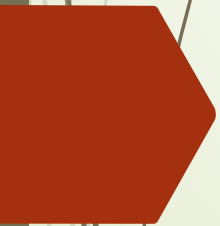


ภาคผนวกที่ 23

เอกสารสอบเทียบเครื่องมือ





บริษัท เอ็นไวโรนเม้นท์ จำกัด 540,540/1 ถนนบางนา 7 แขวงบางนาใต้ เขตบางนา กรุงเทพมหานคร 10150
EnviLab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10150
Tel : 02-802-9577-8 Fax: 02-802-9773 E-mail : info@envilab.com



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TSP High Volume Sampler Calibration

Verification Report No.

A6412 -TSP 01

<input checked="" type="checkbox"/> PM <input type="checkbox"/> Onsite	Site: บริษัท เอ็นไวโรนเม้นท์ จำกัด	Date: 1 Dec 21
	UTM : 47P N1514475 E654269	Technical: 0
	Sampler: ETSP#17	Approval: Sarawut K.
	Recorder: ECRA15314157	

CONDITIONS

Barometric Press. (hPa): 1010.0	Corrected Pressure (mm Hg): 757.6
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

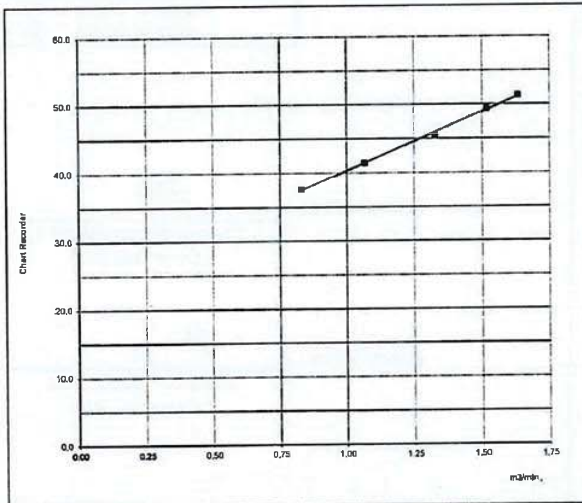
CALIBRATION ORIFICE

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

Qstd Slope: 2.05054
Qstd Intercept: -0.00430
Date Certified: 11 Jan 21

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION Slope = 17.2369 Intercept = 23.0238 Corr. coeff. = 0.9988 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 43 53
1	11.48	1.633	52.0	51.32	
2	9.91	1.517	50.0	49.34	
3	7.57	1.326	46.0	45.40	
4	4.90	1.067	42.0	41.45	
5	2.97	0.832	38.0	37.50	



Calibrated by :

(Surakit Darncholwichit)
1 December 2021

Approved by :

(Sarawut Keawsrinal)
1 December 2021

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PL-001-23 Rev.02/01/2021



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ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นไวเลบ จำกัด 543.540/1 ถนนพหลโยธิน 7 แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10130
EnviLab Co., Ltd. 543.540/1 Soi Bangkhae 7 Bangkhae Bangkhae Bangkok 10130
Tel : 02-602-3577-8 Fax: 02-602-3773 E-mail : info@evltesting.com



Calibration Report

PM10 High Volume Sampler Calibration

Verification Report No.

A6412 -PM 01

<input checked="" type="checkbox"/> PM	<input type="checkbox"/> Onsite
Site: บริษัท เอ็นไวเลบ จำกัด	
UTM : 47P N1514475 E654269	
Sampler: EPM#06	
Recorder: ECRANG47087065	
Date: 1 Dec 21	
Technical: 0	
Approval: Sarawut K.	

CONDITIONS

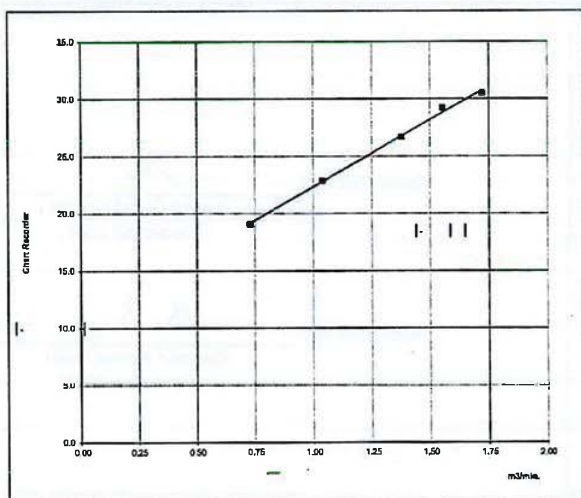
Barometric Press. (hPa): 1010.0	Corrected Pressure (mm Hg): 757.6
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg. Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Slope: 1.28401
Model: TE-5025A	Intercept: -0.00265
Serial#: 2067	Date Certified: 11 Jan 21

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	12.10	1.721	48.0	30.46	Slope = 11.6998
2	9.85	1.553	46.0	29.19	Intercept = 10.6117
3	7.77	1.380	42.0	26.65	Corr. coeff. = 0.9985
4	4.41	1.040	36.0	22.84	SFR = 1.141
5	2.15	0.727	30.0	19.04	SSP = 37.76
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					36
					39



Calibrated by :
(Surakit Darncholwichit)
1 December 2021

Approved by :
(Sarawut Keawsrinul)
1 December 2021

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Environmental responsibility with accuracy and precision
FEMINT-25 Rev.02-01/06/03



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ผู้จัดการฝ่ายควบคุมคุณภาพ



บริษัท เอ็นวีแล็บ จำกัด 540,540/1 ถนนวิภาวดี 7 แขวงวิภาวดี เขตวิภาวดี กรุงเทพฯ 10160
EnviLab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-2602-3577-8 Fax: 02-2602-3773 E-mail : info@evltesting.com



Product & Service supplied under contract

TSP High Volume Sampler Calibration

Verification Report No.

A6412 -TSP 02

☒ PM ☐ Onsite

Site: บริษัท เอ็นวีแล็บ จำกัด

UTM : 47P N1514475 E654269

Sampler: ETSP#11

Recorder: EACRANG15314155

Date: 1 Dec 21

Technical: 0

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1010.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.6

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#: 2067

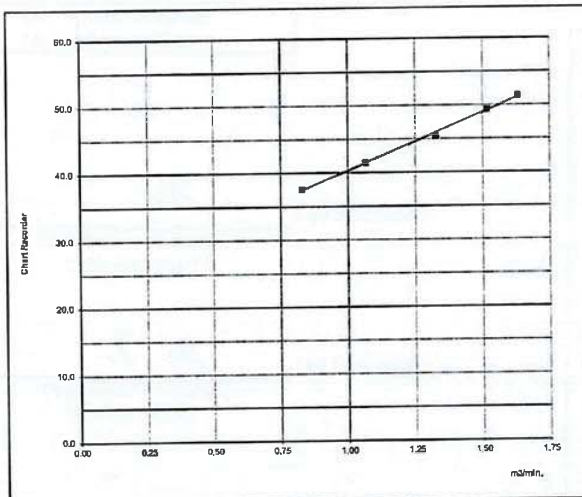
Qstd Slope: 2.05054

Qstd Intercept: -0.00430

Date Certified: 11 Jan 21

CALIBRATIONS

Plate or Test #	H ₂ O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION Slope = 20.3547 Intercept = 15.1095 Corr. coeff. = 0.9978 # of Observations: 5 Range of Chart at 1.1 - 1.7 m ³ /min. 38 50
1	13.67	1.782	52.0	51.32	
2	12.36	1.694	50.0	49.34	
3	8.97	1.444	46.0	45.40	
4	6.52	1.231	40.0	39.47	
5	2.15	0.708	30.0	29.61	



Calibrated by :

(Surakit Darncholwichit)
1 December 2021

Approved by :

(Sarawut Keawsrinual)
1 December 2021

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Environmental responsibility with accuracy standard

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



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E: info@evltesting.com
Tel : 02-862-3577-8 Fax: 02-862-3773 E-mail : info@evltesting.com



Unit & Scale Agreement

PM10 High Volume Sampler Calibration

Verification Report No.

A6412 -PM 02

<input checked="" type="checkbox"/> PM	<input type="checkbox"/> Onsite
Site: บริษัท เอ็นไวเลบ จำกัด	
UTM : 47P N1514475 E654269	
Sampler: EPM#11	
Recorder: NCRTS013211095	
Date: 1 Dec 21	
Technical: 0	
Approval: Sarawut K.	

CONDITIONS

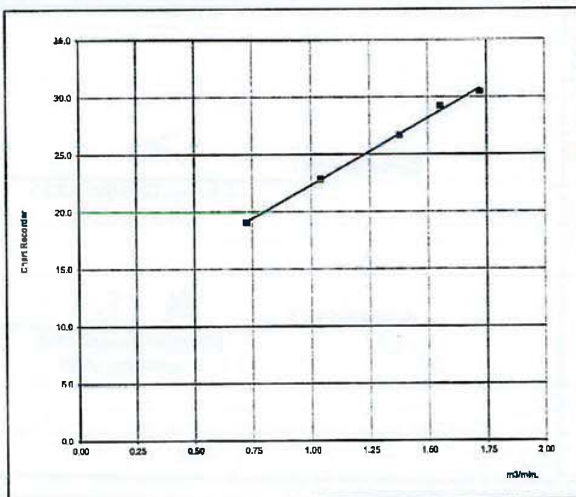
Barometric Press. (hPa): 1010.0	Corrected Pressure (mm Hg): 757.6
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg. Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Slope: 1.28401
Model: TE-5025A	Intercept: -0.00265
Serial#: 2067	Date Certified: 11 Jan 21

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	12.08	1.720	50.0	31.73	
2	9.14	1.496	48.0	30.46	Slope = 11.9099 Intercept = 11.6878 Corr. coeff. = 0.9910 SFR = 1.141 SSP = 39.83 # of Observations: 5 Range of Chart at SFR $\pm 10\%$ 38 41
3	6.96	1.306	42.0	26.65	
4	5.30	1.140	40.0	25.38	
5	2.15	0.727	32.0	20.30	



Calibrated by :
(Surakit Darncholwichit)
1 December 2021

Approved by :
(Sarawut Keawsrinual)
1 December 2021

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Environmental responsibility with accuracy measurement

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



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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 & Envilab Supply & Service

Verification Test Report

Report No.:

6412 -SLM 01

☒ PM

☐ Onsite UTM:

47 P 1514462 N 654258 E

Calibrated Date: 1 December 2021

Site : บริษัท เอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 3098004

Environment: Temperature

31 °C

Humidity

67 %RH

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

Serial No. 1351075

Date of Calibration : Feb.18, 2021

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.8	93.6	-0.2	93.8

Calibrated By:

(Surakit Darncholvichit)

Date:

1 December 2021



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approve By:

(Sarawut Keawsrinal)

Date:

1 December 2021

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บริษัท เอ็นไวเลบ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
EnviLab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-9577-8 Fax: 02-802-9573 E-mail : info@evltesting.com



Printed & Approved by: [Signature]

TSP High Volume Sampler Calibration

Verification Report No.

C6412 -TSP 01

☒ PM ☐ Onsite

Site: บริษัท เอ็นไวเลบ จำกัด

UTM : 47P N1514475 E654269

Sampler: ETSP#07

Recorder: ECRDCPR4169240

Date: 1 Dec 21

Technical: 0

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1009.0

Temperature (deg C): 30.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.8

Temperature (deg K): 303.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 2067

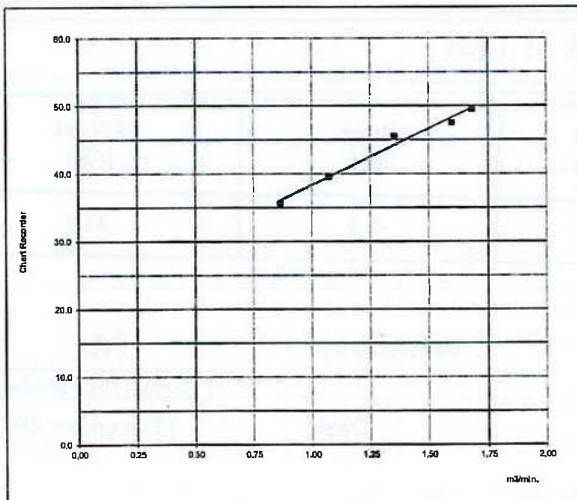
Qstd Slope: 2.05054

Qstd Intercept: -0.00430

Date Certified: 11 Jan 21

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	12.13	1.683	50.0	49.48	Slope = 16.5227
2	10.95	1.599	48.0	47.50	Intercept = 21.8156
3	7.86	1.355	46.0	45.52	Corr. coeff. = 0.9904
4	4.92	1.073	40.0	39.59	# of Observations: 5
5	3.20	0.865	36.0	35.63	Range of Chart at 1.1 - 1.7 m3/min. 41 50



Calibrated by :

(Surakit Darncholwichit)
1 December 2021

Approved by :

(Sarawut Keawsriniul)
1 December 2021

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FE-MNT-25 Rev.00.01/06/23



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Envilab Co., Ltd. 500/50/1 Soi Bangna 7 Bangna Bangkok Bangkok 10150
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



PM10 High Volume Sampler Calibration

Verification Report No.

C6412 -PM 01

☒ PM ☐ Onsite

Site: บริษัท เอ็นไวเลบ จำกัด

UTM : 47P N1514475 E654269

Sampler: EPM#21

Recorder: ECRDS016226660

Date: 1 Dec 21

Technical: 0

Approval: Sarawut K.

CONDITIONS

Barometric Press. (hPa): 1009.0

Temperature (deg C): 30.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.8

Temperature (deg K): 303.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 2067

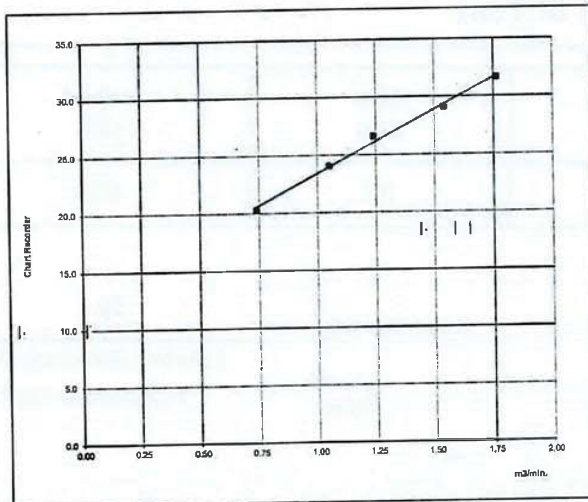
Slope: 1.28401

Intercept: -0.00265

Date Certified: 11 Jan 21

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
1	12.75	1.762	50.0	31.64	Slope =	10.9581
2	9.75	1.541	46.0	29.11	Intercept =	12.4486
3	6.30	1.239	42.0	26.58	Corr. coeff. =	0.9971
4	4.53	1.051	38.0	24.04	SFR =	1.134
5	2.23	0.738	32.0	20.25	SSP =	39.32
					# of Observations:	5
					Range of Chart at SFR $\pm 10\%$	38 41



Calibrated by :

(Surakit Darncholwichit)
1 December 2021

Approved by :

(Sarawut Keawsrinual)
1 December 2021

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FE-MNT-29 Rev.02/01/21



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Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10160
Tel : 02-202-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



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

Verification Test Report

Report No.:

6412 -SLM 02

☐ PM ☐ Onsite UTM: 47 P 1514462 N 654258 E

Calibrated Date: 1 December 2021

Site : บริษัท เอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 3098009

Environment: Temperature 31 °C Humidity 67 %RH

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

Serial No. 1351075

Date of Calibration : Feb. 18, 2021

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.8	93.9	0.1	93.8

Calibrated By:

(Surakit Darncholvichit)

Date:

1 December 2021



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approve By:

(Sarawat Keawsrinual)

Date:

1 December 2021

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Certificate of Calibration

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

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4470	3.3	2.00
2	3	4	1	1.0260	6.4	4.00
3	5	6	1	0.9120	8.0	5.00
4	7	8	1	0.8660	8.9	5.50
5	9	10	1	0.7170	12.9	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
1.0099	0.6979	1.4243	0.9956	0.6881	0.8793
1.0057	0.9803	2.0143	0.9916	0.9664	1.2435
1.0036	1.1004	2.2520	0.9894	1.0849	1.3903
1.0024	1.1575	2.3619	0.9883	1.1412	1.4581
0.9970	1.3906	2.8486	0.9830	1.3710	1.7586
QSTD	m=	2.05054	QA	m=	1.28401
	b=	-0.00430		b=	-0.00265
	r=	0.99994		r=	0.99994

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

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

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

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

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



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ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co.,Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-200011-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.
536 Soi Bangkhuae7, Bangkhuae, Bangkok 10160

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

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

Date of Received : 05 February 2021

Date of Calibration : 05 February 2021

Date of Issue : 08 February 2021

Calibrated by : Akaradath Thippichai

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

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

Standard Weights

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



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 64-200011-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty \pm (g)
0.01	0.0001	0.00011
0.1	0.0001	0.00011
1	0.0000	0.00011
2	0.0001	0.00011
5	0.0000	0.00011
10	0.0000	0.00011
20	-0.0001	0.00012
50	-0.0001	0.00014
100	-0.0001	0.00020
200	-0.0002	0.00038

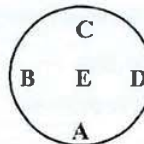
This result of calibration was found accurate as shown on date and place of calibration only.

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

Eccentric error

Load test : 50 g

A B C D E
0.0001 0.0000 0.0000 0.0000 0.0000 g



Repeatability

Load test : 200 g

Stdev. : 0.00005 g

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รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



CAL

Calibratech Co.,Ltd.

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

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



Certificate of Calibration

Certificate No. : 64-410010-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Digital Thermo-Hygrometer

Manufacturer : ebro

Model : EBI 20-TH1

Range Temperature : -30 °C to 60 °C

Resolution : 0.1 °C

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

Resolution : 0.1 %R.H.

Serial No. : 62227425

ID No. : N/A

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

Relative Humidity : (50 ± 15) %

Date of Received : 05 February 2021

Date of Calibration : 11 February to 13 February 2021

Date of Issue : 13 February 2021

Calibrated by : Chortip Samchusri

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

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

Digital Indicator with Standard Probe Temp&Hum

ID No.	Cert. No.	Due Date	Traceability
400034 & 400036	SG-H-00041/64	12 Jul 2021	Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL

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

Certificate of Calibration

Certificate No. : 64-410010-1

Page : 2 of 2

UUC Condition As-Received : Good

Result of Calibration : Without Adjustment

Function : Temperature measurement

Reference Humidity @ 50 %R.H.

Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
10.04	9.8	0.2	0.46
25.00	25.0	0.0	0.46
30.02	30.0	0.0	0.46

Result of Calibration : Without Adjustment

Function : Humidity measurement

Reference Temperature @ 25 °C

Standard Humidity (%R.H.)	UUC Reading (%R.H.)	Correction (%R.H.)	Uncertainty (± %R.H.)
39.99	47.7	-7.7	2.2
50.03	56.2	-6.1	2.2
59.99	66.0	-6.0	2.3

Remark

UUC : Unit Under Calibration

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

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

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รับรองสำเนาถูกต้อง

ผู้ตรวจสอบและควบคุมคุณภาพ





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0312

MTC No. EEL. BP. 57/0264

CALIBRATION CERTIFICATE

Submitted by : Envilab Co., Ltd.

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

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

Instrument Calibrated :

Description : Sound Level Calibrator

Manufacturer : Bruel&Kjaer

Model : 4230

Serial No. : 1351075

Ambient Environment

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

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

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

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

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

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

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

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

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

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

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

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

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

Date of Receipt : 10 Feb. 2021

Date of Calibration : 18 Feb. 2021

1 / 2

The results relate only to the items tested or calibrated.

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

FM.BL.MTC.002 Rev.3

Head Office

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

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 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

Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0312

MTC No. EEL. BP. 57/0264

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

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

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	93.78	-0.22	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	998.3	-1.7	± 1.5	$\pm 1.0\%$

3. Total Distortion

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

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

Calibrated by :

Tawit 2

(Mr.Tawikiat Iamsamran)

Approved by :



Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 18 Feb. 2021

Date of Issue : 19 Feb. 2021

Ref : 2011264021000592001

2 / 2

End of Certificate

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

FM.BL.MTC.002 Rev.3

Head Office

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Tel. (66) 0 2323 1672-80 ext. 115, 118
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office

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Fax. (66) 0 2579 8597
E-mail : sumalee@tistr.or.th



EnviLab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

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

Expiration Date: Feb 19, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	44.68 PPM	G1	+/- 1.4% NIST Traceable	02/12/2021, 02/19/2021
NITRIC OXIDE	45.00 PPM	44.62 PPM	G1	+/- 1.4% NIST Traceable	02/12/2021, 02/19/2021
SULFUR DIOXIDE	45.00 PPM	45.34 PPM	G1	+/- 1.1% NIST Traceable	02/12/2021, 02/19/2021
CARBON MONOXIDE	4500 PPM	4500 PPM	G1	+/- 1.0% NIST Traceable	02/15/2021
NITROGEN	Balance				

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

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Jan 27, 2021
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Jan 21, 2021
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jan 21, 2021

Triad Data Available Upon Request

NOTES:

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



Michael A. Perkins
Approved for Release



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รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Calibration Certificate

Part Number: 721A2601
Description: Micromate with DIN Geophone
Serial Number: UM18210
Calibration Date: **MAR 24 2021**
Calibration Reference Equipment: 714J7402

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

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

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

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

Calibrated By: _____

Xiaoming Yang

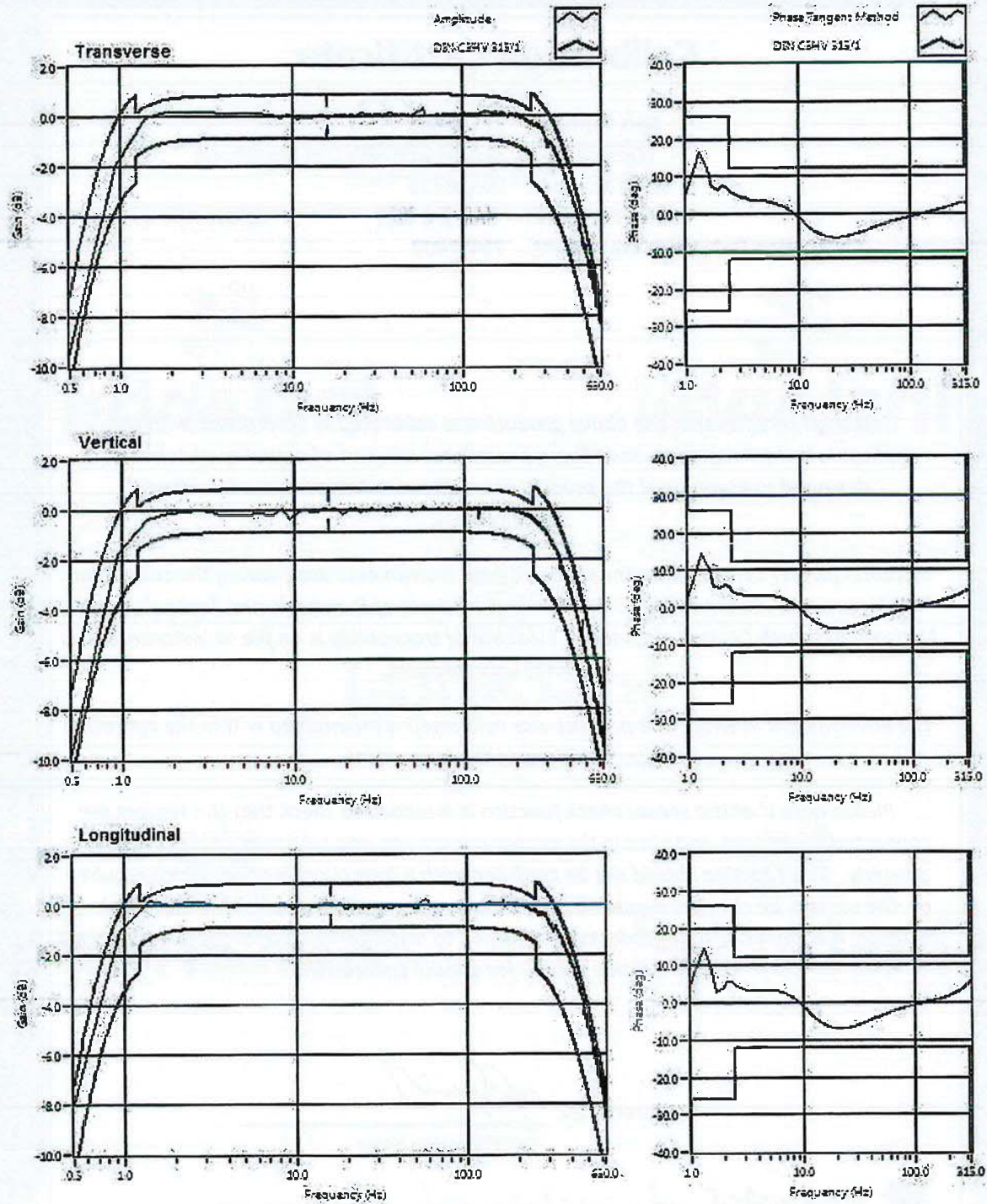


309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Frequency Response of UM18210



Calibration Certificate

Part Number: 721A2601
Description: Micromate with DIN Geophone
Serial Number: UM18211
Calibration Date: **MAR 24 2021**
Calibration Reference Equipment: 714J7402

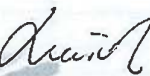
Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

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

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

Calibrated By: _____



Xiaoming Yang

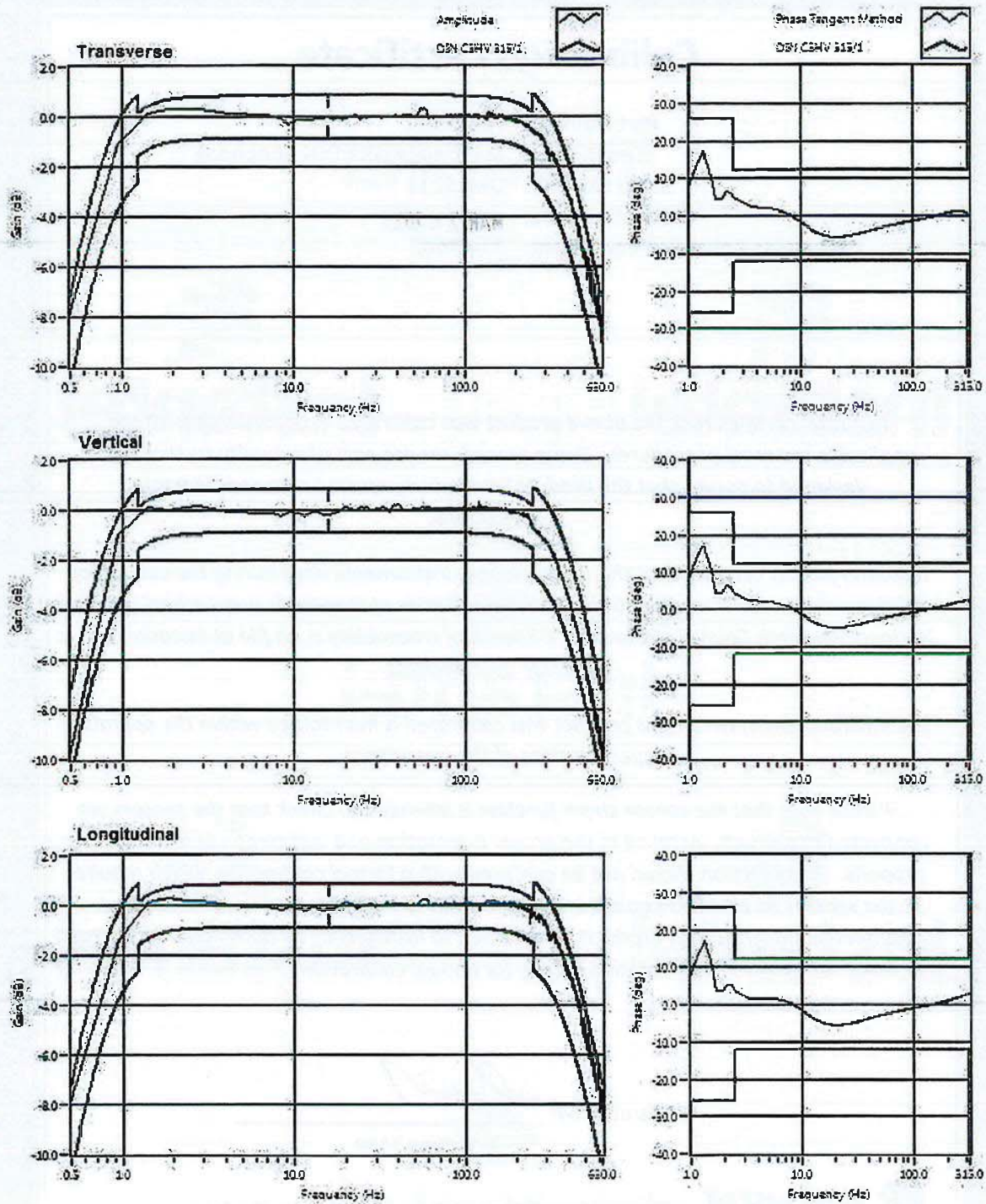


Instantel

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



Frequency Response of UM18211



Envilab Co., Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co.,Ltd.

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



Certificate of Calibration

Certificate No. : 64-200049-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA125-1S

Serial No. : 0034606552

ID No. : ELABBALANCEN05

Capacity : 120 g

Resolution : 0.00001 g

Environment :

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

Ambient Temperature : (23.1 to 24.0) °C

Relative Humidity : (56.7 to 61.9) %

Air Pressure : 1013.0 mbar

Date of Received : 02 March 2021

Date of Calibration : 02 March 2021

Date of Issue : 06 March 2021

Calibrated by : Akaradath Thippichai

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

Edition 5, July 2015

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

Standard Weights

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



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-200049-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

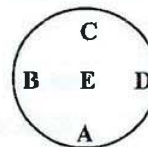
Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty \pm (g)
0.1	0.00000	0.000017
0.5	-0.00001	0.000022
1	0.00001	0.000026
2	0.00000	0.000034
5	-0.00001	0.000043
10	0.00000	0.000053
20	-0.00002	0.000071
50	-0.00003	0.00011
100	-0.00005	0.00020
120	-0.00006	0.00038

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

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

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



Repeatability Load test : 100 g
Stdev. : 0.000014 g

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CAL

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Certificate of Calibration

Certificate No. : 64-410010-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Digital Thermo-Hygrometer

Manufacturer : ebro

Model : EBI 20-TH1

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

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

Serial No. : 62227425

ID No. : N/A

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

Relative Humidity : (50 ± 15) %

Date of Received : 05 February 2021

Date of Calibration : 11 February to 13 February 2021

Date of Issue : 13 February 2021

Calibrated by : Chortip Samchusri

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

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

Digital Indicator with Standard Probe Temp&Hum

ID No.	Cert. No.	Due Date	Traceability
400034 & 400036	SG-H-00041/64	12 Jul 2021	Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268



Approved by :

(Bunjerd Masri)

Supervisor

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-410010-1

Page : 2 of 2

UUC Condition As-Received : Good

Result of Calibration : Without Adjustment

Function : Temperature measurement

Reference Humidity @ 50 %R.H.

Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
10.04	9.8	0.2	0.46
25.00	25.0	0.0	0.46
30.02	30.0	0.0	0.46

Result of Calibration : Without Adjustment

Function : Humidity measurement

Reference Temperature @ 25 °C

Standard Humidity (%R.H.)	UUC Reading (%R.H.)	Correction (%R.H.)	Uncertainty (± %R.H)
39.99	47.7	-7.7	2.2
50.03	56.2	-6.1	2.2
59.99	66.0	-6.0	2.3

Remark

UUC : Unit Under Calibration

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

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

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ผู้จัดการฝ่ายควบคุมคุณภาพ



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NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-420055-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : pH Meter (Pocket)

pH meter

Manufacturer : Eutech

Model : pHTestr 30

Range : -1.00 to 15.00 pH

Resolution : 0.01 pH

Serial No. : 2856418

ID No. : ELABPHTEST3016

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

Ambient Temperature : (24.5 to 25.0) °C

Relative Humidity : (50 to 54) %

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 24 March 2021

Calibrated by : Bunjerd Masri

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

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

Standard Buffer Solution

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

Approved by :


(Bunjerd Masri)

Supervisor



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

The Uncertainties are for a confidence probability of approximately 95%

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CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 64-420055-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : pH meter with electrode

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

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

Remark

1 UUC : Unit Under Calibration

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

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

This reported uncertainty of 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





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


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

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

Cert.No.: 21TW57


Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : Hanna
Model : HI 9146
Serial No. : G0007931
ID No. : EDOHI914607931
Received Date : 16 March 2021
Test Date : 19 March 2021
Reference : 2103-0669DN-1
Submitted by : Envilab Co.,Ltd (Head office)
540, 540/1 Soi Bangkhæ 7, Bangkhæ,
Bangkhæ, Bangkok 10160
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Calibrated by : Walalak Sirithean
Approved by : 
Approved Signatory
(✓) Malee Butkruea
() Salthip Meangmai
() Warakorn Lerngagtrakul
Issue Date : 23 March 2021



Envilab Co.,Ltd.


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ผู้จัดการฝ่ายควบคุมคุณภาพ

B 0257191



Cert.No.: 21TW57

Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: KC1A01TAF

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

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

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Certificate of Calibration

Certificate No. : 64-400569-1

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Air Chamber (Refrigerator)

Manufacturer : M-LAB

Model : BIC-140

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 1011

ID No. : ELABBODC140N03

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

Ambient Temperature : (23.0 to 23.8) °C

Relative Humidity : (55 to 60) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 12 November 2021

Date of Calibration : 12 November 2021

Date of Issue : 18 November 2021

Calibrated by : Bunjerd Masri

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No.

Cert. No.

Due Date

Traceability

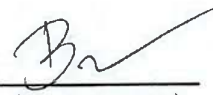
400046 & 400023

64-400443-1

29 Mar 2022

National Institute of Metrology Thailand (NIMT)

Approved by :



(Bunjerd Masri)

Supervisor



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

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Certificate of Calibration

Certificate No. : 64-400569-1

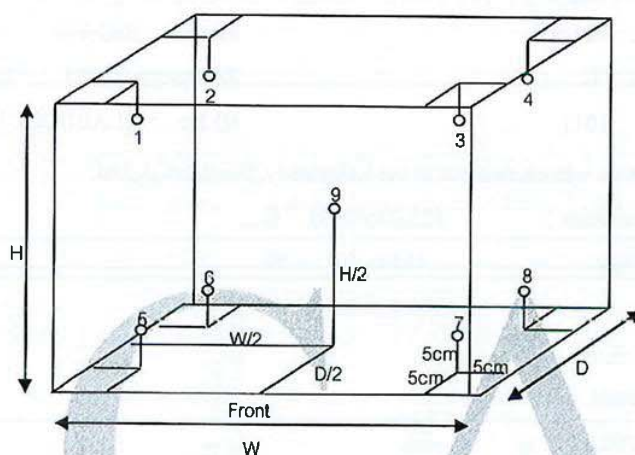
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.38 m

D = 0.35 m

H = 1.15 m

Capacity = 0.15 m³

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

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

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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EnviLab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





Thermology Co., Ltd.

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



CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

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

Place of Calibration MICRO ROOM (B302)

Description Incubator

Model IF75

Serial No. D319.0066

ID.No. -

Date of Receipt Feb 12, 2021

Date of Calibration Feb 12, 2021

Environment

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

Calibration Method

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

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

Standard

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

This certificate is traceable to SI unit.

Page 1 of 3

D. Mi

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



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ผู้จัดการฝ่ายควบคุมคุณภาพ



Thermology Co., Ltd.

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



CALIBRATION CERTIFICATE

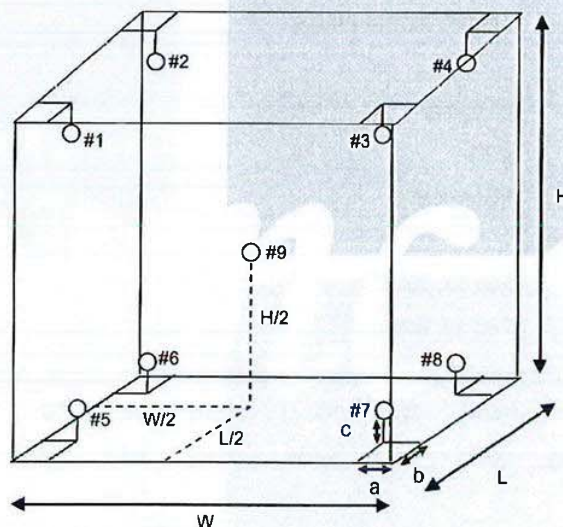
Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

Results (without adjustment)



Position of reference thermometers were placed

Note.

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



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Thermology Co., Ltd.

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



CALIBRATION CERTIFICATE

Date of Issue Feb 13, 2021

Cert No. 21/0323

Site Calibration

Order No. 21020066

Results (without adjustment)

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

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

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

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

APPROVED SIGNATORY : D.M.
(MR. DAMRONG MULSING)

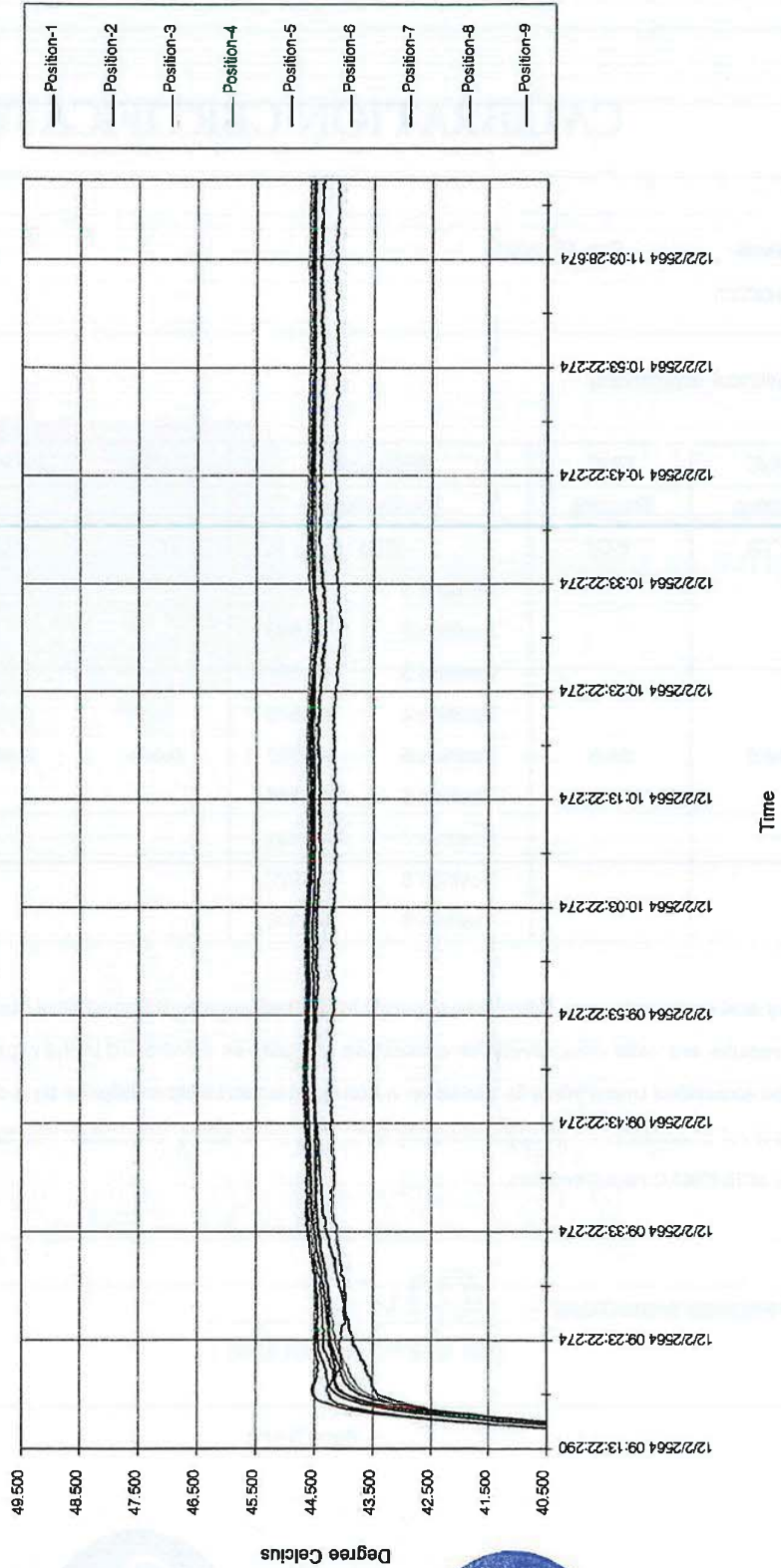
Page 3 of 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Cert.No. 21/0323

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



Envilab Co.,Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ
รองสำหรับห้อง

CAL

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

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-400163-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Oven)

Manufacturer : Memmert

Model : UF 75

Range : N/A °C

Resolution : 0.1 °C

Serial No. : B319.0600

ID No. : N/A

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

Ambient Temperature : (30.0 to 31.5) °C

Relative Humidity : (50 to 55) %

Line Voltage : (224.2 to 225.2) V

Date of Received : 24 March 2021

Date of Calibration : 24 March 2021

Date of Issue : 25 March 2021

Calibrated by : Permpon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

ID No.

Cert. No.

Due Date

Traceability

400029 & 400032

63-400450-1

30 Mar 2021

National Institute of Metrology Thailand (NIMT)



Envilab Co.,Ltd.

Approved by :

(Bunjerd Masri)

Supervisor

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

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Certificate of Calibration

Certificate No. : 64-400163-2

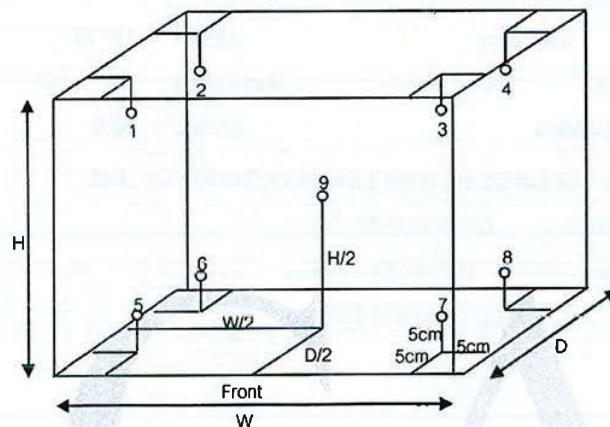
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.56 m

Capacity = 0.07 m³

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

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

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



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Certificate of Calibration

Certificate No. : 64-400049-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB29

Range : N/A °C

Resolution : 0.1 °C

Serial No. : L617.0156

ID No. : ELABWBWNB29N01

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

Ambient Temperature : (26.0 to 26.5) °C

Relative Humidity : (45 to 50) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 05 February 2021

Date of Calibration : 05 February 2021

Date of Issue : 06 February 2021

Calibrated by : Permon Chanpu

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

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

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



Approved by :

Bunjerd Masri

(Bunjerd Masri)

Supervisor

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

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Certificate of Calibration

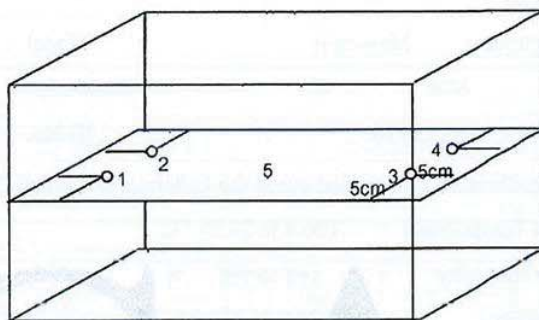
Certificate No. : 64-400049-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Front

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

Remark The uncertainty is not combine uniformity of the water bath

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

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

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EnviLab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ



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NSC-TISI-TIS 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-300152-2

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : PYREX

Class : A

Capacity : 50 ml

Graduation : 1 ml

ID No. : C-WW-002/21

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

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

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

Electronic Balance

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

Approved by :

(Wipa Tovadee)

Supervisor



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

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Certificate of Calibration

Certificate No. : 64-300152-2

Page : 2 of 2

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

UUC Condition As-Received : Good

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

Uncertainty of measurement with in \pm 0.054 ml

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

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

- o0o -

D.



Envilab Co.,Ltd.

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NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-300152-6

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : Witeg

Class : A

Capacity : 1000 ml

Graduation : 10 ml

ID No. : C-WW-029/18

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1012.9 mbar.

Date of Received : 02 March 2021

Date of Calibration : 12 March 2021

Date of Issue : 12 March 2021

Calibrated by : Areerat Sombun

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

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

Electronic Balance

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

Approved by :

(Wipa Tovadee)

Supervisor



Envilab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

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Certificate of Calibration

Certificate No. : 64-300152-6

Page : 2 of 2

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

UUC Condition As-Received : Good

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

Uncertainty of measurement with in \pm 0.17 ml

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

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

- o0o -

D.



EnviLab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

