

ประจำเดือนตุลาคม พ.ศ. 2565



TSP High Volume Sampler Calibration

Verification Report No.

B6510 -TSP 02

<input checked="" type="checkbox"/> PM <input type="checkbox"/> Onsite	Site: บริษัท เอนไวแล็บ จำกัด	Date: 2 Oct 22
	UTM: 47P N1514475 E654269	Technical: Sanayu J.
	Sampler: ETSP#04	Approval: Wisan R.
	Recorder: ECRANG15315224	

CONDITIONS

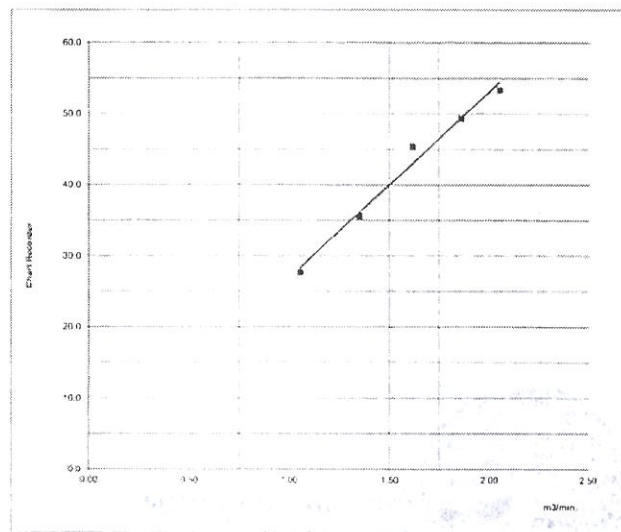
Barometric Press. (hPa): 1010.0	Corrected Pressure (mm Hg): 757.6
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg. Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

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	12.48	2.134	52.0	51.32	Slope = 20.9839
2	10.22	1.932	46.0	45.40	Intercept = 5.4464
3	8.44	1.756	42.0	41.45	Corr. coeff. = 0.9950
4	6.48	1.540	38.0	37.50	
5	3.44	1.124	30.0	29.61	# of Observations: 5
					Range of Chart 29
					at 1.1 - 1.7 m3/min. 41



Calibrated by :
(Sanayu Jantason)
2 October 2022

Approved by :
(Wisan Ritthikamon)
2 October 2022



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ผู้จัดการฝ่ายควบคุมคุณภาพ

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SO₂ Analyzer Verification Test Report

Calibration Report No.: 6510001

Page:1/1

Calibrated Date: 1-Oct-22

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: SO2 Analyzer Model: THERMO.,43C	Manufacturer THERMO S/N: ESOTE43C102362
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Calibration System

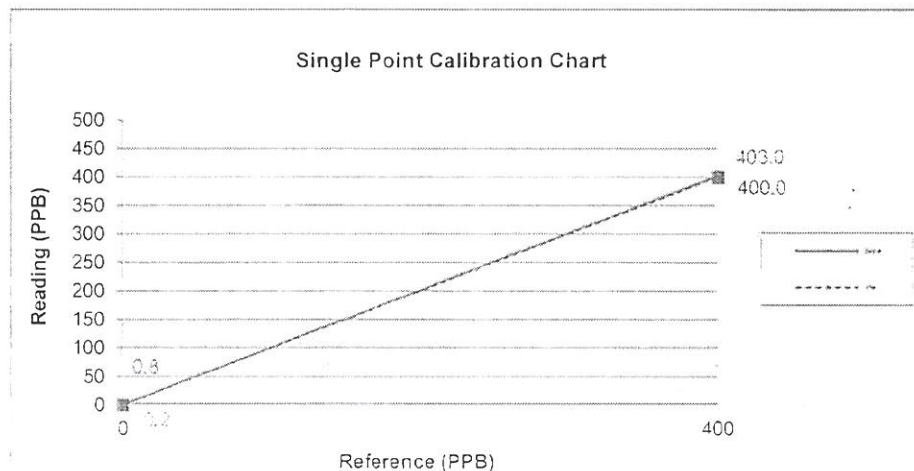
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 25.1 °C

Humidity: 74 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.8	0.8	400.0	403	0.8
After	0.0	0.2	0.2	400.0	400	0.0



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MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-10-2022

S/N : ESOTE43C102362

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 Keawsrinal

Sirirat Poonlak

Sarawut Keawsrinal

Date: 1-Oct-22

Date: 1-Oct-22



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**NOx Analyzer Verification Test Report**

Calibration Report No.: 6510007

Page:1/2

Calibrated Date: 1-Oct-22

☒ PM ☐ Onsite**Instruments Information**

Analyzer Type: NO/NO2/NOx Analyzer Model: 42C	Manufacturer THERMO S/N: ENOTE42C497375
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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: 62 %RH

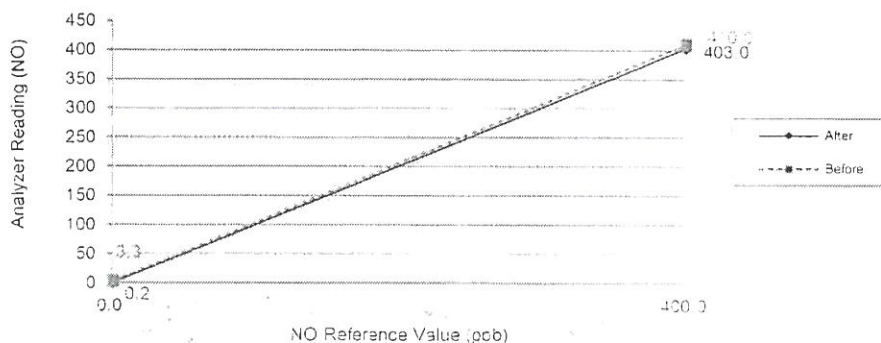
Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	3.3	0.0	3.3	410	400.0	1.2
NO ₂	0.8	0.0	0.8	3.0	0.0	0.4
NOx	4.1	0.0	4.1	413	400.0	1.6

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.2	0.0	0.2	403	400.0	0.4
NO ₂	0.3	0.0	0.3	3.0	0.0	0.4
NOx	0.5	0.0	0.5	406	400.0	0.7

Single Point Calibration Chart



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MODEL : NOx ANALYZER Model 42C THERMO

DATE : 1-10-2022

S/N : ENOTE42C497375

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 Keawsrinal

Sirirat Poonlak

Sarawat Keawsrinal

Date: 1-Oct-22

Date: 1-Oct-22

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Report No.:

6510 -SLM 05

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

Calibrated Date: 1 October 2022

Site : บริษัทเอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 5012

Environment: Temperature 25 °C Humidity 58 %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	93.56	-0.10	93.66

Calibrated By:

(Sanayu Jantason)

Date:

1 October 2022

Approve By:

(Wisan Ritthikamon)

Date:

1 October 2022

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Environmental responsibility with accuracy measurement
FE-MNT-27 Rev 00-01/08/63



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TSP High Volume Sampler Calibration

Verification Report No.

D6510 -TSP 01

☒ PM ☐ Onsite

Site: บริษัท เว็นไวแล็บ จำกัด

UTM: 47P N1514475 E654269

Sampler: ETSP#32

Recorder: ECRANG15315224

Date: 1 Oct 22

Technical: Sanayu J.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1009.8

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.4

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

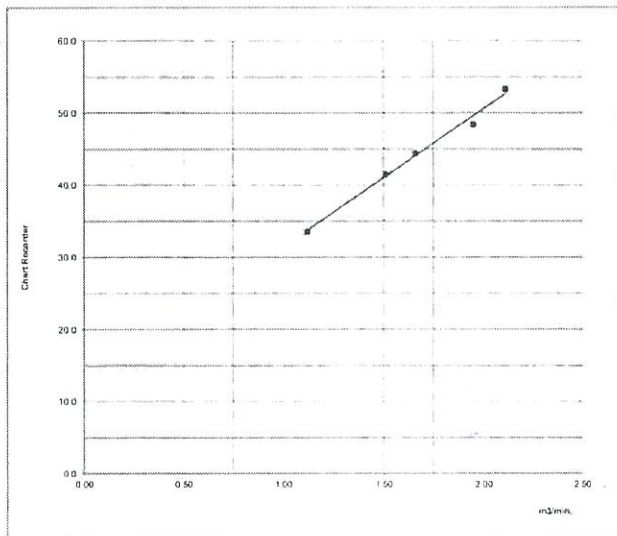
Qstd Slope: 1.63957

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	12.19	2.109	54.0	53.29	Slope = 19.0909 Intercept = 12.3574 Corr. coeff. = 0.9951 # of Observations: 5	Range of Chart at 1.1 - 1.7 m3/min. 34 45
2	10.40	1.948	49.0	48.35		
3	7.52	1.658	45.0	44.40		
4	6.22	1.508	42.0	41.44		
5	3.41	1.119	34.0	33.55		



Calibrated by :

(Sanayu Jantason)
1 October 2022

Approved by :

(Wisan Ritthikamon)
1 October 2022



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PM10 High Volume Sampler Calibration

Verification Report No.

D6510 -PM 02

<input checked="" type="checkbox"/> PM	<input type="checkbox"/> Onsite
Site: บริษัท เอนไวแล็บ จำกัด	
UTM : 47P N1514475 E654269	
Sampler: EPM#21	
Recorder: ECRDS01618124	
Date: 1 Oct 22	
Technical: Sanayu J.	
Approval: Wisan R.	

CONDITIONS

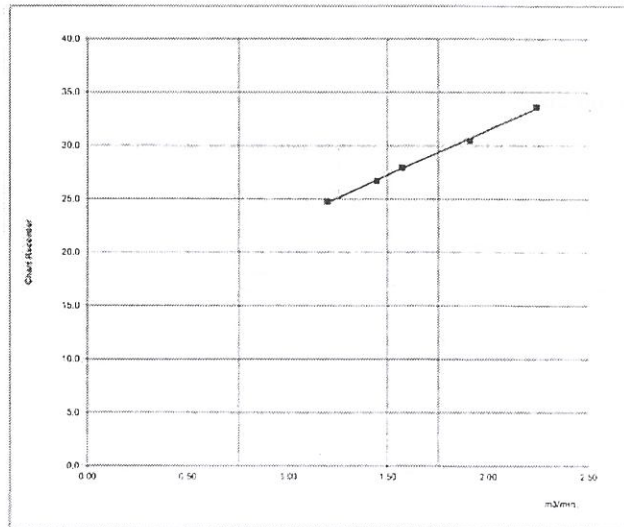
Barometric Press. (hPa): 1009.8	Corrected Pressure (mm Hg): 757.4
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg. Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

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	12.13	2.160	51.0	32.36	Slope = 6.8707
2	9.21	1.883	48.0	30.46	Intercept = 17.4561
3	6.34	1.564	44.0	27.92	Corr. coeff. = 0.9988
4	4.56	1.327	42.0	26.65	SFR = 1.141
5	2.37	0.959	38.0	24.11	SSP = 39.86
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					39
					40



Calibrated by :
(Sanayu Jantason)
1 October 2022

Approved by :
(Wisan Ritthikamon)
1 October 2022



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SO₂ Analyzer Verification Test Report

Calibration Report No.: 6510003

Page:1/1

Calibrated Date: 1-Oct-22

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: SO2 Analyzer Model: THERMO.,43C	Manufacturer THERMO S/N: ESOTE43C801866
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Calibration System

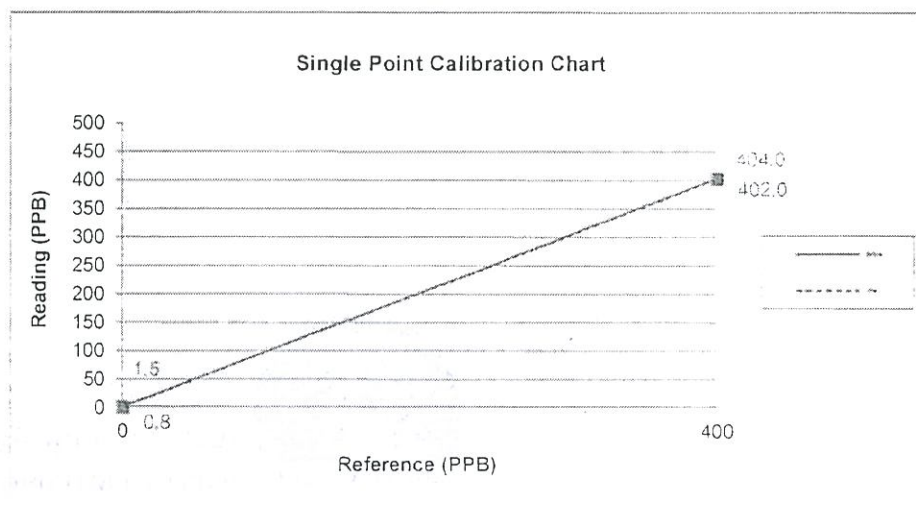
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 25.2 °C

Humidity: 73 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	1.5	1.5	400.0	404	1.0
After	0.0	0.8	0.8	400.0	402	0.5



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MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-10-2022

S/N : ESOTE43C801866

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	0.40

Calibrate By : Sirirat Poonlak

Approve By : Sarawut Keawsrinual

Sirirat Poonlak

Sarawut Keawsrinual

Date:

1-Oct-22

Date:

1-Oct-22

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NOx Analyzer Verification Test Report

Calibration Report No.: 6510008
Calibrated Date: 1-Oct-22

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☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: 42C	Manufacturer THERMO S/N: ENOTE42CD74371
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Calibration System

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

Environment: Temperature 25.3 °C

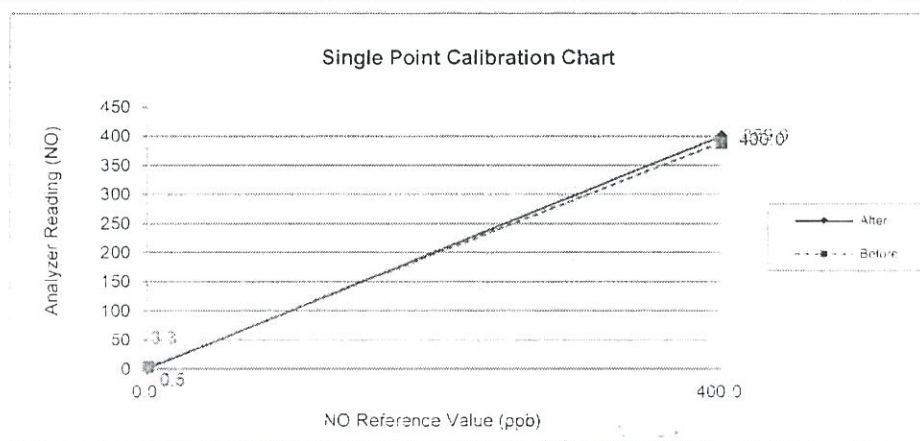
Humidity: 64 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	3.8	0.0	3.8	389	400.0	-1.4
NO ₂	2.9	0.0	2.9	23.0	0.0	2.9
NOx	6.7	0.0	6.7	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	0.5	0.0	0.5	400	400.0	0.0
NO ₂	-0.2	0.0	-0.2	4.0	0.0	0.5
NOx	0.3	0.0	0.3	404	400.0	0.5



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Neediss Supply Instrument Co., Ltd.

MODEL : NOx ANALYZER Model 42C THERMO

DATE : 1-10-2022

S/N : ENOTE42CD74371

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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 : Sirir PoonlakApprove By : Sarawut Keawsrinual

Sirirat Poonlak

Sarawut Keawsrinual

Date: 1-Oct-22

Date: 1-Oct-22

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100/100 หมู่ 10 ตำบล 100 อำเภอ 100 จังหวัด 100
100/100 หมู่ 10 ตำบล 100 อำเภอ 100 จังหวัด 100



Verification Test Report

Report No.:

6510 -SLM 06

☐ PM

☐ Onsite UTM :

47P N 1514462 E 654258

Calibrated Date: 1 October 2022

Site : บริษัทเอ็นไอแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: NEEDISS

Model: NDSM 309

Serial : 565014

Environment: Temperature 25 °C Humidity 58 %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	93.47	-0.19	93.66

Calibrated By:

(Sanayu Jantason)

Date:

1 October 2022

Approve By:

(Wisan Ritthikamon)

Date:

1 October 2022

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FE-MNT 27 Rev.0.01/08/63

Certificate of Calibration

Calibration Certification Information

Cal. Date: January 19, 2022 Roots-meter 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:	roots-meter 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 Bangkhac 7, Bangkhac, 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



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

The Uncertainties are for a confidence probability of approximately 95%

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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

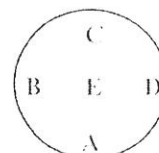
Nominal Value (g)	Correction (g)	Uncertainty \pm (g)
0.01	0.0001	0.00011
0.1	0.0001	0.00011
1	0.0000	0.00011
2	0.0001	0.00011
5	0.0000	0.00012
10	0.0001	0.00012
20	-0.0001	0.00013
50	0.0000	0.00014
100	-0.0002	0.00020
200	-0.0004	0.00038

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
 Stdev. : 0.00005 g

- o0o -

Handwritten signature



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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 Bangkhac 7, Bangkhac, Bangkok 10160

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA3102-1S

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



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. : 65-200022-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

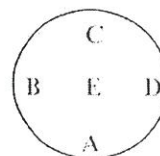
Nominal Value (g)	Correction (g)	Uncertainty \pm (g)
10	0.00	0.0082
20	0.00	0.0082
50	0.00	0.0082
100	0.00	0.0082
200	0.00	0.0083
500	-0.01	0.0085
1000	-0.01	0.0093
1500	-0.01	0.011
2000	-0.01	0.012
3000	-0.01	0.023

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

- o0o -



Envilab Co.,Ltd.

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 Bangkhac 7, Bangkhac, 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

1 / 2

The results relate only to the items tested and the value assigned. Advertising the Report/Certificate and publicity of the results except in full are prohibited without permission is obtained from the governor of TISTR.



รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

FM.BL.MTC.002 Rev.4

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : runpa@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



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 Brüel&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 Brüel&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 Brüel&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 Kluaypa)
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

The results relate only to the item tested and no value assigned.
Advertising the Report/Certificate and publicity of the results except in full and without written permission is obtained from the governor of TISTR.

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
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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

Envilab Co., Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ
Office

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

FM.BL.MTC.002 Rev.4

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



Melinda Parker
Approved for Release

Page 1 of 160-402305646-1



Ok
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ผู้จัดการฝ่ายควบคุมคุณภาพ



CLC
Accredited
ISO/IEC 17025

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. Q22008276

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14631/UM14631[EVMINMMATE4631]
CLID. NO. : 252200218
JOB CONTROL NO. : 220125008276

CUSTOMER : ENVILAB CO., LTD. [HEAD OFFICE]
540,540/1 SOI BANGKHAE 7,
BANGKHAE, BANGKHAE BANGKOK 10160

DATE OF RECEIVED : 25 January 2022

DATE OF ISSUED : 04 February 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
04 February 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. Q22008276A1

F3-012-04/01-12

page 1 of 3



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@clccalibration



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Accredited
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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.	:	UM14631/UM14631[EVMINMMATE4631]
DATE OF CALIBRATION	:	26 January 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, Universal Counter and Portable Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Agilent Technologies Model 34401A S/N. US36044686.
2. Universal Counter, Hewlett Packard Model 5315A S/N. 2448A13042.
3. Portable Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0070-21, Due Date 23 July 2022.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0073/21, Due Date 14 May 2022.
3. The measurements are traceable to International System of Units (SI), through The Modal Shop, Inc. Certificate No. 2649.01, Due Date 10 November 2022.

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:2013)"

Certificate No. Q22008276

F3-011-04/01-12

page 2 of 3



Envilab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ



calibration



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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



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	\pm (% of rdg.)
1	50 Hz	peak	1.000	1.044	-0.044	1.1
2	50 Hz		2.000	2.069	-0.069	1.0
3	50 Hz		3.000	3.088	-0.088	1.0

2. 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	10.089	-0.089	2.3
20	50 Hz		20.000	20.097	-0.097	1.8
30	50 Hz		30.000	30.157	-0.157	1.0

*3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	\pm (% of rdg.)
0.01	50 Hz	peak	0.010	0.010	0.000	6.0
0.02	50 Hz		0.020	0.020	0.000	3.1
0.03	50 Hz		0.030	0.030	0.000	2.7

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

* means Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

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

End of Certificate

Certificate No. Q22008276

F3-011-04/01-12



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

page 3 of 3




calibration

Mettler-Toledo (Thailand) Ltd.
846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10260
+662 723 0382
MT-TH.ServiceSupport@mt.com



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:  0331907248

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.

	Temperature		Humidity	
As Found	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:

Kassakorn

- ☒ Kassakorn Tassanachaisakul
☐ Santi Jitniyom
☐ Surachet Sukkate



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Measurement Results

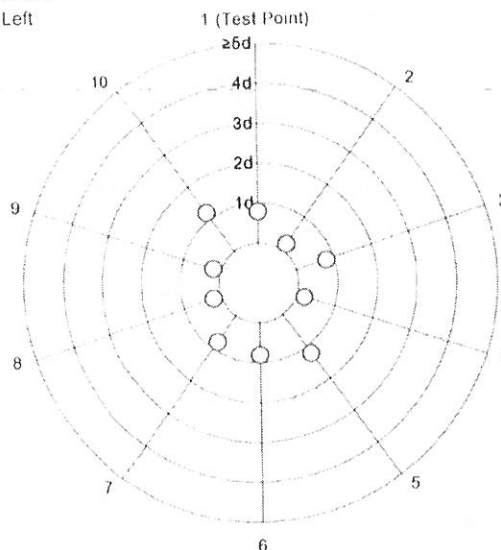
Repeatability

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

Standard Deviation	0.000008 g	N/A
--------------------	------------	-----

○ As Found
◆ As Left



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

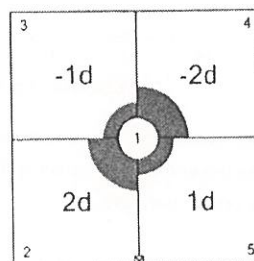
The results of this graph are based upon the absolute values of the differences from the mean value.

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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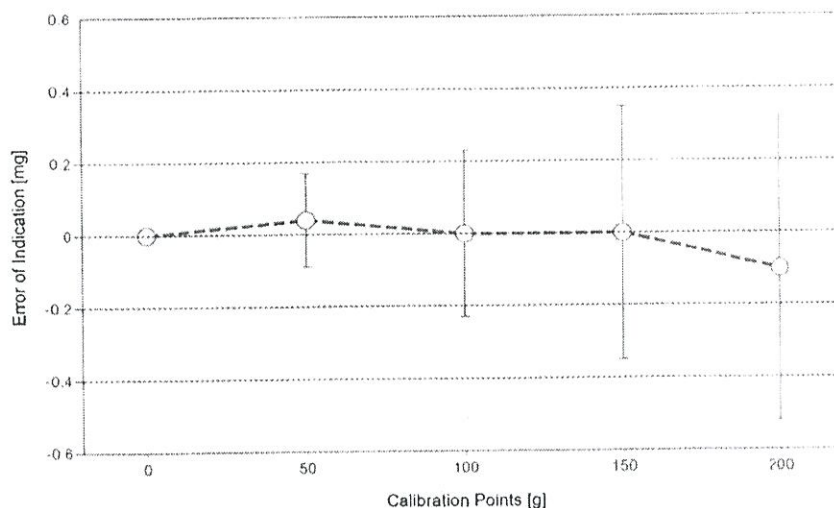
As Found

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

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	0.00000 g	0.23 mg	2
10	150.0000 g	150.0000 g	0.00000 g	0.35 mg	2
11	199.9999 g	199.9998 g	-0.0001 g	0.42 mg	2



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.

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.



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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: $3 K$

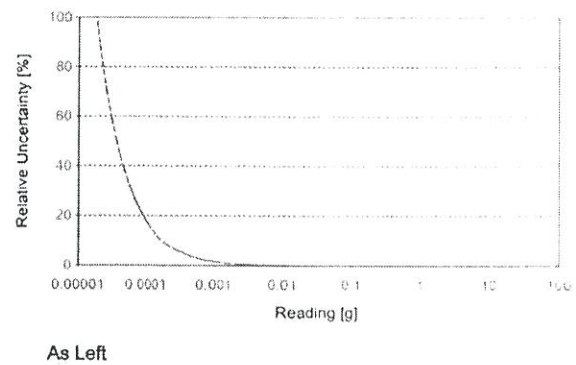
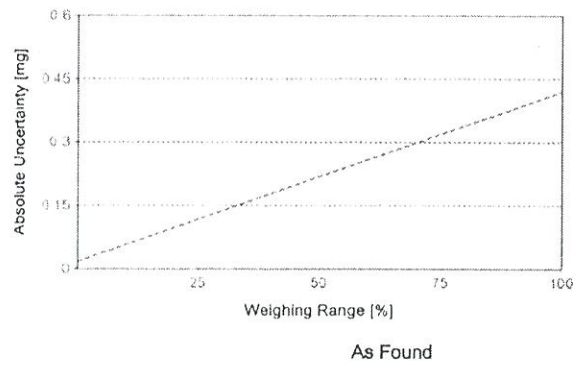
Linearization of Uncertainty Equation

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.



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



Certificate of Calibration

Reference No. : 4182/2202-017
Customer : Envilab Co., Ltd. (Head Office)
: 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

Certificate No. : L2203-290

Page 1 of 2

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 Toolit

☒ Miss Tantaraporn Peltong

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 (\pm % RH)
50.00	49.0	-1.00	2.3

Function : Temperature Measurement

STD Reading (°C)	UUC Reading (°C)	UUC Error (°C)	Measurement Uncertainty (\pm °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.

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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)



Envilab Co.,Ltd.

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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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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MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

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



CALIBRATION CERTIFICATE

Certificate No. : SS2202-154-0002

Date Issued : 24-Feb-22

Customer & : Envilab Co.,Ltd.
Calibrated Place : 540, 540/1 Soi Bangkhuae 7, Bangkhuae, Bangkhuae,Bangkok, Thailand
10160
Equipment : Incubator
Manufacturer : Memmert
Model : IF75
Serial No. : D319.0066
ID No./Tag No. : -
Date Received : 22-Feb-22
Date Calibrated : 22-Feb-22
Calibrated by : Mr. Prakrit Laohawanit

Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

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

Result of Calibration

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

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Approved by :

K. Nathapong

(Mr. Nathapong Krudatun)



Page 1 of 2



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ผู้จัดการฝ่ายควบคุมคุณภาพ

Certificate No. : SS2202-154-0002

Environment : Ambient Temperature : Start record 25.3 °C, Stop record 25.1 °C
Relative Humidity : Start record 58.8 %RH, Stop record 58.5 %RH

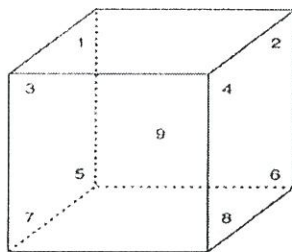
Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability ¹ (°C)	Measured Uniformity ² (°C)	Overall Variation ³ (°C)
35	35.0	35.0	0.05	0.07	0.15
37	37.0	37.0	0.04	0.11	0.16
44.5	44.5	44.5	0.08	0.12	0.24

Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	Uncertainty ⁴ ±°C
35	35.15	35.13	35.17	35.17	35.13	35.15	35.15	35.15	35.12	0.24
37	37.20	37.18	37.23	37.19	37.15	37.21	37.20	37.20	37.15	0.24
44.5	44.62	44.60	44.67	44.63	44.58	44.63	44.63	44.63	44.57	0.25

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. 0



Condition As-Received : New Item

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

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2112-212-0001 for Temperature Indicator with Sensor Serial No. US37020317, Due 28-Jun-22

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

End of Certificate



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

Page 2 of 2

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



Envilab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400569-1

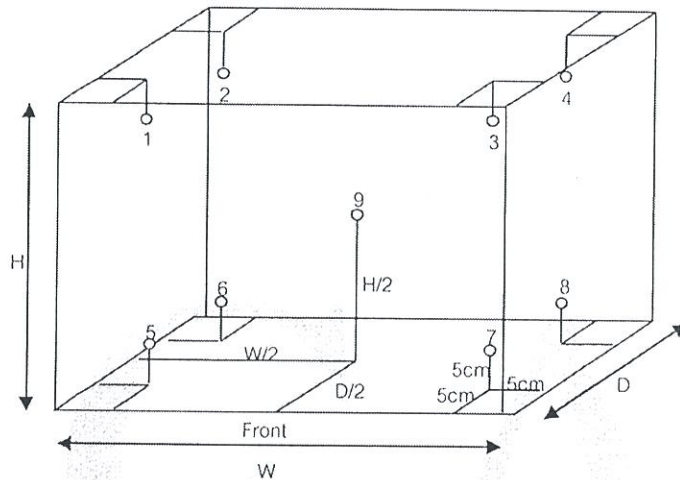
Page : 2 of 2

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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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 : Permpoon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

ID No.	Cert. No.	Due Date	Traceability
400029 & 400032	64-400589-1	25 May 2022	National Institute of Metrology Thailand (NIMT)

Approved by :


(Bunjerd Masri)

Supervisor



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 65-400155-2

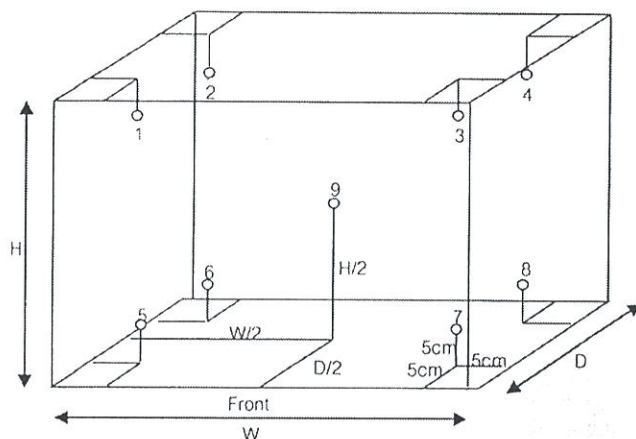
Page : 2 of 2

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%

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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

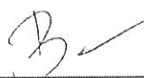
Date of Issue : 07 February 2022

Calibrated by : 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	64-400588-1	24 May 2022	National Institute of Metrology Thailand (NIMT)

Approved by : 
(Bunjerd Masri)



 Supervisor

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ผู้จัดการฝ่ายควบคุมคุณภาพ

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

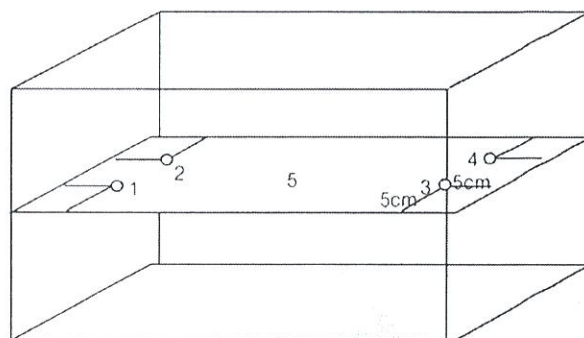
Certificate No. : 65-400053-1

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%

- o0o -



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

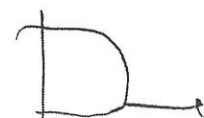
Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

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



Envilab Co.,Ltd.

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

The Uncertainties are for a confidence probability of approximately 95%

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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%

- o0o -

D.



Envilab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ



CAL

Calibratech Co.,Ltd.

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

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



NSC-TISI-TIS 17025
CALIBRATION 0030

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



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, 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. : 65-300147-4

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.

Ok

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