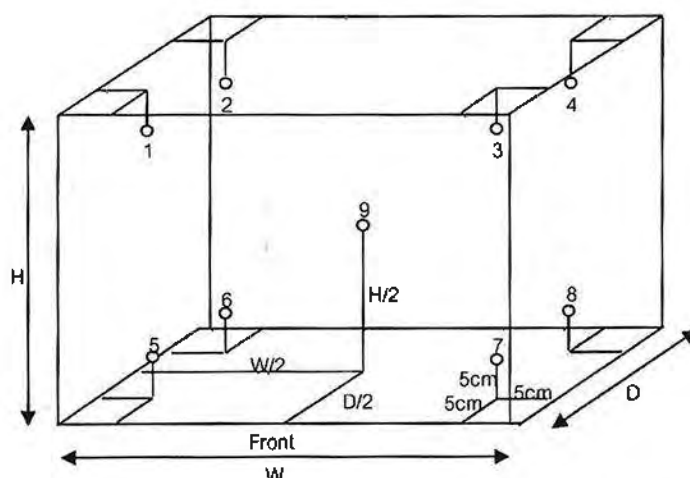
Page : 2 of 2

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 m³

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
20.0	20.0	20.0	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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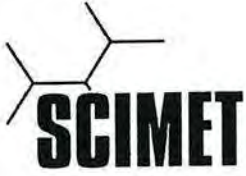


EnviLab Co.,Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ





SCIMET Co., Ltd.
1194 Soi Wachirathamsathit 57, Bangchak,
Phrakhanong, Bangkok 10260 Thailand
Email:scimet2022@gmail.com, Tel:095-552-4939

Certificate No. C27240002

Calibration Certificate

Equipment: DO METER
Model: WQ-330-K
Serial No.(or ID): SF9M0013
Manufacturer: HORIBA
Condition: In Condltion

Job No.: KSMT2400727
Received Date: 04 March 2024
Issued Date: 05 April 2024
Page: 1 of 2

Customer

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

Calibration Place

Environment Laboratory, SCIMET Co., Ltd.
1194 Soi Wachirathamsathit 57, Bangchak, Prakhnong, Bangkok 10260 Thailand

Calibration Date

05 April 2024

Environment Condition

Temperature: 23 °C \pm 2 °C
Humidity: 50 %RH \pm 15 %RH

The Method used

In-house method, WI27 , By comparison with certified
dissolved oxygen solution standard

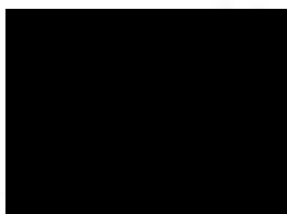
Traceability

This is certificate is traceable to SI Units , Sample test and
temperature test are assured through HANNA instruments
company certificare No. 29E31, through Quality Reborn
Co.,LTD certificare No.QR23-1169

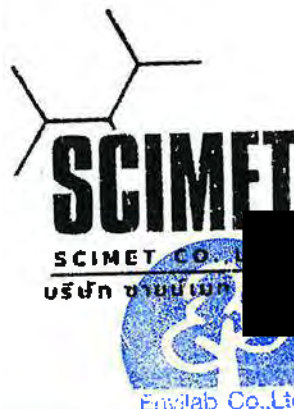
This certificate is issued the units of
measurement according to the International
System of Units (SI). It provides traceability
of measurement to international or national
standard or other recognized national
standard laboratories.

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

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



Mr.Dumrong Boonsopon
Person in charge



alerngkeat POUNGNGARM
Authorized signatory

Calibration Results:

Electrode Serial No. KS9F5037
Model : 300-D-5
Brand : HORIBA

Electrode Test

Atmospheric pressure measured while calibrating. 755.46 mmHg
Temperature measured while calibrating. (± 0.2 °C) 25.0 °C
The Oxygen Solubility was calculated from the ambient conditions. 8.21 \pm 0.03 mg/L
The Oxygen Solubility reading from the DO METER 8.21 mg/L

Sample Test

Standard Oxygen Solution	Unit Under Calibration Reading	Correction	Coverage Factor (k)	Uncertainty of Measurement (\pm)
0.00 mg/L	0.09 mg/L	-0.09 mg/L	2.00	0.13 mg/L

Temperature Electrode

Dimension of Probe;

Length : 105 mn.
Diameter : 16 mn.
Immersion Depth 80 mn.

STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Coverage Factor (k)	Uncertainty of Measurement (\pm °C)
25.02	25.1	-0.08	2.00	0.15

The End of Certificate

บริษัท ชายนีเมค จำกัด (SCIMET CO., LTD.)

1194 Soi Wachirathamsathit 57, Bangchak, Phrakhanong, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 095 552 4939

ภาคผนวก 4



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



ใบตรวจสอบสภาพเครื่อง Do Meter

เลขที่ใบงาน: KSMT2400727

ชนิดเครื่องมือ: DO METER

รุ่น: WQ-330-K

หมายเลขเครื่อง: SF9M0013

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
05 Apr 2024			05 Apr 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิทช์ ปิด – เปิด เครื่อง (On-Off Swicth)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. อิเล็กโทรด (Electrode and Connection Cable)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สายอิเล็กโทรด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. เชื้อนเซอร์อิเล็กโทรด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	9. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	-

ข้อเสนอแนะ :

Mr.Dumrong Boonsopon

Service Engineer

บริษัท ชายนีเมก จำกัด (SCIMET CO., LTD.)

1194 Soi Wachirathamsathit 57, Bangchak, Phrakhanong, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 095 552 4939

ภาคผนวก 4



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Certificate of Calibration

Certificate No. : 67-400166-2

Page : 1 of 2

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

Equipment : Water Bath
Manufacturer : Memmert **Model :** WNB 14
Range : N/A °C **Resolution :** 0.1 °C
Serial No. : L412.2222 **ID No. :** ELABWBWNB29N01

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

Ambient Temperature : (29.0 to 30.0) °C

Relative Humidity : (60 to 650) %

Line Voltage : (224.2 to 225.2) V

Date of Received : 20 March 2024

Date of Calibration : 20 March 2024

Date of Issue : 22 March 2024

Calibrated by : Kittisak Kokaeo

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
400046 & 400024	66-400547-2	02 Apr 2024	National Institute of Metrology Thailand (NIMT)

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

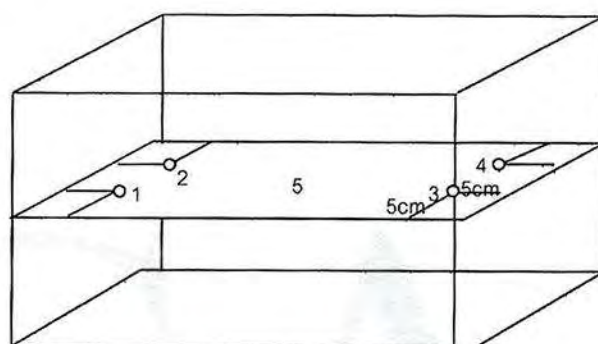
Certificate No. : 67-400166-2

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)
			1	2	3	4	5			
95.0	94.5	94.5	95.12	95.18	95.11	95.02	95.17	0.23	0.26	0.12

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.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



CAL

Calibratech Co.,Ltd.

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

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



Certificate of Calibration

Certificate No. : 67-400166-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Temperature controlled enclosure (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 : (29.0 to 30.0) °C

Relative Humidity : (60 to 650) %

Line Voltage : (224.2 to 225.2) V

Date of Received : 20 March 2024

Date of Calibration : 20 March 2024

Date of Issue : 22 March 2024

Calibrated by : Kittisak Kokaeo

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

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
400046 & 400028	66-400547-3	05 Apr 2024	National Institute of Metrology Thailand (NIMT)

Approved by :

(i Promthong)

ory Manager



The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 67-400166-1

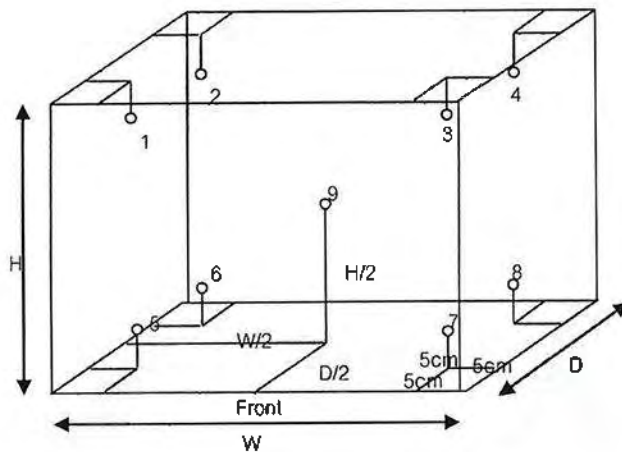
Page : 2 of 2

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 = 0.40 m

D = 0.33 m

H = 0.56 m

Capacity = 0.07 m³

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
104.0	103.5	103.5	104.1	104.4	104.1	104.3	104.1	104.0	104.0	103.7	104.3	0.70
110.0	109.5	109.5	110.1	110.4	110.1	110.3	110.2	110.1	110.1	109.4	110.3	0.72
180.0	179.0	179.0	179.5	180.9	180.3	180.6	180.5	180.3	180.2	180.2	180.8	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	1.0
110.0	109.5	109.5	1.1	0.1	1.2
180.0	179.0	179.0	1.5	0.2	1.6

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



CAL

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

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



Certificate of Calibration

Certificate No. : 67-200060-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Electronic Balance

Manufacturer : METTLER TOLEDO **Model :** XSR205DU

Serial No. : B911363567 **ID No. :** ELABBALANCEN06

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

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

Ambient Temperature : (20.0 to 20.5) °C

Relative Humidity : (54.2 to 59.1) %

Air Pressure : 1013.0 mbar

Date of Received : 20 February 2024

Date of Calibration : 20 February 2024

Date of Issue : 21 February 2024

Calibrated by : Satja Sangkhum

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

Edition 7 - November 2022

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

Standard Weights

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

Approved by :

(Supachai Promthong)

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The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 67-200060-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

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

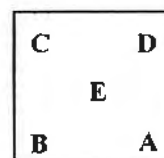
This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g

A	B	C	D	E	
0.00000	0.00000	0.00010	0.00000	0.00000	g



Repeatability

Load test : 200 g
Stdev. : 0.000032 g

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รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Certificate of Calibration

Certificate No. : 67-200060-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA125-1S

Serial No. : 0034606552

ID No. : ELABBALANCEN05

Capacity : 120 g

Resolution : 0.0001 g

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

Ambient Temperature : (20.0 to 20.7) °C

Relative Humidity : (56.2 to 60.3) %

Air Pressure : 1013.0 mbar

Date of Received : 20 February 2024

Date of Calibration : 20 February 2024

Date of Issue : 21 February 2024

Calibrated by : Satja Sangkhum

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

Edition 7 - November 2022

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

Standard Weights

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

Approved by :

The Uncertainties are for a confidence probability of approximately 95%

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รับรองสำเนาถูกต้อง
ผู้จัดทำเอกสารนี้คือ



CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 67-200060-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

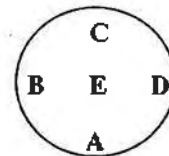
Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty \pm (g)
0.1	0.0000	0.00011
0.5	0.0000	0.00011
1	0.0000	0.00011
2	0.0000	0.00011
5	0.0000	0.00011
10	0.0000	0.00011
20	0.0000	0.00013
50	0.0001	0.00014
100	0.0001	0.00020
120	0.0000	0.00038

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, providing a level of confidence of approximately 95%

Eccentric error Load test : 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

- o0o -



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. : 66-300675-4

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : BOROSIL

Class : A

Capacity : 50 ml

Graduation : 1 ml

ID No. : C-WW-008/23

Environment : Ambient Temperature : (20 ± 3) °C

Relative Humidity : (50 ± 10) %

Air Pressure : 1014.7 mbar.

Date of Received : 10 November 2023

Date of Calibration : 15 November 2023

Date of Issue : 15 November 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	66-200196-1	02 Dec 2023	National Institute of Metrology (Thailand) (NIMT)

Approved by

(Wipa Tovadee)

The Uncertainties are for a confidence probability of approximately 95%

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Envilab Co. Ltd. มีจัดการฝ่ายควบคุมคุณภาพ



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. : 66-300675-4

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	30.09
50	50.11

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 -



Enzlab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



CAL

Calibratech Co.,Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 67-300147-4

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : PYREX

Class : A

Capacity : 250 ml

Graduation : 2 ml

ID No. : C-WW-007/23

Environment : Ambient Temperature : (20 ± 3) °C

Relative Humidity : (50 ± 10) %

Air Pressure : 1009.4 mbar.

Date of Received : 13 March 2024

Date of Calibration : 19 March 2024

Date of Issue : 19 March 2024

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241002	66-200388-1	02 Jun 2024	National Institute of Metrology (Thailand) (NIMT)

Approved by :

(Wipa Tovadee)

Signature

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. : 67-300147-4

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)
150	150.31
250	250.38

Uncertainty of measurement with in \pm 0.087 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%

- ๐0๐ -



EnviLab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ



CAL

Calibratech Co.,Ltd.

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

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



Certificate of Calibration

Certificate No. : 67-300147-11

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Measuring Pipette

Manufacturer : Witeg

Class : A

Capacity : 25 ml

Graduation : 0.1 ml

ID No. : G-HM-013/23

Environment : Ambient Temperature : (20 ± 3) °C

Relative Humidity : (50 ± 10) %

Air Pressure : 1006.8 mbar.

Date of Received : 13 March 2024

Date of Calibration : 19 March 2024

Date of Issue : 19 March 2024

Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-22

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

Electronic Balance

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
241005	66-200388-4	02 Jun 2024	National Institute of Metrology (Thailand) (NIMT)

Approved by :

(Wipa Tovadce)



The Uncertainties are for a confidence probability of approximately 95%

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รับรองสำเนาถูกต้อง

Envilab Co.,Ltd. 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. : 67-300147-11

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 : 14.28 sec.

Nominal Volume (ml)	Measuring Volume (ml)
1	1.0304
10	9.9852
25	24.9764

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%

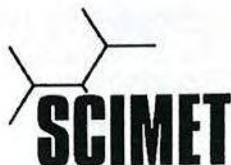
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Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





SCIMET Co., Ltd.
1194 Soi Wachirathamsathit 57, Bangchak,
Phrakhanong, Bangkok 10260 Thailand
Email:scimet2022@gmail.com, Tel:095-552-4939

Certificate No. C06230015

Calibration Certificate

Equipment:	TURBIDIMETER	Job No.:	KSMT2300573
Model:	2100Q	Received Date:	05 October 2023
Serial No.(or ID):	17110C062404 (ELABTB2100Q001)	Issued Date:	05 October 2023
Manufacturer:	HACH	Page:	1 of 2
Condition:	In Condition		

Customer

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

Calibration Place

Envilab Co., Ltd.(CH1 ROOM)
540, 540/1 Soi Bangkhæ 7, Bangkhæ, Bangkhæ, Bangkok 10160

Calibration Date

05 October 2023

Environment Condition

Temperature: 22.3 °C ± 0.1 °C
Humidity: 55.2 %RH ± 0.6 %RH

The Method used

In-house method, WI06, based on Hach Manufacturer Method 8195

Traceability

This certificate is traceable to Primary standard Fromazin and StablCal accepted by United States Environmental Protection Agency (EPA) through Hach Company Certificate No. A2005, A2286, A2292, A2283

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

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

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



(Mr. Dumrong Boonsopon)
Person in charge



Thalerngkeat Pongngam
Authorized signatory



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

FC06-03: 30 MAY 2023

Calibration Results:

Before Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.080	0.06	0.020	0.0	0.070
20.40	20.5	-0.10	0.1	1.0
103.0	97.9	5.1	0.1	7.0
825.0	791	34.0	0.6	45

After Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.080	0.06	0.020	0.0	0.070
20.40	20.3	0.10	0.1	1.0
103.0	103	0.0	0.0	7.0
825.0	825	0.0	0.7	45

The End of Certificate

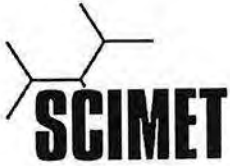
บริษัท ชายนัมก จำกัด (SCIMET CO., LTD.)

1194 Soi Wachirathamsathit 57, Bangchak, Phrakhanong, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 095 552 4939



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

FC06-03: 30 MAY 2023



ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSMT2300573

ชนิดเครื่องมือ: TURBIDIMETER

รุ่น: 2100Q

หมายเลขเครื่อง: 17110C062404

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
05 Oct 2023			05 Oct 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตซ์ ปิด – เปิด เครื่อง (On-Off Swicth)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ค่าความขุ่นที่ค่าสุด (No Sample)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.03NTU
<input type="checkbox"/>	<input type="checkbox"/>	7. ระดับการส่องสว่างของแสง (≥ 2.5 ไม่เกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	

เพิ่มเติม/ข้อแนะนำ :

Mr. Dumrong Boonsopon
Service Engineer

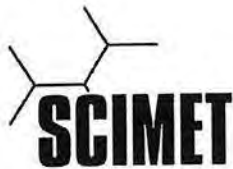
บริษัท ขายนีเมก จำกัด (SCIMET CO., LTD.)

1194 Soi Wachirathamsathit 57, Bangchak, Phrekanong, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 095 552 4939



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ผู้จัดการฝ่ายควบคุมคุณภาพ

FI06-01: 08 MAR 2023



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



Certificate No. C07240032

Calibration Certificate

Equipment

SPECTROPHOTOMETER

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

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

Customer

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

Calibration Place

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

Calibration Date

04 March 2024

Environment Condition

Temperature: 22.3 °C \pm 0.6 °C
Humidity: 65.7 %RH \pm 0.5 %RH

The Method used

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

Traceability

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

The standard for Wavelength Certificate No. 108691 and 108692

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

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

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

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

(Mr. Dumrong Boonsopon)
Person in charge



(Mr. Thalernekeat Pongngam)
Laboratory

Calibration Results:

Without Adjustment

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

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

Photometric Accuracy (Absorbance)

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



EnviLab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

บริษัท ชัยนิเมท จำกัด (SCIMET CO., LTD.)

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

FC07-03: 30 MAY 2023

Calibration Results:
Without Adjustment
Photometric Accuracy (Absorbance)

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

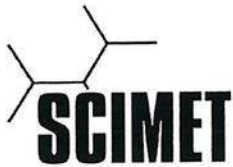
The End of Certificate

บริษัท ชัยนิมิต จำกัด (SCIMET CO., LTD.)

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

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

FC07-03: 30 MAY 2023



Refer to Certificate No.: C07240032

Page: 1 of 3

Statements of conformity:

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

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

Tolerance and Decision rules:

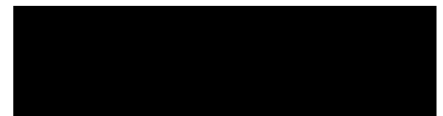
Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

Decision rule : ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk $< 50\%$ PFA.

☒ Choice B Non-binary statement with guard band ($w = 1 U$), Pass or Fail Specific Risk $< 2.5\%$ PFA and Condition Pass or Condition Fail Specific Risk $< 50\%$ PFA.

☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r U$).

; PFA – Probability of False Accept



(Mr. Thalerngkeat Pongngam)

Authorized signatory

บริษัท ชายนีเมก จำกัด (SCIMET CO., LTD.)

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

ภาคผนวก 4



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

FC07-03: 30 MAY 2023

หน้า 128/170

Without Adjustment

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

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

Photometric Accuracy (Absorbance)

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



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

บริษัท ชายนันเมก จำกัด (SCIMET CO., LTD.)

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

FC07-03: 30 MAY 2023

Without Adjustment

Photometric Accuracy (Absorbance)

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

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

The End of Statements of Conformity

บริษัท ชายนีเมท จำกัด (SCIMET CO., LTD.)

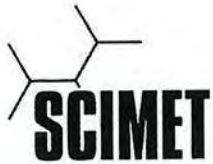
1194 Soi Wachirathamsathit 57, Bangchak, Phrakhanong, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 02 460 9239

ภาคผนวก 4


รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

FC07-03: 30 MAY 2023

หน้า 130/170



ใบตรวจสอบสภาพเครื่อง Spectrophotometer

เลขที่ใบงาน: KSMT2400444

ชนิดเครื่องมือ: SPECTROPHOTOMETER

รุ่น: CARY 60UV-VIS

หมายเลขเครื่อง: MY17490026

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
04 Mar 2024			04 Mar 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด – เปิด เครื่อง (On-Off Swieth)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	-

เพิ่มเติม/ข้อแนะนำ :

Mr. Dumrong Boonsopon

Service Engineer



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

บริษัท ชายนัมเมก จำกัด (SCIMET CO., LTD.)

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

FI07-01: 08 MAR 2023

Agilent CrossLab Start Up Services

Agilent 5100 5110 ICP-OES Preventive Maintenance

ภาคผนวก 4

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

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

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



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Revised: 21 January 2022
Document Number: 68014-90075
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Introduction

Customer Information

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

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Important Customer Web Links

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



EnviLab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
หน้า 133/170

Service Engineer's Responsibilities

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

Instrument Maintenance

System Information

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

Instrument System Name and ID
Instrument System Site and Location

5110 VDU ICP-OES
EnviLab Company Limited

List System Component Product Numbers List the Serial Numbers of each Component

1. G 8015 A	MY 17490002
2. G 8410 A	AN 17393768
3. G 8491-80002	1709-05324
4.	
5.	
6.	
7.	
8.	
9.	

ICP-OES Configuration Table	Circle the type or write in the type if other
Nebulizer Type	SeaSpray OneNeb Conical Other
Spray Chamber	Cyclonic Single Pass Cyclonic Double Pass Other
	Radial (Dual View) Other
	One Piece Semi Demountable Fully Demountable Other
Sampler	2.4mm 1.8mm 1.4mm 0.8mm Other
Scrubber	Quartz Ceramic Other

Preparation

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

Preventive Maintenance Procedures

Record Pre-PM instrument performance

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

Clean and inspect ICP-OES system

- ☒ Look for any obvious external damage or problems.
- ☒ Inspect water cooling hoses, gas lines and power cord for excessive wear or damage.
- ☒ Perform a general internal inspection of the system for excessive dust accumulation, clean if necessary.
- ☒ Inspect sample introduction components and record any required maintenance in the Service Engineer Comments and notify the customer as the required actions required.
- ☒ Record the instrument operating conditions in the ICP-OES Status Results Table.
- ☒ Replace the polychromator purge filter.
- ☒ Replace the radial pre-optics window
- ☒ Replace the axial pre-optics window for SVDV and VDV instruments.
- ☒ Check exhaust flow for the correct positive extraction at the exhaust duct to insure they meet minimum specifications.
- ☒ Replace air inlet dust filter.
- ☒ Replace high capacity air inlet dust filter element if installed. N1A
- ☒ Remove and clean instrument water inlet filter.

Agilent Water Recirculator

- ☒ Service not applicable
- ☒ Drain cooling fluid and remove any particles from the chiller reservoir
- ☒ Clean, clean and reinstall water inlet metal mesh filter if present.
- ☒ Flush with Agilent Cool Clear cooling fluid.
- ☒ Check the cooling system air filter and the condenser.

SPS 3 Auto Sampler

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

SPS 4 Auto sampler

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

AVS 4, 6, 7 Advanced Valve System

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

ICP-OES adjustment

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

Record Post-PM instrument performance

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

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

- ☒ Record the result in the Instrument Test Results Table



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Restore Instrument

- ☐ For HF applications, ask the customer to reinstall their sample introduction system. N18
- ☒ Leave system in an idle state: on and purging.
- ☒ Guidance: If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Service Review

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

Test Results

Instrument Performance Test Results Table

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

	Pre PM Sensitivity Check		Post PM Sensitivity Check	
	Radial	Axial*	Radial	Axial*
Zn 213.857 nm SRBR	1297.1	3382.6	2348.2	6129.9
Mn 257.610 nm SRBR	9945.3	16148.9	10144.1	39077.2
Al 396.152 nm SBR	7.0	16.9	8.5	25.7
K 766.491 nm SBR	8.2	67.3	4.7	88.6

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

Instrument Test Results Table

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

Instrument Test	Result
Subsystem Communications Test	Pass
Air Flow	Pass
Water Flow	Pass
Gas Flow	Pass
	Pass
	Pass
	Pass

ICP-OES Status Results Table

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

Measurement	Standby/Mode		Plasma On
Mains Voltage	219.371	VAC	211.484
Mains Current	0.082	A	0.098
Instrument Temperature	23.5	°C	23.1
RF Air Flow (sensor speed)	13.0	Hz	19.0
Plasma Exhaust Temperature	No measurement		56.4
Water Flow Oscillator	No measurement		4.51
Water Flow Detector	1.09	L/min	1.06
Water Inlet Temperature	16.9	°C	16.7
Polychromator Temperature	39.0	°C	38.0
CCD Temperature	-39.6	°C	-39.4
Thermal Stabilizer	69.0	°C	69.0
Argon Supply Pressure	619.13	kPa	660.32
Purge Gas Supply Pressure*1	616.63	kPa	597.43
Option Gas Supply Pressure*1	-	kPa	-
Nebulizer Flow	No measurement		0.70
Nebulizer Back Pressure	No measurement		293.17
Plasma Gas Flow	No measurement		11.98
Auxiliary Gas Flow	No measurement		1.00
RF Power	No measurement		199.1
RF Supply Current	No measurement		8.190
RF Supply Voltage	No measurement		194.957

*1 If option installed

Consumed PM Parts

Part Description	Part Number	Product or Model# where used	Quantity consumed
Axial Pre-Optic Window	G8010-68014	G8010A, G8011A, G8014A/G8015A	1
Radial Pre-Optic Window	G8010-68015	All	1
Agilent Cool Clear Coolant Fluid	5799-0037	Agilent Water Recirculator	1
Purge Gas Filter	G8010-60136	All	1
Air inlet filter	G8000-68002	All	1
High Capacity Air Filter	G8010-60189	Optional	1
Rotor seal for 6-7 port valve for AVS6/7	G8494-60002	G8494A/G8495	1
Rotor seal for 4 port valve for AVS4	G8493-60002	G8493A	1
Rinse solution to rinse station 2.5mm id x 1m	G8410-80123	SPS 4	1
Barb connector 2.5mm-1.5mm ID	G8410-80124	SPS 4	1
PVC waste tubing 8mm od x 5mm id, 2m	G8410-80122	SPS 4	1
Additional Parts may be required from engineer's stock:			
X axis drive belt	5410047500	SPS 3	1
Z axis drive belt	5410047400	SPS 3	1
Peristaltic pump tubing, PVC SolveFlex, 3 bridged,	3710049000	SPS 4	1

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

Not Applicable.

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

Signature Page

Service Engineer Comments (optional)

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

Service Verification

Service Request Number:
6006121636

Service Engineer Name:
Kanyakorn S.

Service Engineer Signature:
Kanyakorn S.

Total number of pages in this document:
14

Date Service Completed:
31 May 2023

Customer Name:
Agilent

Customer Signature:
Agilent

Report Summary

Instrument Model Agilent 5100/5110 VDV ICP-OES
Instrument ID G8011A/G8015A
Instrument Serial Number MY17490002
Software Version 7.4.0.10280
Firmware Version 3562
Tested By Kanyakorn S.
Test Started On 5/31/2023 12:22:01 PM
Test Completed On 5/31/2023 12:26:21 PM

Result Summary

Subsystem Communications Test	Pass
Air Flow Test	Skipped
Water Flow Test	Skipped
Gas Flows Test	Skipped
RF Generator Test	Skipped
Camera Test	Skipped
Optics Test	Pass
Advanced Valve System Test	Skipped
Resolution Test	Pass
Sensitivity Test	Pass
Precision Test	Pass

Subsystem Communications Test

Test

Radial	Axial
3397602	2923418
Length	737.212

Resolution Test

Element Wavelength	Specification	Width
N (174.213 nm)	≤ 9.40	6.72
As (188.980 nm)	≤ 8.20	6.49
C (193.027 nm)	≤ 11.50	8.01
Mo (202.032 nm)	≤ 8.20	6.43
Cr (206.158 nm)	≤ 13.40	8.50
Zn (213.857 nm)	≤ 8.70	7.16
Pb (220.353 nm)	≤ 8.50	7.51
Co (228.615 nm)	≤ 17.20	11.32
Ba (230.424 nm)	≤ 9.40	7.80
Mn (257.610 nm)	≤ 13.30	9.78
Mn (260.568 nm)	≤ 20.30	13.88
Cr (267.716 nm)	≤ 11.00	9.09
Cu (324.754 nm)	≤ 25.00	18.88
Cu (327.395 nm)	≤ 14.20	12.41
Sr (338.071 nm)	≤ 33.50	24.27
Ba (455.403 nm)	≤ 44.00	34.07
Sr (460.733 nm)	≤ 36.00	22.56
Ba (493.408 nm)	≤ 36.00	27.79
Ba (614.171 nm)	≤ 42.00	27.97
Ar (675.283 nm)	≤ 74.00	62.41
K (766.491 nm)	≤ 80.00	65.95

Sensitivity Test

Pass

Radial

Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 46.0	SRBR	108.0	934.0	64.8
Se (196.026 nm)	≥ 41.0	SRBR	110.2	1159.4	93.6
Zn (213.857 nm)	≥ 1421.0	SRBR	2348.2	23561.0	99.8
Pb (220.353 nm)	≥ 46.0	SRBR	98.7	1075.1	98.0
Mn (257.610 nm)	≥ 3518.0	SRBR	10768.1	218704.5	411.0
Al (396.152 nm)	≥ 3.4	SBR	8.5	40909.0	4325.8
Ba (493.408 nm)	≥ 34.0	SBR	111.9	1396218.4	12367.4
K (766.491 nm)	≥ 1.8	SBR	4.7	108989.7	19076.8

Axial

Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 208.0	SRBR	267.6	3134.3	126.3
Se (196.026 nm)	≥ 159.0	SRBR	284.6	4158.5	194.0
Zn (206.200 nm)	≥ 234.0	SRBR	495.4	1165.9	5.5
Zn (213.857 nm)	≥ 1743.0	SRBR	6129.9	92298.3	225.6
Cd (214.439 nm)	≥ 4227.0	SRBR	16998.9	48382.7	8.1
Pb (220.353 nm)	≥ 320.0	SRBR	416.4	6520.1	228.4
Mn (257.610 nm)	≥ 10625.0	SRBR	38073.2	1331904.8	1159.9
Cr (267.716 nm)	≥ 1048.0	SRBR	5986.5	203696.5	1144.7
Cu (324.754 nm)	≥ 19.0	SBR	77.1	369900.7	4991.6
Al (396.152 nm)	≥ 6.0	SBR	25.7	268775.7	10073.7
Ba (493.408 nm)	≥ 60.0	SBR	293.9	8244783.3	27957.8
K (766.491 nm)	≥ 24.0	SBR	83.6	3030541.1	35617.8

Precision Test

Pass

Radial

Element Wavelength	Specification	Measured Value % RSD
As (188.980 nm)	≤ 2.60	0.75
Se (196.026 nm)	≤ 2.60	0.69
Zn (213.857 nm)	≤ 1.50	0.27
Pb (220.353 nm)	≤ 2.60	1.06
Mn (257.610 nm)	≤ 1.50	0.30
Al (396.152 nm)	≤ 1.50	0.27
Ba (493.408 nm)	≤ 1.50	0.99
K (766.491 nm)	≤ 1.50	0.25

Axial

Element Wavelength	Specification	Measured Value % RSD
As (188.980 nm)	≤ 1.50	0.54
Se (196.026 nm)	≤ 1.50	0.48
Zn (206.200 nm)	≤ 1.50	1.06
Zn (213.857 nm)	≤ 1.50	0.48
Cd (214.439 nm)	≤ 1.50	0.33
Pb (220.353 nm)	≤ 1.50	0.37
Mn (257.610 nm)	≤ 1.50	0.77
Cr (267.716 nm)	≤ 1.50	0.62
Cu (324.754 nm)	≤ 1.50	0.45
Al (396.152 nm)	≤ 1.50	0.45
Ba (493.408 nm)	≤ 1.50	0.80
K (766.491 nm)	≤ 1.50	0.91

Report Summary		
Instrument Model	Agilent 6100/6110 VDV ICP-OES	
Instrument ID	G8011A/G8015A	
Instrument Serial Number	MY17490002	
Software Version	7.4.0.10280	
Firmware Version	3562	
Tested By	Kanyakorn S.	
Test Started On	5/31/2023 12:34:17 PM	
Test Completed On	5/31/2023 12:46:55 PM	
Result Summary		
Subsystem Communications Test	Pass	
Air Flow Test	Pass	
Water Flow Test	Pass	
Gas Flows Test	Pass	
RF Generator Test	Pass	
Camera Test	Pass	
Optics Test	Skipped	
Advanced Valve System Test	Skipped	
Resolution Test	Skipped	
Sensitivity Test	Skipped	
Precision Test	Skipped	
Subsystem Communications Test		
Pass		
Air Flow Test		
30% Air Flow (relative speed)	75% Air Flow (relative speed)	
18.00	18.00	
Test		
Flow(L/min)	Camera Water Flow (L/min)	Water Inlet Temperature (°C)
	1.06	16.78

Gas Flows Test			
Pass			
Nebulizer Target Flow	Actual Flow	Back Pressure	
0.70	0.71	280.77	
Makeup Target Flow	Actual Flow	Back Pressure	
2.00	1.99	95.26	
Plasma Target Flow	Actual Flow	Back Pressure	
18.00	17.94	23.27	
RF Generator Test			
Pass			
RF Power Supply Test	Passed		
RF Power Supply (V)	147.418		
RF Oscillator Test	Passed		
RF Oscillator Frequency (MHz)	25.961		
Work Coil Current (A)	45.326		
RF Power Supply Current (A)	2.000		
Camera Test			
Pass			
Integration Time (ms)	Standard Deviation	Status	
1000	5.120	Passed	
Array Test	0.015	Passed	
Linearity Test	0.122	Passed	





PinAAcle 900F Preventive Maintenance Report

Company Name: Envilab Co.,Ltd
Instrument Location: 540/1 ซอยบางแค 7, แขวงบางแค เขตบางแค
กรุงเทพมหานคร 10160
Instrument Serial No.: PFBS20011403
Date: 05-Apr-2024

PinAAcle 900F Preventive Maintenance (PM)			
Company Name:	Envilab Co.,Ltd		
Address (Instrument Location):	540/1 ซอยบางแค 7, แขวงบางแค เขตบางแค	10160	
Serial Number:	PFBS20011403	PM Number:	4/4
Customer Name (if applicable):	K.Janjira	Telephone Number:	095-550-0510
Customer Support Engineer Name:	Khwanchai	Service Order Number:	WO-02707812
Date PM Performed: (DD-MM-YYYY)	05-Apr-2024	Next PM Due Date: (DD-MM-YYYY)	05-Oct-2024
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date
09370145 Rev.9	A	January 2018

PerkinElmer

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

General Instructions:
The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.
Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.
The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.
Update the PM sticker and instrument logbook as required.

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Component List

Component / Specification	Serial #	Configuration Notes

Parts Lists

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

Additional Reagents and Standards Required for PM			
Part Number (if applicable)	Description	Quantity	Expiry Date (MM/YY)
M9300183	1000 mg/L Copper Standard	AR	27-39C0Y1 04/25

Additional Reagents and Standards Required for PM (Customer Support Solution)			
Number (if applicable)	Description	Quantity	Expiration Date (MM/YY)
N/A	DI Water	250 mL	AR
N/A	0.5% HNO ₃	250 mL	AR



รับรองสำเนาถูกต้อง
ผู้จัดทำ: 14/11/2024

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	MG0-056
N1013002	1.0A Neutral density filter	1	MG2-054
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Mi Lumina HCL	1	100516-030190

Procedure Checklist

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

1. General:
 - ☒ Review the instrument performance with the customer and document any recent problems.
 - ☒ Inspect the customer log book and make any appropriate PM entries.
 - ☒ Perform general inspection of system for cleanliness.
2. PC Instrument Software:
 - ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.
3. Mechanical:
 - ☒ Inspect and clean all fans and filters. Replace filters if necessary.
 - ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
 - ☒ Clean exterior of the instrument.
 - ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
 - ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking slot width. Replace if out of specification.
 - ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
 - ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
 - ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).
4. Electrical:
 - ☒ Inspect PC boards. Clean if necessary.
 - ☒ Carefully check all internal and external cable connections.
 - ☒ Check instrument firmware revisions upgrade to current levels (if necessary).
 - ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.
5. Optics:
 - ☒ Inspect and clean the sample compartment windows, if needed.
 - ☒ Inspect optics. Clean or replace if necessary.

Gases:

- ☒ Verify that the Gases supplied to the instrument are within the pressure and purity specifications found in the PirAde 900 Series Pre-Installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

7. Flame Interlock Check:

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

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests:

8.1 Detector Linearity with Barium

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

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	±5% from Cert.	1.0531	1.0606	Passed
0.2 A ND Filter	±5% from Cert.	0.1806	0.1840	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0020	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0004	Passed

8.4 D₂ Background Compensation with Copper

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0069	Passed

8.5 AA-BG Baseline Noise with Copper

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0005	Passed

8.6 AA-BG Baseline Noise with Arsenic

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0003	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
1 mg/L Sensitivity (if applicable)	> 0.230 Abs.	-	Not Applicable
2 mg/L Sensitivity (if applicable)	> 0.230 Abs.	0.3090	Passed

Review:

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



Eivilab Co., Ltd.

รับรองค่าเผือกถูกต้อง
หน้า 145/170
ผู้จัดการฝ่ายควบคุมคุณภาพ

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.

This PinAAcle 900F Passes ☒ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance

Authorized PerkinElmer Representative:

KLS

Date:

05-Apr-2024
(DD-MMM-YYYY)

Authorized Customer Representative:

6996357

Date:

05-Apr-2024
(DD-MMM-YYYY)

Atomic Absorption/FIAS 100/400 Preventive Maintenance (PM)			
Company Name:	EnviLab Co., Ltd		
Address (Instrument Location):	640/1 ซอยบางนา 7, แขวงบางนาแค เขตบางนา กรุงเทพมหานคร 10160		
Room Number:	-		
Asset Number (if applicable):	100S20010501	Customer System ID:	
Service Engineer Name:	Patrayut W.	Service Order Number:	WO-02707811
Date PM Performed: (DD-MM-YYYY)	05-Apr-2024	Next PM Due Date: (DD-MM-YYYY)	05-Oct-2024

Part Number	Release	Publication Date	
09370005	C	January 2013	 PerkinElmer

Scope
The purpose of this PM is to ensure the continued functionality of the Atomic Absorption/FIAS 100/400 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.
The customer should save their method before the PM begins.

General Instructions:
Always check with the customer before making any changes that may affect the customer's analysis or calibration.
The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.
Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Firmware Version	Configuration Notes

Parts Lists

Parts Included with the PM			
Part Number (if applicable)	Description	Quantity	Expiration Date (MM/YY)
B050 2706	Fan Filter	1	N/A

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Calibration Due Date (MM/YY)
	Digital Volt Meter	1	N/A

Additional Reagents and Standards Required for PM			
Part Number (if applicable)	Description	Quantity	Expiration Date (MM/YY)

Procedure Checklist

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

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.

- ☒ Is the Working Environment Acceptable? If not, document.

- ☒ Visual Damage (if yes, describe)

- ☒ Check incoming AC line voltage for proper levels and grounding.
☒ Verify Voltage switch on back of instrument is correct
☒ Perform general inspection of system for cleanliness. Clean if needed.
☒ Gas supply cylinders secured, lines leak checked and argon or nitrogen supply pressure verified (45 – 58 psi).
☒ Inspect the customer log book and make any appropriate PM entries.
☒ Fan checked and filter cleaned
☒ Heating mantle or Universal Cell Holder checked

2. Instrument components

- ☒ Non-return valve checked/repairs/replaced if needed (B019 8111). Clean the valve if there is any liquid in it. Replace the rubber sleeve (B013 5123) if it is worn. Check the flow meter for any signs of fluid in it. Clean the flow meter if needed.
☒ Verify condition of pump pressure adjustment levers (B050 7794 - look for cracks or problems with the springs), pump rollers (B300 0251 check for wear), and thumb screws (B050 7796).
☒ Check the Multiport valve for proper switching, flow, and insure there are no leaks. Clean valve parts and replace o-rings if needed (large o-ring: B050 1250, small o-ring: B004 5095). Use a squirt bottle & fishing line to try to dislodge clogs.
☒ Firmware Version checked. Latest is 2.20.

3. Mixing/Separation Assembly & Pump Tubing:

- ☒ Mixing separator assembly checked
☒ Filter/membrane checked (B050 8306)
☒ Condition of the pump tubing (replace if necessary), correct pump tubing for the solutions being run. Make sure the correct magazines are being used. B050 7791 for 0.13 – 1.80 mm tubing; B050 7792 for 1.60 – 3.18 mm tubing.

4. Cell, Cell Windows, Transfer Line:

- ☒ Cell checked
☒ Cell windows checked
☒ Transfer line checked for moisture (if moisture is a problem, the Nation dryer might be needed)

5. Operational Tests:

- ☒ Run DI water through the carrier/reductant/sample system. Verify smooth flow of liquid throughout without leaks. Replace tubing & fittings if needed.

6. Review:

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

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for FIAS 100/400 have been completed.	
This FIAS 100/400 Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative:	Date: 05-Apr-2024 (DD-MMM-YYYY)
Authorized Customer Representative:	Date: 05-Apr-2024 (DD-MMM-YYYY)



รับรองสำเนาถูกต้อง
ผู้จัดทำ: 1148/170
ผู้ควบคุมคุณภาพ

Document History

Revision	Description of Change	Page(s)	Date
A	First release		May 2008
B	Addition of Batch/Lot Number, Expiration Date, and Report Fields.	2,7	February 2009
C	Update to new format	All	January 2013



PerkinElmer TruQ

PerkinElmer Number: N9300183
 Element and Matrix: 1000 µg/mL Copper in 2% HNO₃
 Starting Material: Copper Metal
 Starting Material Lot No: 06201C
 Density: 1.011 g/mL @ 20°C

Lot No: 27-39CUY1

Certification Date: OCT -- 2023
 Expiration Date: APR 30 2025

Trace Metallic Impurities in the Actual Solution via ICP / MCP-MS Analysis:

Element	µg/mL	Element	µg/mL	Element	µg/mL	Element	µg/mL
Ag	<0.001	Dy	<0.001	Li	<0.001	Tb	<0.001
Al	0.003	Er	<0.001	Lu	<0.001	Te	<0.001
As	<0.001	Eu	<0.001	Mg	<0.005	Th	<0.001
Au	<0.001	Fe	0.02	Mn	0.002	Ti	<0.001
B	<0.001	Ga	<0.001	Mo	<0.001	Tl	<0.001
Ba	<0.001	Gd	<0.001	Nb	<0.001	Tm	<0.001
Be	<0.001	Ge	<0.001	Ni	<0.001	U	<0.001
Bi	<0.001	Hf	<0.001	Nd	<0.001	V	<0.001
Ca	<0.001	Hg	<0.001	Ni	<0.002	W	<0.001
Cd	<0.001	In	<0.001	P	<0.5	Y	<0.001
Ce	<0.001	Ir	<0.001	Pb	0.004	Yb	<0.001
Co	<0.001	K	<0.001	Pd	<0.001	Zn	<0.001
Cr	<0.001	K	0.5	Pt	<0.001	Zr	<0.001
Cs	<0.001	La	<0.001				

Traceability Documentation for Solution Standard:

Certified Value: 998 µg/mL ± 5 µg/mL (refer to slide 2)

Certified Value is Traceable to: NIST SRM #3114

* Classical Wet Assay: 998 µg/mL

Method: EDTA titration using PAN as indicator. EDTA standardized against Pb(NO₃)₂, NIST SRM #825.

* Instrument Analyte using ICP Spectrometer: 1000 µg/mL

via NIST SRM #3114

We guarantee that our PerkinElmer TruQ Atomic Spectroscopy Standards are stable and accurate to ±0.5% of certified concentration until the expiration date, provided the standards are kept tightly capped and stored under normal laboratory conditions. This value is the amount of the element or compound in the standard, not the concentration of the solution. We use high purity materials and associated with the analytical determinations, pipetting, and diluting to final volume. For these solutions, we use high purity water (18 megohm double deionized), and leached, triple-rinsed bottles. All glassware used is

STIM Type 1 water (18 megohm double deionized), and leached, triple-rinsed bottles. All glassware used is

PerkinElmer
 Analyst, Senior Spectroscopist

รับรองสำเนาถูกต้อง
 วันที่ 14/09/2023
 หน่วยงานควบคุมคุณภาพ

www.perkinelmer.com

PerkinElmer Secondary Spectrometric Calibration Standards

Certificate of Calibration for Report Number: M93-054-20110324

Ordinate Calibration

Calibration Data for Gray Glass Secondary Calibration Standards:

Wavelength / Absorbance	Number	Ordinate Reading (Absorbance) at the following wavelengths:			
Wavelength		193.70	324.80	553.60	706.50
Standard 1	M93-054	1.0004	1.0062	1.0631	1.9170

The uncertainty of the given absorbance values is ±0.003 A at the given wavelengths. The uncertainty is the expanded uncertainty expressed at an approximate level of confidence of 95% and a coverage factor of k=2 based on JCGM 100:2008 Evaluation of measurement data - Guide to the expression of uncertainty in measurement.

Conditions of Calibration

The following settings were used on the Lambda 900 UV/Vis/NIR Spectrometer employed to obtain the calibration data quoted on this certificate:

Measurement of Calibration

Ordinate mode	Absorbance	SLN UV/Vis	1 nm
SLN mode UV/Vis	Fix	SLN NIR	Servo
Integration time UV/Vis	5 s	Gain	2
SLN mode NIR	Servo		
Integration time NIR	5 s		

The instrument's wavelength program facility was used to measure the absorbance of the standards at the wavelength given above.

This set of Spectrometric Solution was calibrated on a PerkinElmer high performance Lambda 900 UV/Vis/NIR Spectrometer.

Serial Number: 98015

This instrument is used solely for calibration purposes. The most recent quality control check of this instrument was performed on:

Date / Time: 3/17/2011

using the standard PerkinElmer quality control procedure. A set of NIST or NBS/PTB Standard Reference Standard Materials:

NIST model SRM 1930 RWR set S/N 155 Calibration Date 11/05/2009 NRC Calibration Report No. PAR 2009 2759

was used during this procedure. Measurements were performed at an ambient temperature of 24.1 °C and the humidity of 18 %

Date / Time: 3/24/2011 / 11:16:32 AM

Operator: Cam Le Horvath

Signature:

PerkinElmer LAS, Inc., 710 Bridgeport Avenue, Shelton, CT 06484-4794, USA

End of Report



PerkinElmer, Inc.
710 Bridgeport Avenue
Shelton, CT 06484-4794, U.S.A.

CERTIFICATE OF CALIBRATION

Test Standard for Instrument Performance Validation

(ISO 9000, GMP, GLP)

This is to certify that this PerkinElmer Reference Standard was tested and verified to be in conformance with all applicable quality requirements, including specifications, drawings, calibration, preservation, packing, marking requirements and part identification.

Declaration of Validation

The Reference Standard was found to meet its functional and performance specification prior to shipment. To support this declaration, the following Engineering, Production and Test Documents are held by PerkinElmer and are available for reference upon request in justified cases and to an appropriate extent:

- The Test Specification
- The Final Test Protocol
- The Records of the Primary Standard
- The Calibration Records

Note: PerkinElmer will maintain possession of all documents; their reproduction may require a nondisclosure agreement to be provided by those requiring access to them.

The existence of these documents and the procedures used in their production are formal requirements of the PerkinElmer Quality System. The integrity of this PerkinElmer Quality System is routinely audited and is certified by the British Standards Institution as meeting all the requirements of ISO 9001, the internationally recognized standard for Quality Assurance.

This document shall not be reproduced except in full without the express written approval of the PerkinElmer UV Standards Certification Laboratory.

Quality Manager PKI RMCL
PerkinElmer Instruments
Shelton, CT, USA

PerkinElmer Inc., Shelton, CT 06484 USA An ISO 9001 Company

PerkinElmer, Inc.
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Secondary Spectrometric Calibration Standards

Certificate of Calibration

Ordinate Calibration

Calibration Data for Secondary Calibration Standards:

Wavelength / Absorbance	Number	Ordinate Reading (Absorbance) at the following wavelengths:			
Wavelength		193.70	324.80	653.60	798.50
Standard 1	MCO-409	0.2483	0.1857	0.1906	0.1674

The tolerance of the given absorbance values is ± 0.006 A in the ultra violet and visible range, and ± 0.010 A in the near infrared range. The uncertainty is the sum of the tolerance of the primary NIST/PTB reference material, the measurement reproducibility, and an estimated bias due to the possible systematic errors.

We recommend that you recalibrate this set of spectrometric standards once a year.

Conditions of Calibration

The following settings were used on the Lambda 900 UV/VIS/NIR Spectrometer employed to obtain the calibration data quoted on this certificate:

Measurement of Calibration

Ordinate mode	Absorbance	
Slit mode UV/VIS	Pik	SM UV/VIS
Integration time UV/VIS	5 s	
SIN mode NIR	Servo	SIN NIR
Integration time NIR	5 s	Gain
		2

The instrument's wavelength program facility was used to measure the absorbance of the standards at the wavelength given above.

This set of Spectrometric Solution was calibrated on a PerkinElmer high performance Lambda 900 UV/VIS/NIR Spectrometer.

Serial Number: 89015

This instrument is used solely for calibration purposes. The most recent quality control check of this instrument was performed on:

Date / Time: 9/19/2010

using the standard PerkinElmer quality control procedure. A set of NIST or NBS/PTB Standard Reference Standard Materials certified on:

Date: NIST 1930 S/N 155 11/05/2009

was used during this procedure. Measurements were performed at an ambient temperature of 25.6 C° and the humidity of 14 %

Date / Time: 12/20/2010 / 1:46:28 PM

Operator: Cam Le Horvath

Signature:

PerkinElmer Instruments, 710 Bridgeport Avenue, Shelton, CT 06484-4794

PerkinElmer, Inc.
710 Bridgeport Avenue
Shelton, CT 06484-4794, U.S.A.

CERTIFICATE OF CALIBRATION
Test Standard for Instrument Performance Validation
(ISO 9000, GMP, GLP)

This is to certify that this PerkinElmer Reference Standard was tested and verified to be in conformance with all applicable quality requirements, including specifications, drawings, calibration, preservation, packing, marking requirements and part identification.

Declaration of Validation

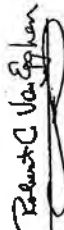
The Reference Standard was found to meet its functional and performance specification prior to shipment. To support this declaration, the following Engineering, Production and Test Documents are held by PerkinElmer and are available for reference upon request in justified cases and to an appropriate extent:

- The Test Specification
- The Final Test Protocol
- The Records of the Primary Standard
- The Calibration Records

Note: PerkinElmer will maintain possession of all documents; their reproduction may require a nondisclosure agreement to be provided by those requiring access to them.

The existence of these documents and the procedures used in their production are formal requirements of the PerkinElmer Quality System. The integrity of this PerkinElmer Quality System is routinely audited and is certified by the British Standards Institution as meeting all the requirements of ISO 9001, the internationally recognized standard for Quality Assurance.

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Quality Manager PKI RMCL
PerkinElmer Instruments
Shelton, CT, USA

PerkinElmer Inc., Shelton, CT 06484 USA An ISO 9001 Company

PerkinElmer, Inc.
registered trademark of PerkinElmer, Inc.



This certifies that

Khwanchai Siangwong
Has successfully completed

AA PinAacle 900 T, H, Z, F and 500
Completed on 4/7/2017 05:00 AM Eastern New York

Certified By: Fred Rubino
Global Training Leader

This Certificate has been generated electronically from PerkinElmer Learning Management System, LMS ES-0708-000, 0-05-05-11.

Certificate of Completion

This certifies that

Khwanchai Siangwong

Has successfully completed

FIAS 100 & 400 System

Completed on 8/17/2016 06:00 AM Eastern/New York

Certified By: Fred Rubino

Global Training Leader

Print Date Nov 17, 2016, 8:31 AM

This Certificate has been generated electronically from PerkinElmer Learning Management System, LMS ES-009-000, 0-05-55-11.



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



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 : B224051
Issued Date : 1 March 2024
Job Number : B224051
Page : 1 of 7 Pages

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

Environment Condition : **Temperature:** 20.8 °C ± 0.5 °C
Humidity: 53.0 %RH ± 3.1 %RH
Voltage: 221.5 VAC ± 0.3 VAC

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

Test By : Mr.Achira Kaewpaitoon

Test Date : 29 February 2024

Due Date : 28 February 2025

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-0-86850
Leak test of HEPA filter is traceable to WK Certificate Number :WK2309-176-1
Illumination test is traceable to SP Certificate Number :SPR23030030-1
UltravioletRadiation test is traceable to EEI Certificate Number :CO20230085EA
Sound test is traceable to SP Certificate Number :SPR23030030-2

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

This certificate may not be reproduced other than in full except with the prior written approval of the Air Flow Calibration Company Limited.

Mr. Watcharin Tavera
Authorized Signatory

51/104 Moo 9, Ladsawai, Lam Lukka Phatumthani 12150 Thailand

Tel : 0 2152 8350 , 0 2152 8348 , 0 2152 8070 , 08 4360 2558 , 09 2265 3175 Fax : 0 2152 8348

http:// www.airflow-calibration.com E-mail : bm.airflow@gmail.com nopa.airflow@gmail.com



Primary Test Results

1. Downflow Velocity Test

Test equipment used

- Thermo anemometer
- Brand: Testo
- Model: 425
- Serial number: 3101751
- Calibration due: 6-Nov-2024

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 front window. Start 150 mm from the left side window and with 300 mm between the measuring spots.

Back			
0.35	0.36	0.35	0.34
0.33	0.35	0.35	0.34
Front			

Characteristic of downflow velocities

Specification	Mean	Maximum	Minimum	±20 % of Mean
• Mean downflow velocity to achieve product protection : 0.25 m/s - 0.50 m/s. All measurements should be within ±20 % of mean values.	0.35	0.36	0.33	0.28 - 0.42

Result Summary : Pass



AIRFLOW CALIBRATION CO.,LTD.

Continuation of the Certificate of Test Report Number : B224051

Page 3 of 7 Pages

2. Inflow Velocity Test

Test equipment used

- Thermo anemometer ● Brand: Testo ● Model: 425
- Serial number: 3101751 ● Calibration due: 6-Nov-2024

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.

Inflow Velocity Units: m/s										
1.29	1.28	1.29	1.31	1.32	1.32	1.31	1.32	1.31	1.32	1.32

Characteristic of air velocities in the work opening

Specification	Mean Inflow (m/s)
• Mean Inflow velocity to achieve product protection : ≥ 0.40 m/s.	0.50

Result Summary : Pass

Adjustments Required

Fan speed



No Change

Damper



No Change

51/104 Moo 9, Ladsewai, Lamkukka Phatunthani 12150

Tel : 0 2152 8350 , 0 2152 8348 , 0 2152 9870 , 08 4360 2550 , 09 226

http://www.airflow-calibration.com E-mail : bm.airflow@gmail.com , ncp.airflow@gmail.com

ATB-FM-SV-08-01 Sep 2021



Continuation of the Certificate of Test Report Number : B224051

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: 20-Sep-2024

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

Concentration on the opposite side of main HPLC plate	34	µg/l
Relative retention of the minor component as percentage of main HPLC peak	0.001	%
Relative retention of the HPLC component as percentage of main HPLC peak	0.001	%

Main HEPA Filter

Leak position

[illegible]

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

53/104 Moo 9, Ladswai, Lamlukka Phatumthani 12150 Thailand

Tel : 0 2152 8350 , 0 2152 8348 , 0 2152 8070 , 08 4368 2558 , 09 2265 3175 Fax : 02 15 28 34 99

<http://www.airflow-calibration.com> E-mail : bm.airflow@gmail.com , rep.airflow@gmail.com

ภาคผนวก 4


 ร็บบรอสสำเนาถูกต้อง
 Epi-Lab Co., Ltd.



AIRFLOW CALIBRATION CO.,LTD.

Continuation of the Certificate of Test Report Number : B224051

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

AIR FM - SV - 08 : 01 Sep 2021

51/104 Moo 9, Ladsewak, Lamduka Phatumthani 12150, Thailand

Tel : 0 2152 8350 , 0 2152 8348 , 0 2152 8070 , 08 4360 2558 , 09 2265 3175 Fax

[http:// www.airflow-calibration.com](http://www.airflow-calibration.com) E-mail : bm.airflow@gmail.com , npp.airflow@gmail.com



รับรองสำเนาถูกต้อง
ผู้จัดทำ 1571170 คุณคุณภาพ



AIRFLOW CALIBRATION CO.,LTD.

Continuation of the Certificate of Test Report Number : B224051

Page 6 of 7 Pages

5. Site Installation

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

6. Soap Solution

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

Result Summary : Absence of soap bubbles. N/A

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: Daiichi
- Model: LM507
- Serial number: 1300421511013
- Calibration due: 2-Mar-2024



Back

819	923	944	1059	1049
-----	-----	-----	------	------

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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Tel : 0 2152 8350 , 0 2152 8348 , 0 2152 8070 , 09 4360 2558 , 09 2265 3175

http://www.airflow-calibration.com E-mail : bm.airflow@gmail.com , ncb.airflow@gmail.com

รับรองสำเนาถูกต้อง
Envilab Co.,Ltd. ผู้จัดการฝ่ายควบคุมคุณภาพ



AIRFLOW CALIBRATION CO.,LTD.

Continuation of the Certificate of Test Report Number : B224051

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: Lutron
- Model: UVC-254SD
- Serial number: Q853539
- Calibration due: 26-Sep-2024

Back				
2300	2920	3350	2080	1960
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/m² 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: 19090231
- Calibration due: 2-Mar-2024

* Sound pressure level of the background: 50.6 dBA

* Sound levels: 59.2 dBA

Result Summary : Pass

End of Certificate of Test Report

AIR FM - SV - 08 : 01 Sep 2021

51/104 Moo 9, Ladsewal, Lamduka Phatthamthani 12150, Thailand

Tel : 0 2152 8350 , 0 2152 8348 , 0 2152 8070 , 08 4360 2558 , 09 2265 3175

http://www.airflow-calibration.com E-mail : bm.airflow@gmail.com , info.airflow@gmail.com

Certificate of Calibration

Certificate No. : 67-400054-2

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, Envilab Co., Ltd.

Ambient Temperature : (30.0 to 31.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 01 February 2024

Date of Calibration : 01 February 2024

Date of Issue : 03 February 2024

Calibrated by : Permpon Chanpu

Calibration Method : This instrument was calibrated by In-house method CAL-M4007 based on BS 2646 Part 1 : 2021

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

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
400039	66-400707-1	27 Jun 2024	National Institute of Metrology Thailand (NIMT)
400040	66-400707-2	27 Jun 2024	National Institute of Metrology Thailand (NIMT)
400041	66-400707-3	27 Jun 2024	National Institute of Metrology Thailand (NIMT)

(Surachai Promthong)

Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

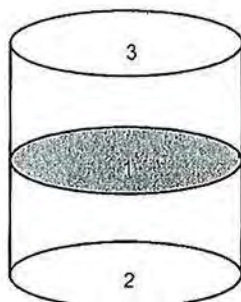
Certificate No. 67-400054-2

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	121.4	121.4	121.4	1.0	1.0	0.5	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%

- ๐0๐ -



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. : 67-300021-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Piston Pipette

Manufacturer : Witeg

Model : N/A

Serial No. : 15L0237

ID No. : ELABMICROPP002

Capacity : 100 µl to 1000 µl

Resolution : 2 µl

Environment : Ambient Temperature : (20 ± 3) °C

Relative Humidity : (55 ± 10) %

Air Pressure : (1008.1 to 1008.3) mbar.

Date of Received : 18 January 2024

Date of Calibration : 20 January 2024

Date of Issue : 20 January 2024

Calibrated by : Wipa Tovadee

Calibration Method : In-house method CAL-M3002 base on ISO 8655-6 : 2022-04

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

Electronic Balance

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
241003	66-200388-2	02 Jun 2024	National Institute of Metrology (Thailand) (NIMT)

Approved by :

(Wipa Tovadee)

The Uncertainties are for a confidence probability of approximately 95%

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รับรองสำเนาถูกต้อง



Certificate of Calibration

Certificate No. : 67-300021-1

Page : 2 of 2

Result of Calibration : Without Adjustment

based on the gravimetric determination of the quantity of water which is converted to true volume at the standard temperature of 20 °C

Setting Volume (µl)	Measuring Volume (µl)	e_s (µl)	η_s (%)	S_r (µl)	C_v (%)	Uncertainty (± µl)	Coverage Factor (k)
100	100.27	0.27	0.27	0.05	0.05	1.6	2.00
500	496.39	-3.61	0.72	0.05	0.01	1.7	2.00
1000	993.07	-6.93	0.69	0.05	0.01	2.0	2.00

Note : e_s : Systematic error (µl) , η_s : Relative systematic error (%)

S_r : Standard deviation (µl) , C_v : Coefficient of variation (%)

The formula used to convert weighing values into volume is

$$V_{20} = M \times Z$$

V_{20} = is the water volume at standard temperature of 20 °C

M = is the balance reading of delivered water

Z = is the combined factor for buoyancy correction and conversion from mass to volume

UUC Condition As-Received : Good

UUC Calibrated to delivery (Ex) by using : White Tip

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

This reported uncertainty of measurment was based on a standard uncertainty multiplied by a coverage factor (k)

providing a level of confidence of approximately 95%

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Envislab Co.,Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ



Certificate of Calibration

Certificate No. : 67-400101-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Temperature controlled enclosure (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 : (23.0 to 24.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (223.0 TO 225.0)V

Date of Received : 20 February 2024

Date of Calibration : 20 February 2024

Date of Issue : 22 February 2024

Calibrated by : Kittisak Kokaeo

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	67-400047-1	25 Jul 2024	National Institute of Metrology Thailand (NIMT)

The Uncertainties are for a confidence probability of approximately 95%

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ผู้จัดทำ: ธีรภัฏ วัฒนคุณุภาพ



Certificate of Calibration

Certificate No. : 67-400101-1

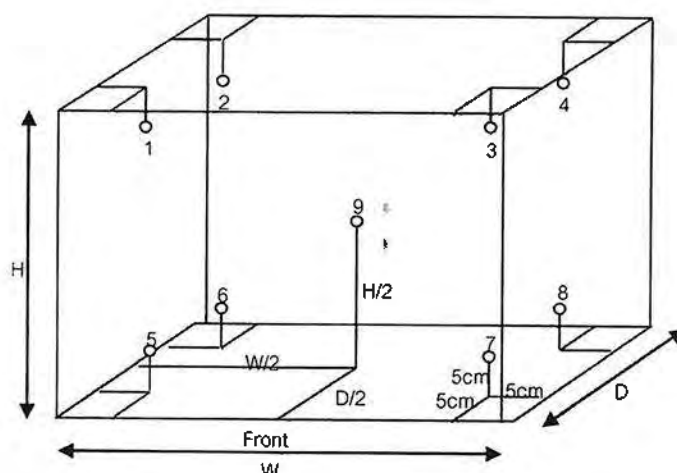
Page : 2 of 2

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 m³

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
35.0	35.0	35.0	35.00	35.10	35.16	35.14	35.15	35.14	35.03	35.00	35.12	0.30
37.0	37.0	37.0	37.01	37.11	37.17	37.15	37.16	37.15	37.04	37.01	37.13	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	0.1	0.0	0.2
37.0	37.0	37.0	0.1	0.0	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 -



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ผู้จัดการฝ่ายควบคุมคุณภาพ



CAL

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 66-400477-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

540 . 540/1 Soi Bangkhac 7, Bangkhac ,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

ID No.

Cert. No.

Due Date

Traceability

400046 & 400024

66-400184-2

06 Oct 2023

National Institute of Metrology Thailand (NIMT)

Approved by : [Signature]

The Uncertainties are for a confidence probability of approximately 95%

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CAL

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

Certificate of Calibration

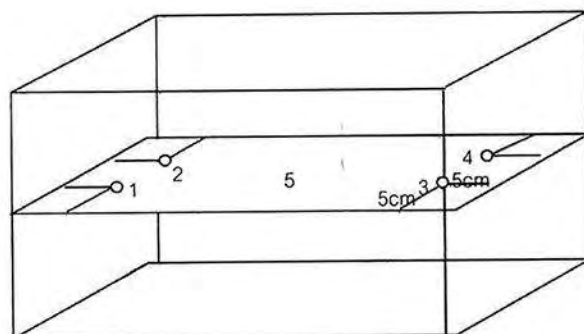
Certificate No. : 66-400477-1

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%

- o0o -



รับรองให้ถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24030525-1

Page : 1 of 3

Customer : Envilab Co., Ltd.

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

Equipment Name : Light Meter

Manufacturer : Tenmars

Model : TM-720

Serial Number : 190600485

ID. Number : N/A

Environmental Conditions

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

Received Date : 30 Mar 2024

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

Calibration Date : 18 Apr 2024

Location of Calibration : In-Lab

Recommend Due Date : 18 Apr 2025

Calibration Procedure : SP-CPE-04-32

Date of Issue : 19 Apr 2024

Method of Calibration

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

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

Calibrated by : Mr.Nanthawat Wanasit

Approved by

Calibration Officer

(Ms.Bussakorn Chaikaew)

Signatory



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24030525-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Digital Light Meter	LX-73	Q842777	23PH462	05 Sep 2024

Traceability

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

TPA - Technology Promotion Association (Thailand-Japan)





ID LINE : IEC17025



Result of Calibration

Certificate No. : SPR24030525-1

Page : 3 of 3

Function: Illumination Measurement

Unit : Lux

Calibration Point	Standard Reading	UUC Reading	Error	Uncertainty (±)
100	100.0	93.0	-7.0	1.3
500	500	457.7	-42.3	6.6
1000	1000	912.2	-87.8	13
1500	1500	1357	-143	20
2000	2000	1810	-190	26

Note:

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

Measurement Uncertainty

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

- End of Certificate -



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ