

ประจำเดือนกันยายน พ.ศ. 2565



TSP High Volume Sampler Calibration

Verification Report No.

B6509 -TSP 02

☒ PM ☐ Onsite

Site: บริษัท เอ็นไวแล็บ จำกัด

UTM : 47P N1514475 E654269

Sampler: ETSP#04

Recorder: ECRANG15315224

Date: 1 Sep 22

Technical: Sanayu J.

Approval: Wisan R.

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-5028A

Serial#: 1328

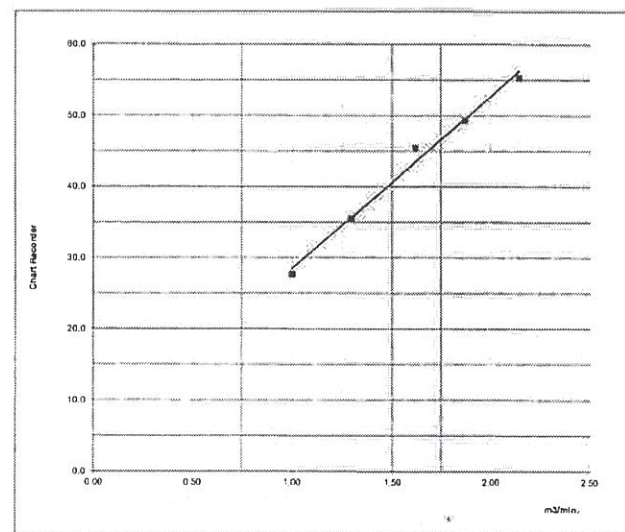
Qstd Slope: 1.63957

Qstd Intercept: -0.01202

Date Certified: 19 Jan 22

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	15.18	2.352	46.0	45.40	
2	11.37	2.037	40.0	39.47	<p>Slope = 19.8858 Intercept = -1.1252 Corr. coeff. = 0.9918</p> <p># of Observations: 5</p> <p>Range of Chart at 1.1 - 1.7 m3/min. 22 33</p>
3	8.65	1.778	34.0	33.55	
4	5.68	1.442	30.0	29.61	
5	3.36	1.111	20.0	19.74	



Calibrated by :

(Sanayu Jantason)
1 September 2022

Approved by :

(Wisan Ritthikamon)
1 September 2022



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PM10 High Volume Sampler Calibration

Verification Report No.

B6509 -PM 02

<input checked="" type="checkbox"/> PM	<input type="checkbox"/> Onsite
Site: บริษัท เอ็นไวแล็บ จำกัด	
UTM : 47P N1514475 E654269	
Sampler: EPM#09	
Recorder: ECRDS01618124	
Date: 1 September 2022	
Technical: Sanayu J.	
Approval: Wisan R.	

CONDITIONS

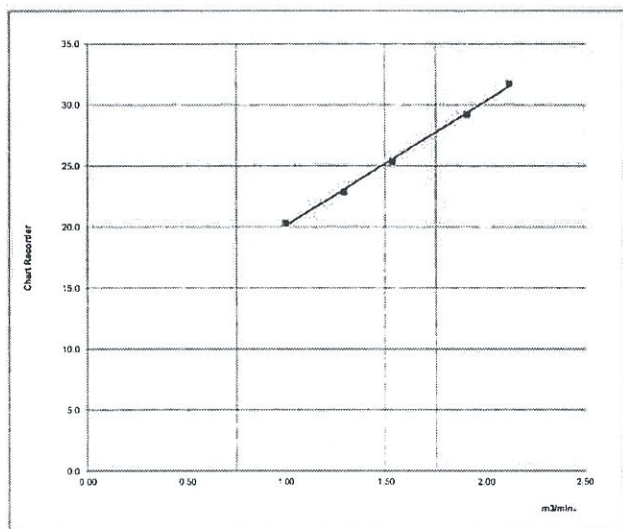
Barometric Press. (hPa): 1010.0	Corrected Pressure (mm Hg): 757.6
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg. Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Slope: 1.02667
Model: TE-5028A	Intercept: -0.00753
Serial#: 1328	Date Certified: 19 Jan 22

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.22	1.983	50.0	31.73	Slope = 13.4050
2	8.12	1.768	46.0	29.19	Intercept = 5.0643
3	6.54	1.588	40.0	25.38	Corr. coeff. = 0.9921
4	4.22	1.277	36.0	22.84	SFR = 1.141
5	2.88	1.056	30.0	19.04	SSP = 32.08
					# of Observations: 5
					Range of Chart 30
					at SFR $\pm 10\%$ 34



Calibrated by :
(Sanayu Jantason)
1 September 2022

Approved by :
(Wisan Ritthikamon)
1 September 2022



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

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



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Neediss Supply Instrument Co., Ltd.

555 หมู่ 11 ตำบล คลองเตย อำเภอ คลองเตย จังหวัด สงขลา 90110
Tel: 090-300-3399 Fax: 090-300-3398 E-mail: neediss@neediss.co.th



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6509006

Page:1/1

Calibrated Date: 1-Sep-22

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: SO2 Analyzer Model: THERMO.,43C	Manufacturer THERMO S/N: ESOTE43C069871
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Calibration System

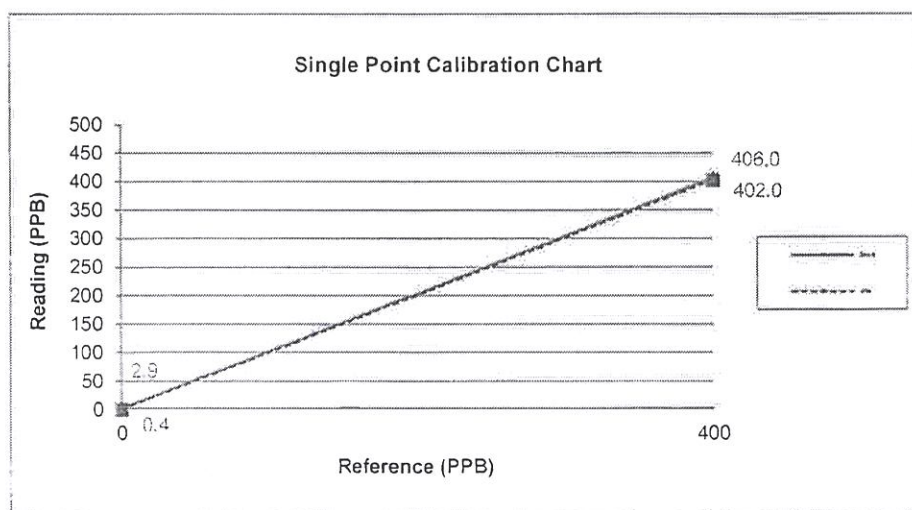
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 25.1 °C

Humidity: 54 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	2.9	2.9	400.0	406	1.5
After	0.0	0.4	0.4	400.0	402	0.5



Ok & h
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Tel: 090-000-0000 Fax: 090-000-0000 Email: info@neediss.com



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-09-2022

S/N : ESOTE43C069871

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

Calibrate By : Sirirat Poonlak

Approve By : Sarawut Keawsrinual

Sirirat Poonlak

Sarawut Keawsrinual

Date:

1-Sep-22

Date:

1-Sep-22



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540 ถนน 7 มิถุนายน แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
Tel: 02-812-1261 Fax: 02-812-1262 E-mail: info@neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: 6509006
Calibrated Date: 1-Sep-22

Page:1/2

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: 42C	Manufacturer THERMO S/N: ENOTE42CD75279
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Calibration System

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

Environment: Temperature 25.4 °C

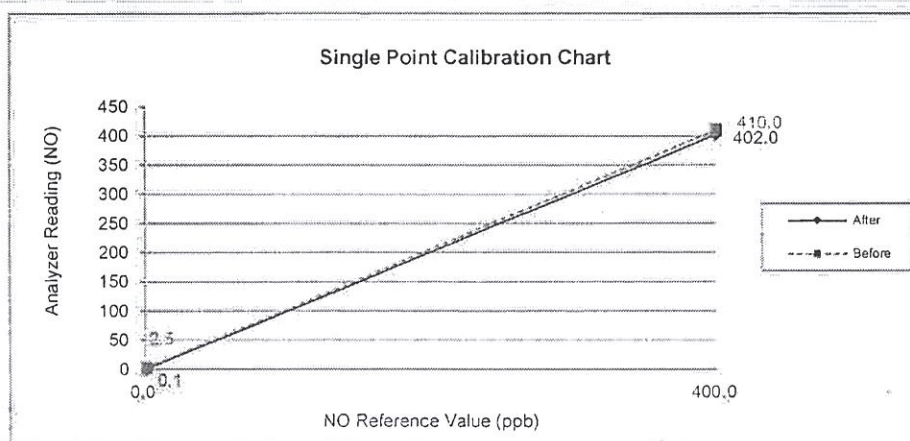
Humidity: 54 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	2.5	0.0	2.5	410	400.0	1.2
NO ₂	6.6	0.0	6.6	2.0	0.0	0.2
NOx	9.1	0.0	9.1	412	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	0.1	0.0	0.1	402	400.0	0.2
NO ₂	0.2	0.0	0.2	3.0	0.0	0.4
NOx	0.3	0.0	0.3	405	400.0	0.6



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MODEL : NOx ANALYZER Model 42C THERMO

DATE : 1-09-2022

S/N : ENOTE42CD75279

Page:2/2

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

Calibrate By : Sirirat Poonlak

Approve By : Sarawat Keawsrinual

Sirirat Poonlak

Sarawat Keawsrinual

Date: 1-Sep-22

Date: 1-Sep-22

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Tel : 02-00-91111 Fax : 02-00-91112 E-mail : envilab@evltesting.com



Verification Test Report

Report No.:

6509 -SLM 01

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

Calibrated Date: 1 September 2022

Site : บริษัทเอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 8001

Environment: Temperature 25 °C Humidity 57 %RH

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

Serial No.1351075

Date of Calibration : March.21, 2022

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.66	93.54	-0.12	93.66

Calibrated By:

(Sanayu Jantason)

Date:

1 September 2022



Approve By:

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ผู้จัดการฝ่ายควบคุม

(Wisan Ritthikamon)

Date:

1 September 2022

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โทรศัพท์ 02-5577111 โทรสาร 02-5577112 E-mail: info@evltesting.com



TSP High Volume Sampler Calibration

Verification Report No.

B6509 -TSP 01

<input checked="" type="checkbox"/> PM <input type="checkbox"/> Onsite	Site: บริษัท เอ็นไวแล็บ จำกัด	Date: 1 Sep 22
	UTM : 47P N1514475 E654269	Technical: Sanayu J.
	Sampler: ETSP#25	Approval: Wisan R.
	Recorder: ECRANG15315224	

CONDITIONS

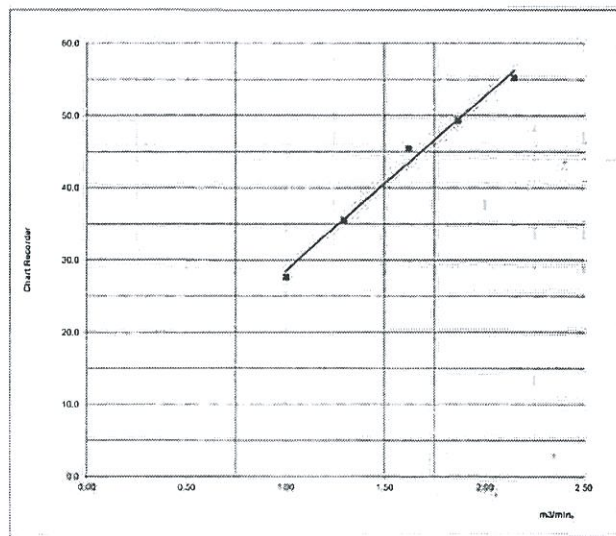
Barometric Press. (hPa): 1010.0	Corrected Pressure (mm Hg): 757.6
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg. Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Qstd Slope: 1.63957
Model: TE-5028A	Qstd Intercept: -0.01202
Serial#: 1328	Date Certified: 19 Jan 22

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	12.65	2.148	56.0	55.26	
2	9.56	1.868	50.0	49.34	Slope = 24.1847 Intercept = 4.2653 Corr. coeff. = 0.9945 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 32 45
3	7.18	1.620	46.0	45.40	
4	4.58	1.295	36.0	35.53	
5	2.72	1.000	28.0	27.63	



Calibrated by:
(Sanayu Jantason)
1 September 2022

Approved by:
(Wisan Ritthikamon)
1 September 2022



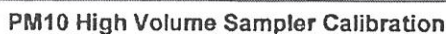
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Environmental responsibility with accuracy measurement

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



B6509 -PM 01

Site: บริษัท เอ็นไวแล็บ จำกัด

UTM : 47P N1514475 E654269

Sampler: EPM#17

Recorder: ECRDS01618124

Date: 1 September 2022

Technical: Sanayu J.

Approval: Wisan R.

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-5028A

Serial#: 1328

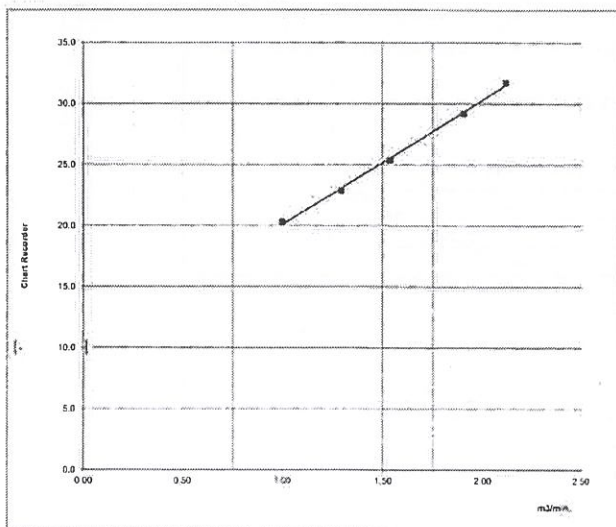
Slope: 1.02667

Intercept: -0.00753

Date Certified: 19 Jan 22

CALIBRATIONS

Plate or Test #	H ₂ O (in)	Q _a (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	11.66	2.118	50.0	31.73	Slope = 10.2323
2	9.44	1.906	46.0	29.19	Intercept = 9.8191
3	6.12	1.536	40.0	25.38	Corr. coeff.= 0.9988
4	4.32	1.292	36.0	22.84	SFR = 1.141
5	2.58	1.000	32.0	20.30	SSP = 33.87
					# of Observations: 5
					Range of Chart 33
					at SFR ±10% 35



Calibrated by :

(Sanayu Jantason)

1 September 2022

Approved by :

(Wisan Ritthikamon)

1 September 2022

Approved
Envilab Co., Ltd.

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FE-MNT-22 Rev. 02/01/2016



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6509007

Page:1/1

Calibrated Date: 1-Sep-22

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: SO2 Analyzer	Manufacturer THERMO
Model: THERMO.,43C	S/N: ESOTE43C053884

Calibration System

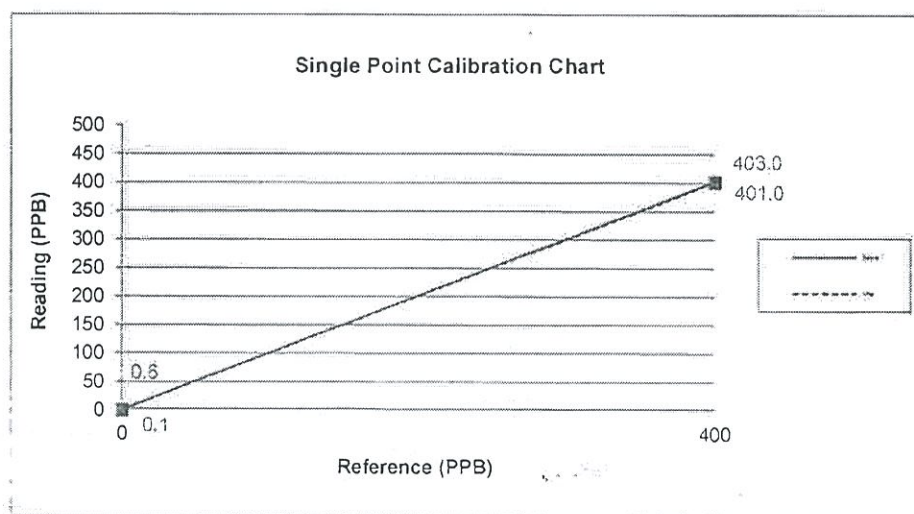
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101	NO Conc 44.68 PPM
S/N: 792	SO2 Conc 45.34 PPM
ZERO AIR Generator ZAG7001	CO Conc 4500 PPM
S/N: 644	Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 25.1 °C

Humidity: 55 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.6	0.0	400.0	403	0.8
After	0.0	0.1	0.1	400.0	401	0.3



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Neediss Supply Instrument Co., Ltd.

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Tel: 02-521-1111 Fax: 02-521-1112 E-mail: info@neediss.com



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-09-2022

S/N : ESOTE43C053884

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

Calibrate By :

Sirirat Pooniak

Approve By :

Sarawut Keawsrinual

Sirirat Pooniak



Sarawut Keawsrinual
รับรองสำเนาถูกต้อง

Sarawut Keawsrinual

Date:

1-Sep-22

Envilab Co., Ltd

Date:

1-Sep-22

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NOx Analyzer Verification Test Report

Calibration Report No.: 6509002

Calibrated Date: 1-Sep-22

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☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: 42C	Manufacturer THERMO S/N: ENOTE42C704365
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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 26.5 °C

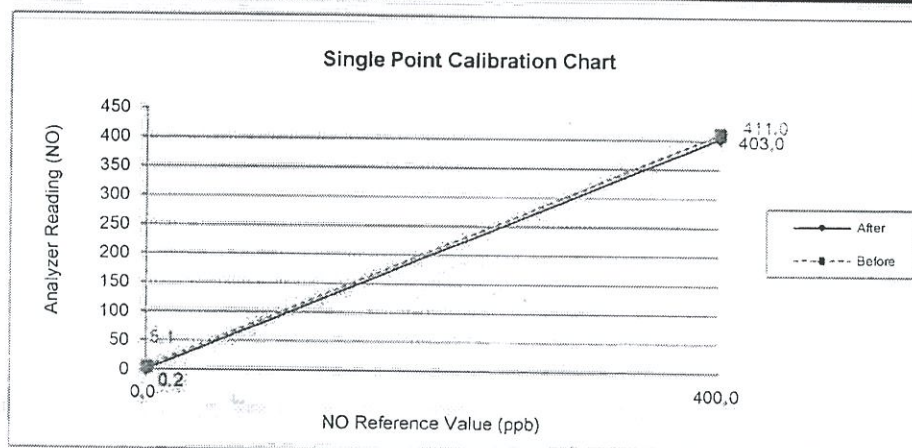
Humidity: 57 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	5.1	0.0	5.1	411	400.0	1.4
NO ₂	2.0	0.0	2.0	4.0	0.0	0.5
NOx	7.1	0.0	7.1	415	400.0	1.8

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.2	0.0	0.2	403	400.0	0.4
NO ₂	0.6	0.0	0.6	2.0	0.0	0.2
NOx	0.8	0.0	0.8	405	400.0	0.6



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MODEL : NOx ANALYZER Model 42C THERMO

DATE :1-09-2022

S/N : ENOTE42C704365

Page:2/2

Test Function Value	Before	After
Range 500 (PPB)	500	500
PMT VOLTS -450 - -850 (V)	-675	-678
LAMP VOLTAGE 950 - 1,200 (V)		
INTER TEMP 15 - 45 DEG C	44	43
CHAMBER TEMP 47 - 51 C	50	50
COOLER TEMP -5 - (-2) DEG C	-3	-2
PRESSURE 400 - 1000.0 mm Hg	350	380
SAMPLE FLOW 0.350 - 0.900 LPM	0.45	0.46
OZONEATOR FLOW 0.035 - 0.075 LPM	0.05	0.05
No/Nox BKG	12/9.0	12/9.1
No/Nox Slope	1.0/0.8	0.9/0.8

Calibrate By: Sirirat PoonlakApprove By: Sarawut Keawsrinual

Sirirat Poonlak

Sarawut Keawsrinual

Date: 1-Sep-22

Date: 1-Sep-22

neediss
Neediss Supply Instrument Co., Ltd.

รับรองสำเนาถูกต้อง

EnviLab Co., Ltd. "ผู้จัดการฝ่ายควบคุมคุณภาพ"

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www.neediss.com

We know the best thing to save environment



Verification Test Report

Report No.:

6509 -SLM 02

☒ PM

☐ Onsite UTM :

47P N 1514462 E 654258

Calibrated Date: 1 September 2022

Site : บริษัทเอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 8008

Environment: Temperature 25 °C Humidity 57 %RH

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

Serial No.1351075

Date of Calibration : March.21, 2022

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.66	93.35	-0.31	93.66

Calibrated By:

(Sanayu Jantason)

Date:

1 September 2022

Approve By:

(Wisan Ritthikamon)

Date:

1 September 2022



รับรองสำเนาถูกต้อง

ผลการดำเนินงานมีความถูกต้อง

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Certificate of Calibration

Calibration Certification Information

Cal. Date: January 19, 2022 Rootsmeter S/N: 438320 Ta: 294 °K
Operator: Jim Tisch Pa: 749.05 mm Hg
Calibration Model #: TE-5028A Calibrator S/N: 1328

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3190	3.7	1.50
2	3	4	1	1.0220	6.2	2.50
3	5	6	1	0.9290	7.5	3.00
4	7	8	1	0.8590	8.7	3.50
5	9	10	1	0.6530	14.8	6.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9941	0.7536	1.2241	0.9951	0.7544	0.7673
0.9907	0.9694	1.5803	0.9917	0.9704	0.9906
0.9890	1.0646	1.7312	0.9900	1.0656	1.0851
0.9874	1.1495	1.8699	0.9884	1.1506	1.1721
0.9793	1.4996	2.4483	0.9802	1.5011	1.5346
QSTD	m=	1.63957	QA	m=	1.02667
	b=	-0.01202		b=	-0.00753
	r=	0.99999		r=	0.99999

Calculations

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

Standard Conditions

Tstd: 298.15 °K
Pstd: 760 mm Hg

Key

ΔH: calibrator manometer reading (in H2O)
ΔP: 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.

Certificate of Calibration

Certificate No. : 65-200022-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA224-1S

Serial No. : 0034803270

ID No. : ELABBALANCEN04

Capacity : 220 g

Resolution : 0.0001 g

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

Ambient Temperature : (23.7 to 23.8) °C

Relative Humidity : (57.1 to 58.0) %

Air Pressure : 1012.0 mbar

Date of Received : 02 February 2022

Date of Calibration : 02 February 2022

Date of Issue : 09 February 2022

Calibrated by : Akaradath Thippichai

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

Edition 5, July 2015

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

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E261-E2624	C02213103	18 Nov 2022	National Institute of Metrology (Thailand), (NIMT)

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 65-200022-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty \pm (g)
0.01	0.0001	0.00011
0.1	0.0001	0.00011
1	0.0000	0.00011
2	0.0001	0.00011
5	0.0000	0.00012
10	0.0001	0.00012
20	-0.0001	0.00013
50	0.0000	0.00014
100	-0.0002	0.00020
200	-0.0004	0.00038

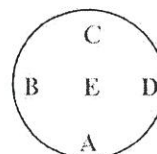
This result of calibration was found accurate as shown on date and place of calibration only.

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

Eccentric error

Load test : 50 g

A B C D E
-0.0001 -0.0002 -0.0002 -0.0001 0.0000 g



Repeatability

Load test : 200 g

Sdev. : 0.00005 g

- o o o -



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ผู้จัดการฝ่ายควบคุมคุณภาพ



Certificate of Calibration

Certificate No. : 65-200022-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA3102-IS

Serial No. : 0034409695

ID No. : ELABBALANCEN03

Capacity : 3100 g

Resolution : 0.01 g

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

Ambient Temperature : (23.7 to 24.2) °C

Relative Humidity : (57.6 to 57.8) %

Air Pressure : 1012.0 mbar

Date of Received : 02 February 2022

Date of Calibration : 02 February 2022

Date of Issue : 09 February 2022

Calibrated by : Akaradath Thippichai

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

Edition 5, July 2015

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

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
F181-F1821	65-210044-1	31 Jul 2022	National Institute of Metrology (Thailand), (NIMT)

Approved by :

(Surachai Promthong)

Laboratory Manager

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, Sukhprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

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

Certificate of Calibration

Certificate No. : 65-200022-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

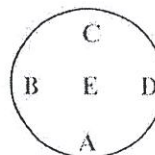
Nominal Value (g)	Correction (g)	Uncertainty \pm (g)
10	0.00	0.0082
20	0.00	0.0082
50	0.00	0.0082
100	0.00	0.0082
200	0.00	0.0083
500	-0.01	0.0085
1000	-0.01	0.0093
1500	-0.01	0.011
2000	-0.01	0.012
3000	-0.01	0.023

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

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

Eccentric error

Load test : 1000 g
A B C D E
0.00 0.01 0.02 0.00 0.00 g



Repeatability

Load test : 2000 g
Stdev. : 0.000 g



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0383

MTC No. EEL. BP. 59/0365

CALIBRATION CERTIFICATE

Submitted by : Envilab Co.,Ltd.

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

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

Instrument Calibrated :

Description : Acoustic Calibrator

Manufacturer : Bruel&Kjaer

Model : 4230

Serial No. : 1351075

Ambient Environment

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

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

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

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

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

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

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

Date of Receipt : 10 Mar. 2022

Date of Calibration : 21 Mar. 2022



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

1 / 2

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

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FM.BL.MTC.002 Rev.4

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Thailand
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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0383

MTC No. EEL. BP. 59/0365

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

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

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.66	-0.34	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	997.8	-2.2	± 1.5	$\pm 1.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.55	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr. Weerachai Deechaiyae)

Approved by :

(Mr. Prawate Khuaypa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Mar. 2022

Date of Issue : 22 Mar. 2022

Ref : 2011265031501147002

End of Certificate

2 / 2

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Office

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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

FM.BL.MTC.002 Rev.4

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD
Part Number: E05NI91E15A0003
Cylinder Number: EB0146406
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12022
Gas Code: CO, CO2, NO, NOX, SO2, BALN
Reference Number: 160-402305646-1
Cylinder Volume: 148.7 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Jan 03, 2022

Expiration Date: Jan 03, 2030

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

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

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	12/27/2021, 01/03/2022
CARBON MONOXIDE	100.0 PPM	98.02 PPM	G1	+/- 0.5% NIST Traceable	12/27/2021
NITRIC OXIDE	100.0 PPM	100.1 PPM	G1	+/- 1.0% NIST Traceable	12/27/2021, 01/03/2022
SULFUR DIOXIDE	100.0 PPM	100.2 PPM	G1	+/- 1.0% NIST Traceable	12/27/2021, 01/03/2022
CARBON DIOXIDE	8.000 %	7.962 %	G1	+/- 0.9% NIST Traceable	12/27/2021
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	09010241	KAL004894	98.48 PPM CARBON MONOXIDE/NITROGEN	+/- 0.5%	Oct 16, 2024
NTRM	200610-56	CC733475	98.61 PPM NITRIC OXIDE/NITROGEN	+/- 0.6%	Oct 06, 2026
GMIS	124206889119	CC322885	4.294 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Sep 03, 2024
NTRM	11010419	KAL004813	99.6 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jul 28, 2023
NTRM	08010636	K019200	13.94 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jan 30, 2024

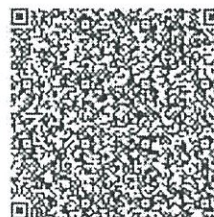
ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO2	FTIR	Dec 02, 2021
SIEMENS ULTRAMAT6E N1-C8-180	NDIR	Dec 09, 2021
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Dec 16, 2021
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Dec 29, 2021
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Dec 23, 2021

Triad Data Available Upon Request

NOTES: Gross Weight: 28.1 Kg, Net Weight: 5.1 Kg.

UF0X5CX



Mulinda Anderson
Approved for Release

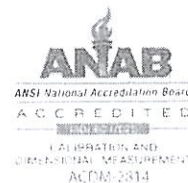


Ok
รับรองสำเนาถูกต้อง
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CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



Supplement to Calibration Certificate No. Q22080017

CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14632/UM14632[EVMINMMATE4632]
CLID. NO. : 252101369
JOB CONTROL NO. : 220809080017

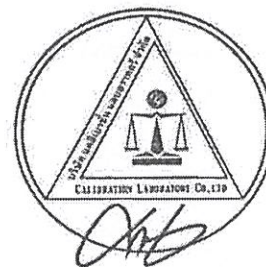
CUSTOMER : ENVILAB CO., LTD.
540, 540/1 SOI BANGKHAE 7, BANGKHAE,
BANGKHAE, BANGKOK 10160 THAILAND

DATE OF RECEIVED : 09 August 2022

DATE OF ISSUED : 23 August 2022

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
23 August 2022

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q22080017A1
F3-012-04/01-12



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

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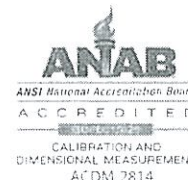


@clccalibration



CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



REPORT OF CALIBRATION FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14632/UM14632[EVMINMMATE4632]
DATE OF CALIBRATION : 10 August 2022

ENVIRONMENT CONDITIONS :

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

Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPEE-08** based on **ISO 16063-21** as calibration guideline.

The calibration was performed by using Digital Multimeter, High Resolution Programmable Timer/Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Hewlett Packard Model 34401A S/N. 3146A75935.
2. High Resolution Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0112-21, Due Date 26 October 2022.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0001/22, Due Date 22 February 2023.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0009-22, Due Date 22 June 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2,00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2021)"

Certificate No. Q22080017

F3-011-04/01-12



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

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@clccalibration



CALIBRATION LABORATORY Co., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	\pm (% of rdg.)
10	50 Hz	peak	10.000	10.224	-0.224	2.3
20	50 Hz		20.000	20.477	-0.477	1.8
30	50 Hz		30.000	30.692	-0.692	1.8

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 1 of 54

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q22080017

F3-011-04/01-12



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

page 3 of 3




@clccalibration

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Accuracy Calibration Certificate

Customer

Company: EnviLab Co., Ltd.
Address: 540, 540/1 Soi Bang Khae 7, Bang Khae
City: Bang Khae Contact: Ngarmthip Sampanpuang
Zip / Postal: 10160
State / Province: Bangkok
Order Number: 
* 0 3 3 1 9 0 7 2 4 8 *

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: XSR205DU Asset Number: N/A
Serial No.: B911363567 Terminal Model: SRAT
Building: N/A Terminal Serial No.: B911363567
Floor: 3 Terminal Asset No.: N/A
Room: B304

Range	Max. Capacity	Readability (d)
1	81 g	0.00001 g
2	220 g	0.0001 g

Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CP/W002/20

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

As Found	Temperature		Humidity	
	Start: 22.2 °C	End: 22.6 °C	Start: 58.3 %	End: 59.7 %

As Found Calibration Date: 02-Mar-2022
As Left Calibration Date: N/A
Issue Date: 03-Mar-2022

Calibrator:

Naruephon C.

Naruephon Chonprasertsuk

Approved Signatory:





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- ☒ Kassakorn Tassanachaisakul
☐ Santi Jitniyom
☐ Surachet Sukkate

Measurement Results

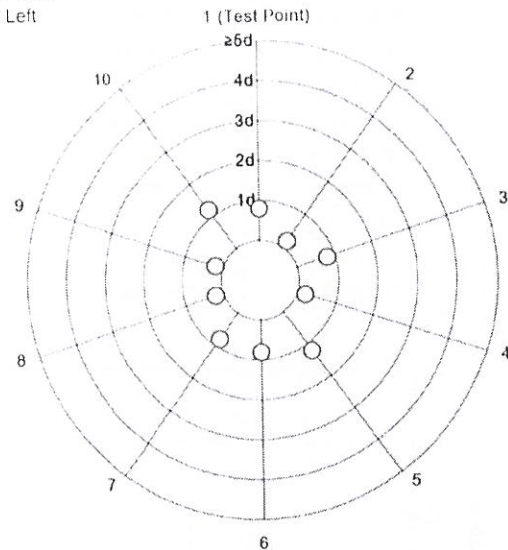
Repeatability

Test Load: 70 g

	As Found	As Left
1	70.00001 g	N/A
2	70.00002 g	N/A
3	70.00001 g	N/A
4	70.00002 g	N/A
5	70.00003 g	N/A
6	70.00001 g	N/A
7	70.00001 g	N/A
8	70.00002 g	N/A
9	70.00002 g	N/A
10	70.00003 g	N/A

○ As Found
◆ As Left

Standard Deviation	0.000008 g	N/A
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The "d" in the graph represents the readability of the range/interval in which the test was performed.

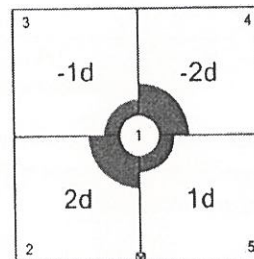
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	100.0002 g	N/A
3	99.9999 g	N/A
4	99.9998 g	N/A
5	100.0001 g	N/A

Maximum Deviation	0.0002 g	N/A
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As Found

The "d" in the graph represents the readability of the range/interval in which the test was performed.

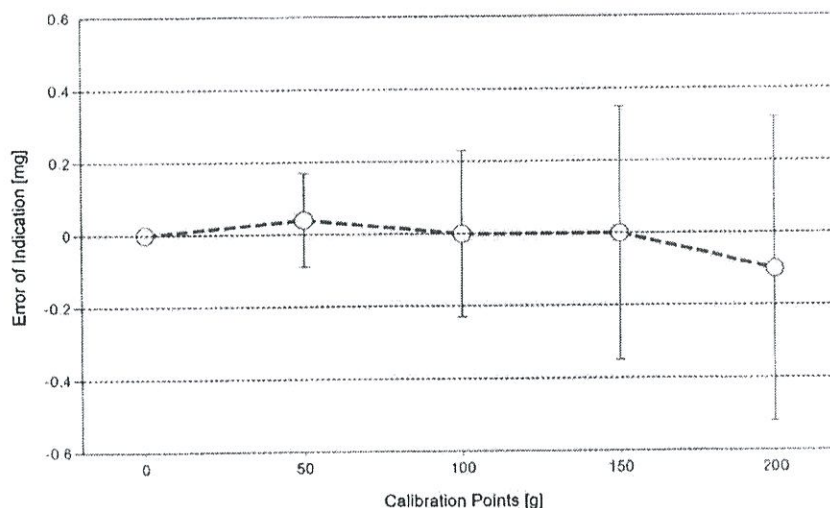


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Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.017 mg	2
2	0.10000 g	0.10000 g	0.00000 g	0.023 mg	2
3	0.50000 g	0.50001 g	0.00001 g	0.028 mg	2
4	0.99999 g	0.99999 g	0.00000 g	0.032 mg	2
5	1.99999 g	2.00000 g	0.00001 g	0.040 mg	2
6	5.00001 g	5.00001 g	0.00000 g	0.048 mg	2
7	10.00001 g	10.00002 g	0.00001 g	0.062 mg	2
8	49.99998 g	50.00002 g	0.00004 g	0.13 mg	2
9	100.0000 g	100.0000 g	0.0000 g	0.23 mg	2
10	150.0000 g	150.0000 g	0.0000 g	0.35 mg	2
11	199.9999 g	199.9998 g	-0.0001 g	0.42 mg	2



○ As Found

◆ As Left

For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.



รับรองสำเนาถูกต้อง
Fovilah Co., Ltd. ผู้จัดการฝ่ายควบคุมคุณภาพ

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.:	WS22	Date of Issue:	06-Jan-2022
Certificate Number:	177036	Calibration Due Date:	03-Jul-2023

Weight Set 2: OIML E2

Weight Set No.:	WS76	Date of Issue:	31-Jan-2022
Certificate Number:	C205470237	Calibration Due Date:	12-Jul-2023

Thermo Hygrometer

Equipment No.:	IN193	Date of Issue:	14-Jun-2021
Certificate Number:	21H1221	Calibration Due Date:	01-Jun-2022

Remarks

FACT adjustment functionality activated
Equipment condition: Good
Next calibration according to customer's procedure

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.5 \cdot 10^{-5} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 3 K

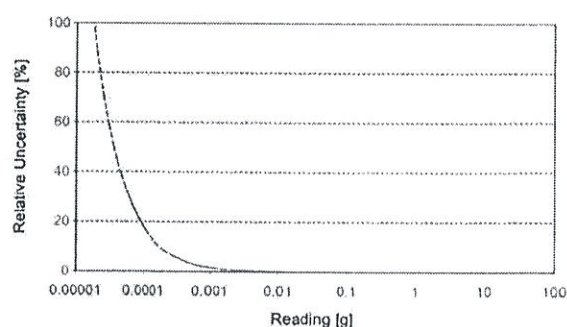
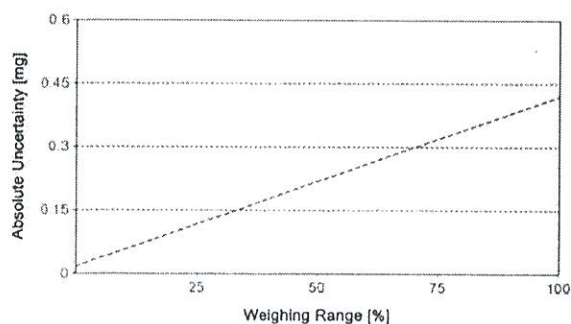
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.00001 g	81 g	$U_1 = 0.018 \text{ mg} + 0.00497 \text{ mg/g} \cdot R$	N/A
2	0.0001 g	220 g	$U_2 = 0.06 \text{ mg} + 0.00492 \text{ mg/g} \cdot R$	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
0.00220 g	0.018 mg	0.82%	N/A	N/A
0.02200 g	0.018 mg	0.082%	N/A	N/A
0.22000 g	0.019 mg	0.0087%	N/A	N/A
2.20000 g	0.029 mg	0.0013%	N/A	N/A
220.0000 g	1.1 mg	0.00052%	N/A	N/A



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.



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S K SALES AND SERVICE CO.,LTD.
194/56, 194/57 Thakham Rd. Samae Dom
Bang Khun Thian Bangkok 10150
Tel. : 02-417-2144 Fax : 02-417-2155



Certificate of Calibration

Reference No. : 4182/2202-017 Certificate No. : L2203-290
Customer : Envilab Co., Ltd. (Head Office) Page 1 of 2
: 540, 540/1 Soi Bangkhuae 7, Bangkhuae,
: Bangkhuae Bangkok 10160
Equipment : Digital Thermo-Hygrometer
Manufacturer : Testo
Model : 608-H1
Serial No. : 83353607
ID No. : -
Received Date : 7 March 2022
Calibrated Date : 9 March 2022
Issued Date : 15 March 2022

Environment	Start Calibration	Stop Calibration
Ambient Temperature (°C)	24.7	25.5
Relative Humidity (% RH)	51	52

Calibrated by : Mr. Nattawut Reangdech

Calibration Method

In-house method : by comparison with standard hygrometer for humidity measurement function
and comparison with standard thermometer for temperature measurement function into humidity/temperature chamber

Condition of this result of calibration

1. Reference standard instrument

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Hygrometer	HL-NT2-D	61468576	QR21-0851	13 May 22
2) Digital Thermometer With Probe	GT11	08000089	PSL-T 0072/65	14 November 2022

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

3. This certificate can be traceable to International System of Unit :

- Through Thailand Institute of Scientific And Technological Research (TISTR)
- Through Quality Reborn Co.,Ltd.

Approved by :

☐ Mr.Suphachai Saksri

☐ Mr.Phayak Tootit

☒ Miss Tantaraporn Pettong

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



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Result of Calibration

Function : Humidity Measurement Reference Temperature at 25 °C

STD Reading (% RH)	UUC Reading (% RH)	UUC Error (% RH)	Measurement Uncertainty (±% RH)
50.00	49.0	-1.00	2.3

Function : Temperature Measurement

STD Reading (°C)	UUC Reading (°C)	UUC Error (°C)	Measurement Uncertainty (±°C)
25.012	25.0	-0.012	0.35

Resolution : 0.1 (°C) , 0.1 % RH

STD= Standard

UUC= Unit Under Calibration

** End of Calibration Report **



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

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Certificate of Calibration

Certificate No. : 65-420020-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : pH Meter with electrode

pH meter

Manufacturer : Horiba

Model : F-74BW-G

Range : N/A pH

Resolution : 0.001 pH

Serial No. : B41J0001

ID No. : ELABPHHB74BW01

Electrode

Model : 9615S

Serial No. : 9X1K0003

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

Ambient Temperature : (23.5 to 24.8)° C

Relative Humidity : (50 to 55) %

Date of Received : 02 March 2022

Date of Calibration : 02 March 2022

Date of Issue : 05 March 2022

Calibrated by : Bunjerd Masri

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

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

1. Multiproduct Calibrator

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

2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61235182	795894	14 Feb 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.985	61223875	769927	15 May 2022	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.008	61244986	795895	25 Feb 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :
(Bunjerd Masri)



Supervisor

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The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 65-420020-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

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

Adjustment Curve at nominal pH	Applied Voltage (mV)	Nominal Value (pH)	UUC Reading		Correction (mV)	Uncertainty (± mV)
			(pH)	(mV)		
4, 7, 10	177.4800	4	4.00	177.5	0.0	0.12
	0.0000	7	7.00	0.0	0.0	0.086
	-177.4800	10	10.00	-177.5	0.0	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	4.005	0.003	0.0084
	6.985	7.001	-0.016	0.010
	10.008	10.009	-0.001	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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รับรองสำเนาถูกต้อง
ผู้ตรวจฝ่ายควบคุมคุณภาพ

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

Cert.No.: 22TW70
Page.: 1 of 2

Certificate of Testing

Equipment : Dissolved Oxygen Meter
Manufacturer : Hanna
Model : HI 9147
Serial No. : H0007030
ID No. : ELABDOHI914701
Received Date : 15 March 2022
Test Date : 18 March 2022
Reference : 2203-0566DN-1
Submitted by : Envilab Co.,Ltd (Head office)
540, 540/1 Soi Bangkhuae 7, Bangkhuae,
Bangkhuae, Bangkok 10160
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Walalak Sirithean

Approved by : Malee
Approved Signatory

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

Issue Date : 22 March 2022



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Cert.No.: 22TW70
Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: KC3N0639K

Titration Method (Azide Modification Method) (mg/L)	Dissolved Oxygen Meter Reading (mg/L)	Standard Deviation (mg/L)
8.04	8.1	0.045

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

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ผู้จัดการฝ่ายควบคุมคุณภาพ

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Certificate of Calibration

Certificate No. : 64-400527-3

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Incubator)

Manufacturer : M-LAB

Model : BIC-140

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 100613-0

ID No. : ELABREFRIG140L

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

Ambient Temperature : (24.5 to 25.0) °C

Relative Humidity : (55 to 58) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 15 October 2021

Date of Calibration : 15 October 2021

Date of Issue : 16 October 2021

Calibrated by : Bunjerd Masri

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

ID No.	Cert. No.	Due Date	Traceability
400046 & 400023	64-400443-1	29 Mar 2022	National Institute of Metrology Thailand (NIMT)

Approved by :


(Bunjerd Masri)

Supervisor




รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

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Certificate of Calibration

Certificate No. : 64-400527-3

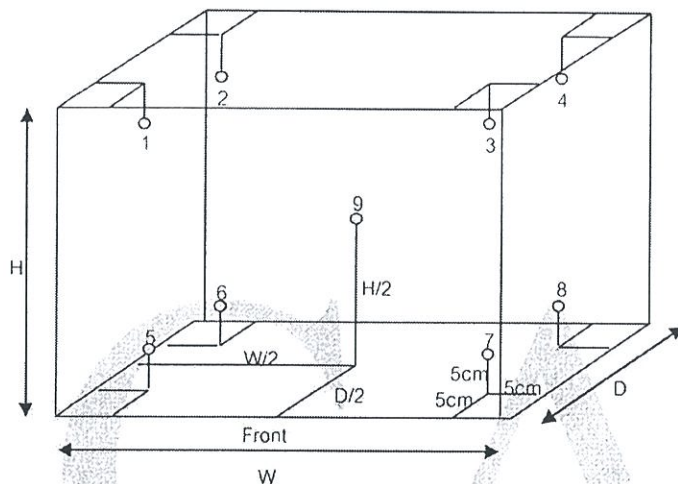
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.38 m

D = 0.35 m

H = 1.15 m

Capacity = 0.15 m³

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
20.0	20.0	20.0	19.9	19.8	19.8	19.9	19.9	19.9	20.0	19.8	20.1	0.53

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
20.0	20.0	20.0	0.4	0.1	0.4

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



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
ผู้ตรวจความถูกต้อง

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400569-1

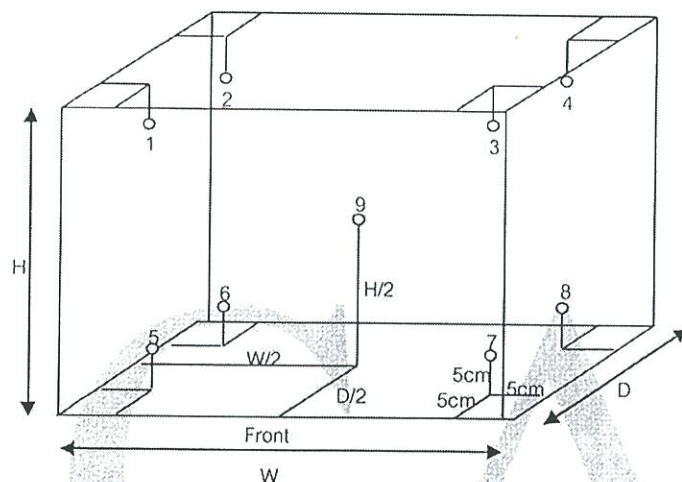
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.38 m

D = 0.35 m

H = 1.15 m

Capacity = 0.15 m³

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

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

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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รับรองตำแหน่งถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Certificate of Calibration

Certificate No. : 65-400155-2

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Air Chamber (Oven)

Manufacturer : Memmert

Model : UF 75

Range : N/A °C

Resolution : 0.1 °C

Serial No. : B319.0600

ID No. : ELABHAOVEN0600

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

Ambient Temperature : (30.0 to 31.0) °C

Relative Humidity : (60 to 65) %

Line Voltage : (224.2 to 225.2) V

Date of Received : 24 March 2022

Date of Calibration : 24 March 2022

Date of Issue : 29 March 2022

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	64-400589-1	25 May 2022	National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 65-400155-2

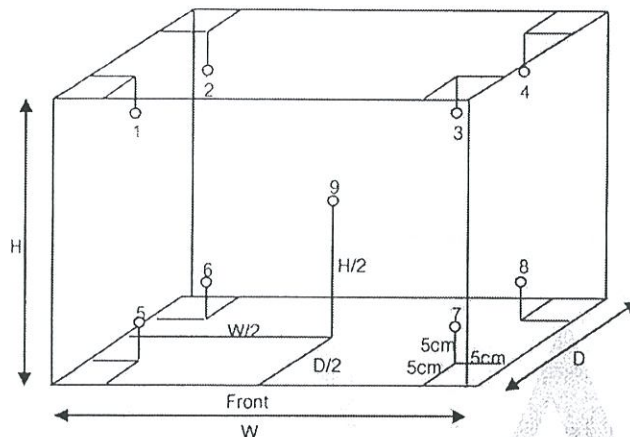
Page : 2 of 2

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	103.9	104.2	104.2	104.2	104.1	104.0	103.7	104.2	104.3	0.69
110.0	109.5	109.5	110.0	110.3	110.3	110.2	110.2	110.0	109.7	110.2	110.3	0.69
180.0	179.0	179.0	179.1	180.0	180.0	180.1	180.1	179.8	179.0	180.1	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	0.7	0.1	0.8
110.0	109.5	109.5	0.7	0.1	0.8
180.0	179.0	179.0	1.5	0.2	1.5

Remark The uncertainty is not combine uniformity of the air chamber

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

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

- o0o -



รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ



Certificate of Calibration

Certificate No. : 65-400053-1

Page : 1 of 2

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

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

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

Ambient Temperature : (22.7 to 23.5) °C

Relative Humidity : (45 to 50) %

Line Voltage : (224.0 to 225.0) V

Date of Received : 02 February 2022

Date of Calibration : 02 February 2022

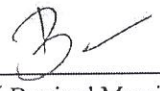
Date of Issue : 07 February 2022

Calibrated by : Permpon Chanpu

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

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

ID No.	Cert. No.	Due Date	Traceability
400029 & 400031	64-400588-1	24 May 2022	National Institute of Metrology Thailand (NIMT)

Approved by : 
(Bunjerd Masri)

Supervisor



The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

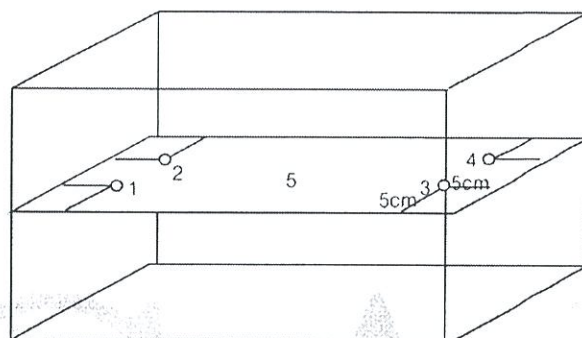
Certificate No. : 65-400053-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Front

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @					Uncertainty (± °C)	Measured Uniformity (°C)	Measured Stability (°C)
			Sensor No.							
			1	2	3	4	5			
95.0	95.0	95.0	95.35	95.45	95.51	95.66	95.56	0.19	0.27	0.06

Remark The uncertainty is not combine uniformity of the water bath

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

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

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Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



Certificate of Calibration

Certificate No. : 65-300146-10

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : PYREX

Class : A

Capacity : 50 ml

Graduation : 1 ml

ID No. : C-WW-020/18

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1002.0 mbar.

Date of Received : 09 March 2022

Date of Calibration : 21 March 2022

Date of Issue : 21 March 2022

Calibrated by : Areerat Sombun

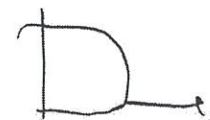
Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241002	64-200354-1	02 Jun 2022	National Institute of Metrology (Thailand) (NIMT)

Approved by :



(Wipa Tovadee)

Supervisor



The Uncertainties are for a confidence probability of approximately 95%

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CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 65-300146-10

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	29.79
50	49.73

Uncertainty of measurement with in \pm 0.054 ml

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

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

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Envilab Co.,Ltd

On the

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ผู้จัดการฝ่ายควบคุมคุณภาพ



Certificate of Calibration

Certificate No. : 65-300147-4

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

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

Equipment : Cylinder

Manufacturer : ISOLAB

Class : A

Capacity : 1000 ml

Graduation : 10 ml

ID No. : C-WW-028/18

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

Relative Humidity : (50 ± 15) %

Air Pressure : 1002.0 mbar.

Date of Received : 09 March 2022

Date of Calibration : 21 March 2022

Date of Issue : 21 March 2022

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	64-200354-1	02 Jun 2022	National Institute of Metrology (Thailand) (NIMT)

Approved by :



(Wipa Tovadee)

Supervisor



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

The Uncertainties are for a confidence probability of approximately 95%

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

Certificate of Calibration

Certificate No. : 65-300147-4

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)
500	501.84
1000	1001.39

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%

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D



Envilab Co.,Ltd

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