

ภาคผนวก ง.

เอกสารผลการสอบเทียบเครื่องมือตรวจวัด

ประจำเดือนกรกฎาคม พ.ศ. 2565



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



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

TSP High Volume Sampler Calibration

Verification Report No.

HO2200025-D006 -TSP 01

☐ PM ☒ Onsite

Site: โครงการก่อสร้างอาคารพักอาศัยพร้อมสิ่งอำนวยความสะดวกของ สำนักงานปลัดกระทรวงกลาโหม

UTM : 47P 1524271 N 666054 E

Date: 1 Jul 22

Sampler: NTSP#12

Technical: Wisan R.

Recorder: ECRANG15315224

Approval: 0

CONDITIONS

Barometric Press. (hPa): 1000.7

Corrected Pressure (mm Hg): 750.6

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

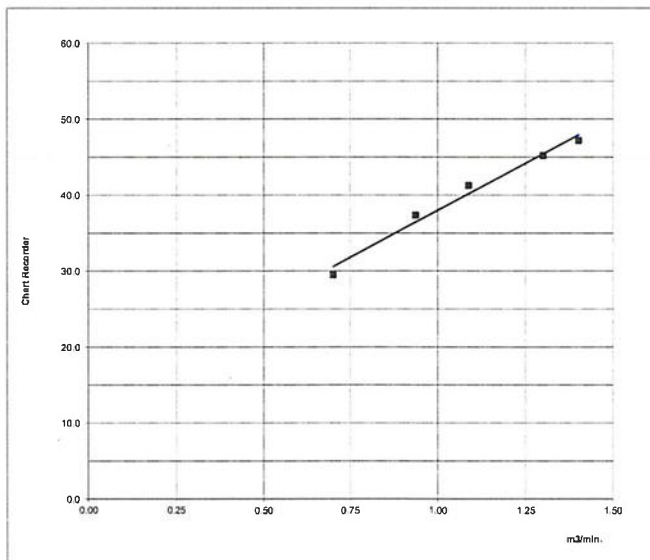
Qstd Intercept: -0.01202

Serial#: 1328

Date Certified: 19 Jan 22

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	5.41	1.401	48.0	47.15	Slope = 24.7996
2	4.65	1.299	46.0	45.19	Intercept = 13.1665
3	3.25	1.087	42.0	41.26	Corr. coeff. = 0.9902
4	2.41	0.937	38.0	37.33	
5	1.34	0.701	30.0	29.47	
					# of Observations: 5
					Range of Chart at 1.1 - 1.7 m3/min. 42 56



Calibrated by :

(Wisan Ritthikamon)
1 July 2022

Approved by :

(Tanin Huadcharoan)
1 July 2022

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TSP High Volume Sampler Calibration

Verification Report No.

HO2200025-D006 -TSP 02

<input type="checkbox"/> PM	<input checked="" type="checkbox"/> Onsite
Site: โรงพยาบาลเกษมราษฎร์ ประชาชื่น	
UTM : 47P 1529602 N 666283 E	
Sampler: NTSP#01	
Recorder: ECRANG15315224	
Date: 1 Jul 22	
Technical: Wisan R.	
Approval: 0	

CONDITIONS

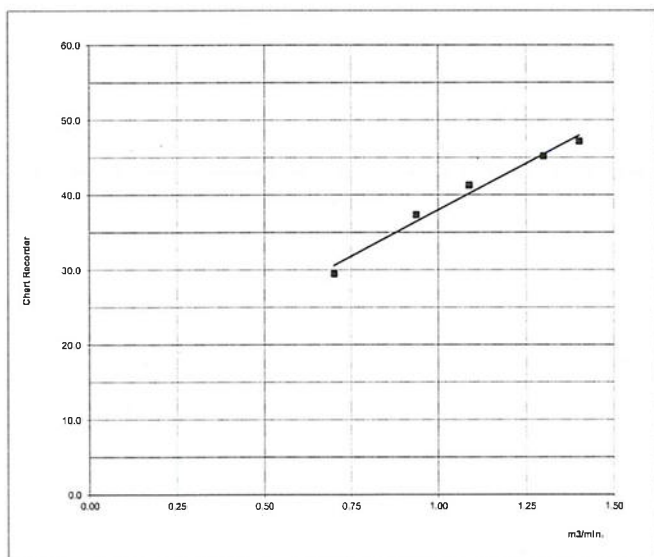
Barometric Press. (hPa): 1009.7	Corrected Pressure (mm Hg): 757.3
Temperature (deg C): 33.0	Temperature (deg K): 306.0
Average Press. (hPa): 1013.0	Corrected Avg.Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

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	8.23	1.731	52.0	51.23	Slope = 18.2651
2	6.36	1.523	46.0	45.32	Intercept = 18.5954
3	4.52	1.285	42.0	41.37	Corr. coeff.= 0.9921
4	2.63	0.982	38.0	37.43	
5	1.39	0.716	32.0	31.52	
					# of Observations: 5
					Range of Chart at 1.1 - 1.7 m3/min. 40 50



Calibrated by :

(Wisan Ritthikamon)
 1 July 2022

Approved by :

(Tanin Huadcharoan)
 1 July 2022

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



Download & install Apple's App Store

PM10 High Volume Sampler Calibration

Verification Report No.

HO2200025-D006 -PM 01

☐ PM

☒ Onsite

Site: โครงการก่อสร้างอาคารพักอาศัยพร้อมสิ่งอำนวยความสะดวกของ สำนักงานปลัดกระทรวงกลาโหม

UTM : 47P 1524271 N 666054 E

Date: 1 Jul 22

Sampler: NPM#11

Technical: Wisan R.

Recorder: ECRDS01618124

Approval: 0

CONDITIONS

Barometric Press. (hPa): 1000.7

Corrected Pressure (mm Hg): 750.6

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

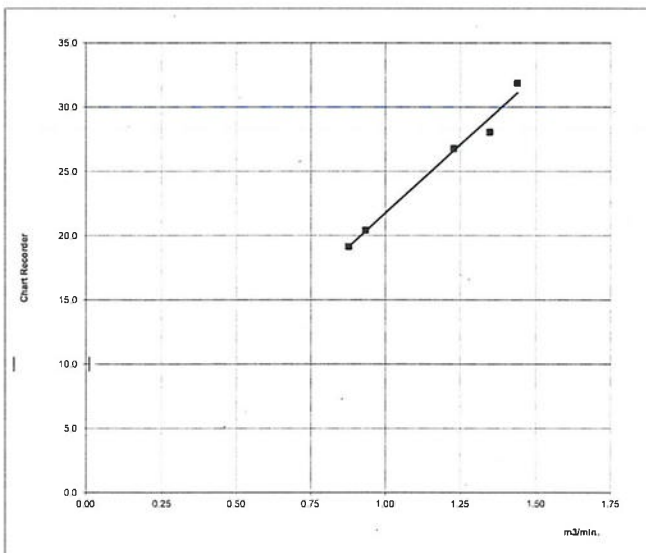
Intercept: -0.00753

Serial#: 1328

Date Certified: 19 Jan 22

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	5.32	1.439	50.0	31.87	Slope = 21.3111
2	4.65	1.346	44.0	28.05	Intercept = 0.4223
3	3.87	1.229	42.0	26.77	Corr. coeff. = 0.9923
4	2.22	0.932	32.0	20.40	SFR = 1.151
5	1.96	0.877	30.0	19.12	SSP = 39.16
					# of Observations: 5
					Range of Chart 36
					at SFR $\pm 10\%$ 42



Calibrated by :

(Wisan Ritthikamon)

1 July 2022

Approved by :

(Tanin Huadcharoan)

1 July 2022

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



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



Online & Mobile Apps Information

PM10 High Volume Sampler Calibration

Verification Report No.

HO2200025-D006 -PM 02

☐ PM

☒ Onsite

Site: โรงพยาบาลเกษมราษฎร์ ประชาชื่น

UTM : 47P 1529602 N 666283 E

Sampler: NPM#02

Recorder: ECRDS01618124

Date: 1 Jul 22

Technical: Wisan R.

Approval: 0

CONDITIONS

Barometric Press. (hPa): 1009.7

Temperature (deg C): 33.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.3

Temperature (deg K): 306.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5028A

Serial#: 1328

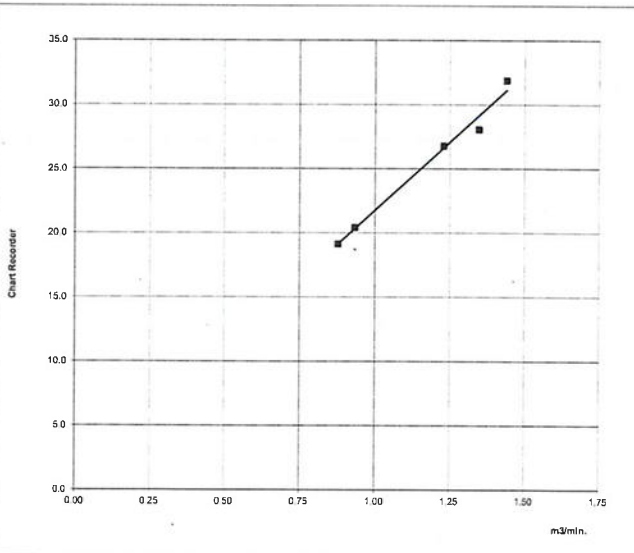
Slope: 1.02667

Intercept: -0.00753

Date Certified: 19 Jan 22

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	8.19	1.779	52.0	33.05	Slope = 12.8693
2	6.28	1.559	46.0	29.24	Intercept = 9.4109
3	4.39	1.305	40.0	25.43	Corr. coeff. = 0.9923
4	2.49	0.984	34.0	21.61	SFR = 1.145
5	1.23	0.694	30.0	19.07	SSP = 37.99
					# of Observations: 5
					Range of Chart 36
					at SFR $\pm 10\%$ 40



Calibrated by :

(Wisan Ritthikamon)

1 July 2022

Approved by :

(Tanin Huadcharoan)

1 July 2022

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

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



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



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Verification Test Report

Report No.:

HO2200025-D006 -SLM 01

☐ PM

☒ Onsite UTM :

47 P 1529770 N 666269 E

Calibrated Date: 1 July 2022

Site : โครงการก่อสร้างอาคารพักอาศัยพร้อมสิ่งอำนวยความสะดวกของ สำนักงานปลัดกระทรวงกลาโหม

Equipment: Sound Level Meter

Manufacturer: ACO

Model: 6226

Serial : 50027

Environment: Temperature 32 °C Humidity 60 %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	93.62	-0.04	93.66

Calibrated By:

(Wisan Ritthikamon)

Date:

1 July 2022

Approve By:

(Tanin Huadcharoan)

Date:

1 July 2022

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Envilab Co., Ltd. 540.540/1 Soi Bangkhae 7 Bangkhae Bangkhae Bangkok 10160
Tel : 02-202-3577-8 Fax: 02-202-3773 E-mail : info@evltesting.com



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Verification Test Report

Report No.:

HO2200025-D006 -SLM 02

☒ PM

☐ Onsite UTM :

47 P 1529587 N 666247 E

Calibrated Date: 1 July 2022

Site : โรงพยาบาลเกษมราษฎร์ ประชาชื่น

Equipment: Sound Level Meter

Manufacturer: ACO

Model: 6226

Serial : 40289

Environment: Temperature 32 °C Humidity 60 %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:

(Wisan Ritthikamon)

Date:

1 July 2022

Approve By:

(Tanin Huadcharoan)

Date:

1 July 2022

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SO₂ Analyzer Verification Test Report

Calibration Report No.: 6507007

Page:1/1

Calibrated Date: 1-Jul-22

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: SO2 Analyzer Model: THERMO_43C	Manufacturer THERMO S/N: ESOTE43C703317
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Calibration System

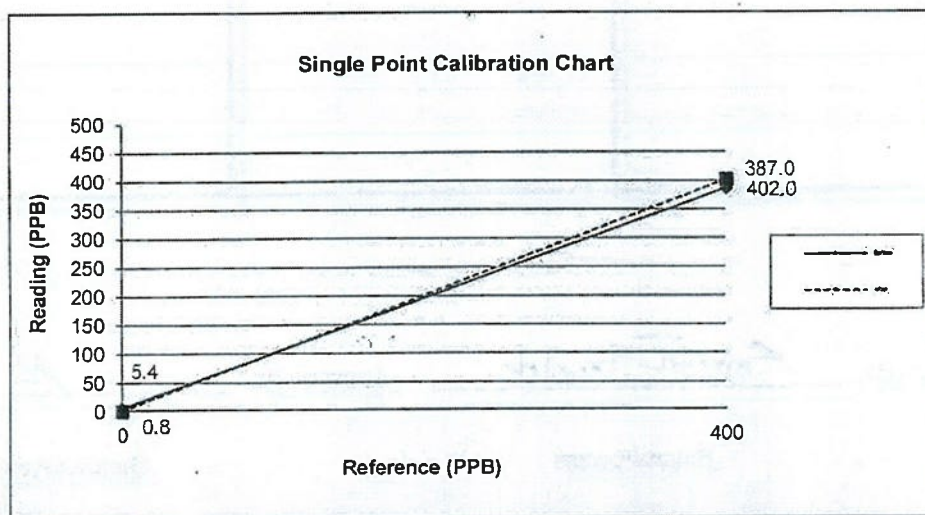
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 27.2 °C

Humidity: 45 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	5.4	5.4	400.0	387	-3.3
After	0.0	0.8	0.8	400.0	402	0.5



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ผู้จัดการฝ่ายควบคุมคุณภาพ



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

535 ซอยบางนา 7 แขวงบางนา เขตคลองเตย กรุงเทพฯ 10150 535 Soi Bangkhu 7 Bangkhu Bangkok Bangkok
Tel. 02-802-3780-2 Fax. 02-802-3788 E:info@neediss.com



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-07-2022

S/N : ESOTE43C703317

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-Jul-22

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Date:

1-Jul-22

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Neediss Supply Instrument Co., Ltd.535 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10162 535 ซอย บางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10162
Tel. 02-802-3980-2 Fax 02-802-3988 E: info@neediss.com**NOx Analyzer Verification Test Report**

Calibration Report No.: 6507007

Page:1/2

Calibrated Date: 1-Jul-22

☒ PM ☐ Onsite**Instruments Information**Analyzer Type: NO/NO2/NOx Analyzer
Model: 42CManufacturer THERMO
S/N: ENOTE42C497375**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 27.9 °C

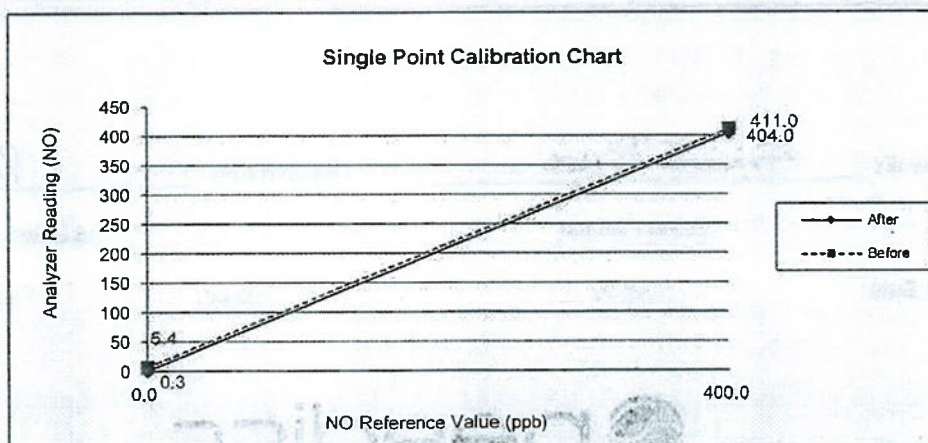
Humidity: 44 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	6.4	0.0	6.4	411	400.0	1.4
NO ₂	3.9	0.0	3.9	5.0	0.0	0.6
NOx	10.3	0.0	10.3	416	400.0	2.0

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.3	0.0	0.3	404	400.0	0.5
NO ₂	0.3	0.0	0.3	2.0	0.0	0.2
NOx	0.6	0.0	0.6	406	400.0	0.7



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Neediss Supply Instrument Co., Ltd.536 ซอยบางพลี 7 แขวงบางพลี เขตบางพลี กรุงเทพฯ 10160 536 Soi Bangkhoe 7 Bangkhoe Bangkok
Tel 02-802-3780-2 Fax 02-802-3788 E:info@neediss.com

MODEL : NOx ANALYZER Model 42C THERMO

DATE : 1-07-2022

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 : Sirint PoonlakApprove By : [Signature]

Sirirat Poonlak

Sarawat Keawsriniual

Date: 1-Jul-22

Date: 1-Jul-22

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ผู้จัดการฝ่ายควบคุมคุณภาพ



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6507006

Page:1/1

Calibrated Date: 1-Jul-22

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: SO2 Analyzer Model: THERMO_43C	Manufacturer THERMO S/N: ESOTE43C069871
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Calibration System

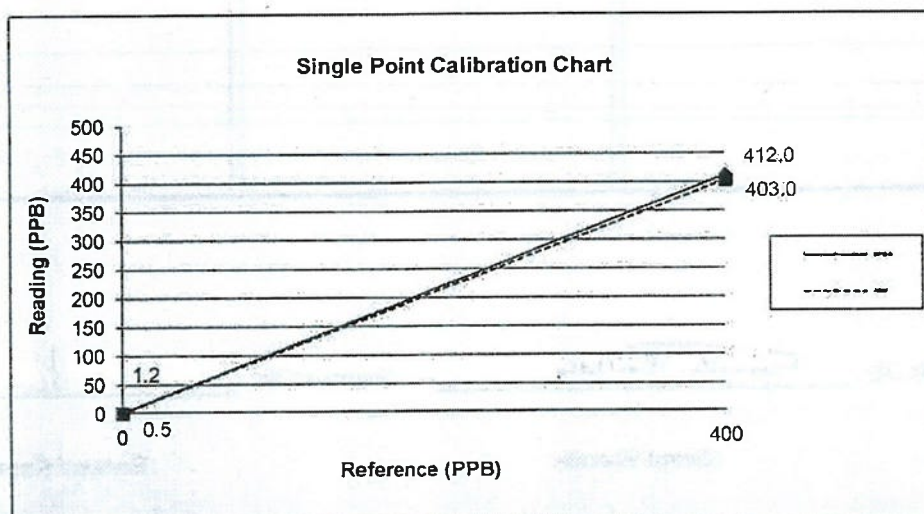
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 27.2 °C

Humidity: 45 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	1.2	1.2	400.0	412	3.0
After	0.0	0.5	0.5	400.0	403	0.8



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ผู้จัดการฝ่ายควบคุมคุณภาพ



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 1-07-2022

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 : K

Sirirat Poonlak

Sarawut Keawsrinual

Date: 1-Jul-22

Date: 1-Jul-22



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 ผู้จัดการฝ่ายควบคุมคุณภาพ



NOx Analyzer Verification Test Report

Calibration Report No.: 6507006

Page:1/2

Calibrated Date: 1-Jul-22

☒ 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 28.3 °C

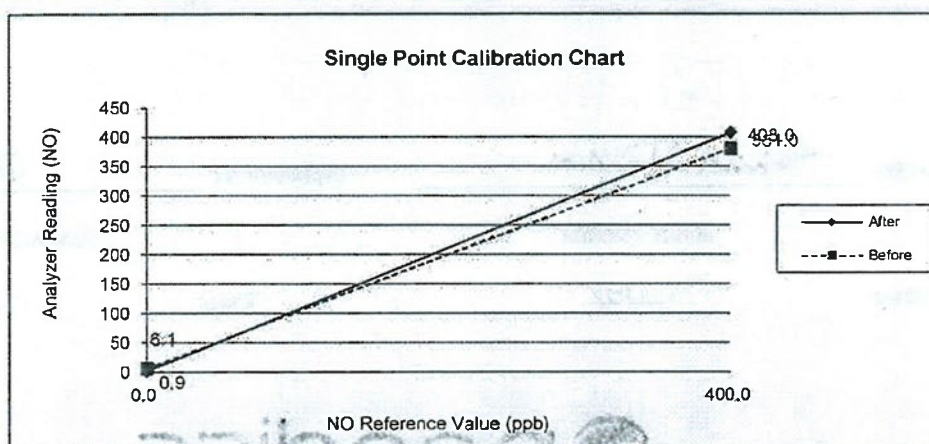
Humidity: 48 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	6.1	0.0	6.1	381	400.0	-2.4
NO ₂	2.2	0.0	2.2	34.0	0.0	4.3
NOx	8.3	0.0	8.3	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	0.9	0.0	0.9	408	400.0	1.0
NO ₂	0.6	0.0	0.6	2.0	0.0	0.2
NOx	1.5	0.0	1.5	410	400.0	1.2



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Envileb Co., Ltd. ผู้จัดการฝ่ายควบคุมคุณภาพ



neediss

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

536 ซอยบางเขน 7 แขวงบางเขน เขตบางเขน กรุงเทพฯ 10150 536 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel 02-802-3980-2 Fax 02-802-3988 E:info@neediss.com



MODEL : NOx ANALYZER Model 42C THERMO

DATE : 1-07-2022

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 :

Sirir Poonlak

Approve By :

K.

Sirirat Poonlak

Sarawat Keawsrinual

Date:

1-Jul-22

Date:

1-Jul-22



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ผู้จัดการฝ่ายควบคุมคุณภาพ

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.

CAL

Calibratech Co., Ltd.

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

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



Certificate of Calibration

Certificate No. : 65-200022-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

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

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA224-1S

Serial No. : 0034803270

ID No. : ELABBALANCEN04

Capacity : 220 g

Resolution : 0.0001 g

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

Ambient Temperature : (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, 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. : 65-200022-1

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.

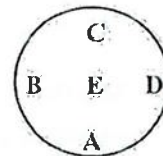
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.11$, providing a level of confidence of approximately 95%

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

- 000 -



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 : SECURA3102-1S

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

The Uncertainties are for a confidence probability of approximately 95%

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CAL

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

Certificate of Calibration

Certificate No. : 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.

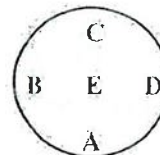
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, providing a level of confidence of approximately 95%

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-





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

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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Envilab Co.,Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ



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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	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 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 items tested/calibrated or value assigned.

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FM.BL.MTC.002 Rev.4

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รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

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



[Signature]
Approved for Release



[Signature]
รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



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.	:	UM14629/UM14629[EVMINMMATE4629]
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. Q22008275

F3-011-04/01-12

page 2 of 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



@clccalibration

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)	± (% of rdg.)
1	50 Hz	peak	1.000	1.030	-0.030	1.1
2	50 Hz		2.000	2.076	-0.076	1.0
3	50 Hz		3.000	3.091	-0.091	1.0

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
10	50 Hz	peak	10.000	9.818	+0.182	2.3
20	50 Hz		20.000	19.782	+0.218	1.8
30	50 Hz		30.000	30.329	-0.329	1.0

*3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% 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	0.031	-0.001	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. Q22008275

F3-011-04/01-12

page 3 of 3



รับรองสำหรับลูกค้าต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ พ



@ckcalibration



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. Q22008275

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14629/UM14629[EVMINMMATE4629]
CLID. NO. : 252200217
JOB CONTROL NO. : 220125008275

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. Q22008275A1

F3-012-04/01-12

page 1 of 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ




@clccalibration

Mettler-Toledo (Thailand) Ltd.
848/4 - 848/5 Lasalle Rd., Bangna Tal 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: 

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 (n)
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 Calibrator: Naruephon C.
As Left Calibration Date: N/A
Issue Date: 03-Mar-2022
Approved Signatory: 

- ☒ Kassakorn Tassanachalsakul
☐ Santi Jitniyom
☐ Surachet Sukkate



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

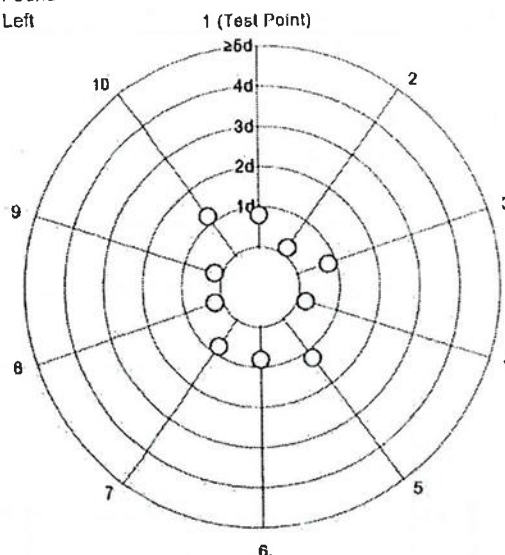
Measurement Results

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

○ As Found
◆ As Left



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

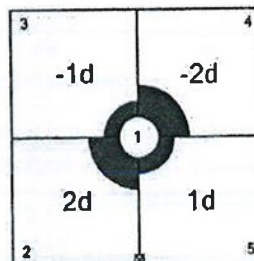
The results of this graph are based upon the absolute values of the differences from the mean value.

Standard Deviation	0.000008 g	N/A
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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



As Found

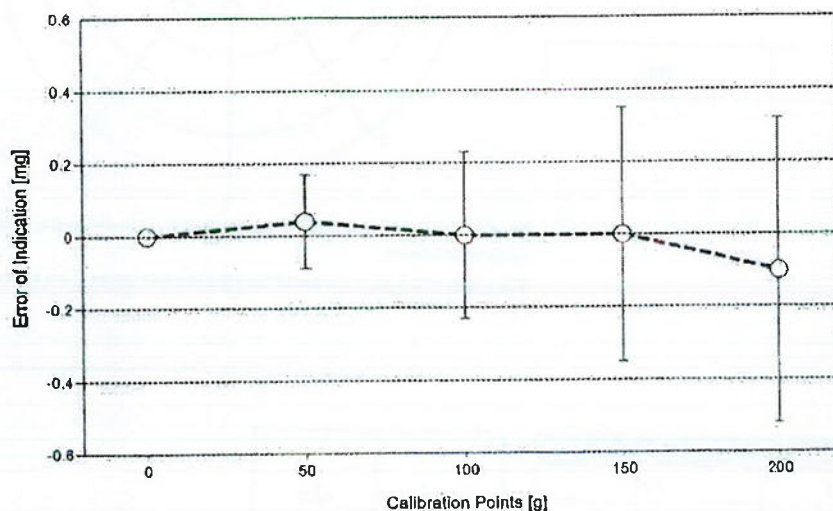
The "d" in the graph represents the readability of the range/interval in which the test was performed.

Maximum Deviation	0.0002 g	N/A
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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	199.9990 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.

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.

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: $3 K$

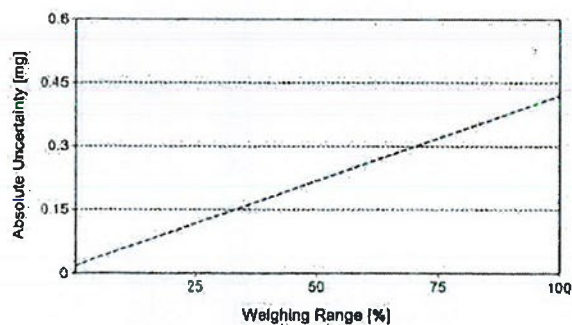
Linearization of Uncertainty Equation

	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

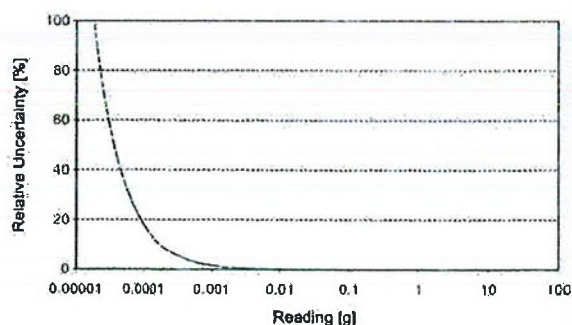
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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



As Found



As Left

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



S K SALES AND SERVICE CO.,LTD.
194/56, 194/57 Thakham Rd. Samoe 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 **

Certificate of Calibration

Certificate No. : 65-420020-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540,540/1 Soi Bangkhæ7, Bangkhæ, 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

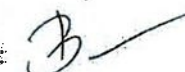
1. Multiproduct Calibrator

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

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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B





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 :	 Approved Signatory
	(<input checked="" type="checkbox"/>) Malee Butkruea (<input type="checkbox"/>) Saithip Meangmai (<input type="checkbox"/>) Warakorn Lerngagtrakul
Issue Date :	22 March 2022



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

B 0284369



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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Malu.



Envilab Co., Ltd.

Dr. Dan

a 1100969

รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

Certificate of Calibration

Certificate No. : 64-400527-3

Page : 1 of 2

Submitted by : Envilab Co., Ltd.

540, 540/1 Soi Bangkhae 7, Bangkhae, 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

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400527-3

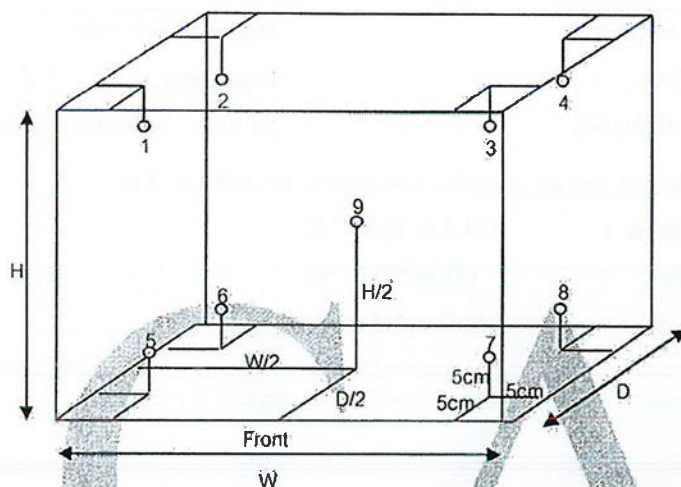
Page : 2 of 2

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)
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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CAL

Calibratech Co.,Ltd.

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

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



Certificate of Calibration

Certificate No. : 64-400569-1

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

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03



Envilab Co.,Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 64-400569-1

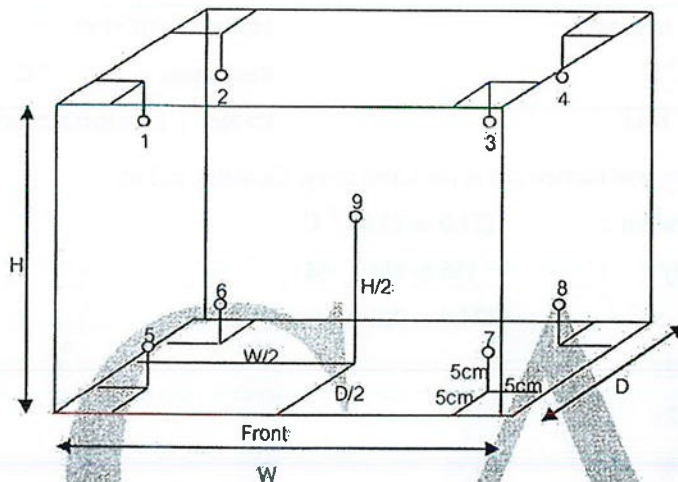
Page : 2 of 2

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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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. : 65-400155-2

Page : 1 of 2

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

Equipment : Air Chamber (Oven)
Manufacturer : Memmert
Range : N/A °C
Serial No. : B319.0600
Model : UF 75
Resolution : 0.1 °C
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

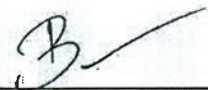
Calibration Method : CAL-M4004, TLAS G-20

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

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F003 I-03



Envilab Co.,Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ

Certificate of Calibration

Certificate No. : 65-400155-2

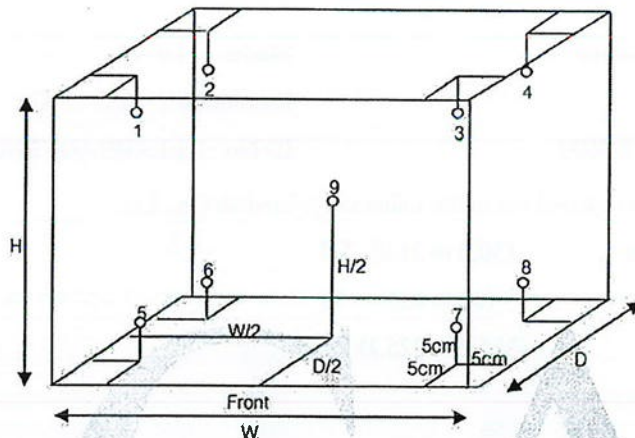
Page : 2 of 2

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 -

B.



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. : 65-400053-1

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 : Permpoon 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

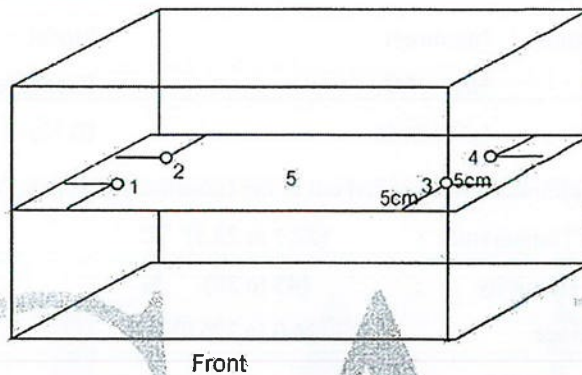
Certificate No. : 65-400053-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



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%

- o0σ -

B



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Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpoo, 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 : 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-F0031-03



Envilab Co.,Ltd.

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ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co.,Ltd.

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

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

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.



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 : 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 Toyadce)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03



Envilab Co.,Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ

CAL

Calibratech Co.,Ltd.

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

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

Certificate of Calibration

Certificate No. : 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%

- o O o -

D



ประจำเดือนสิงหาคม พ.ศ. 2565



TSP High Volume Sampler Calibration

Verification Report No.

HO2200025-D007 -TSP 01

☐ PM ☒ Onsite

Site: โครงการก่อสร้างอาคารพักอาศัยพร้อมสิ่งอำนวยความสะดวกของ สำนักงานปลัดกระทรวงกลาโหม

UTM : 47P 1524271 N 666054 E

Date: 1 Aug 22

Sampler: NTSP#12

Technical: Sanayu J.

Recorder: ECRANG15315224

Approval: 0

CONDITIONS

Barometric Press. (hPa): 1000.7

Corrected Pressure (mm Hg): 750.6

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

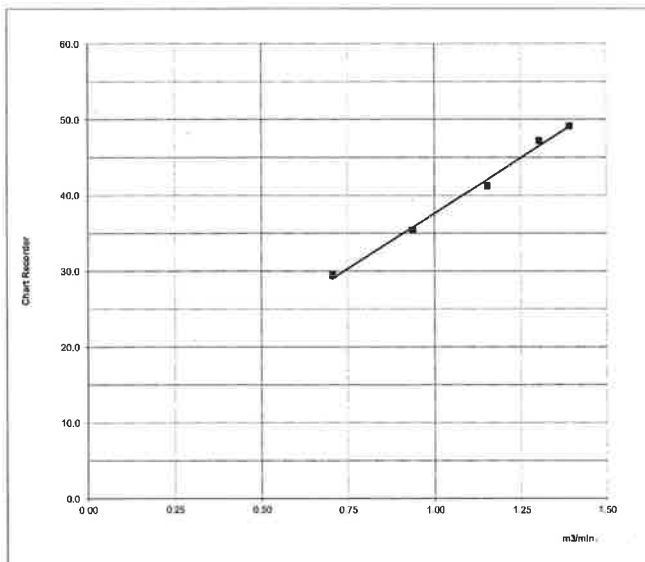
Qstd Intercept: -0.01202

Serial#: 1328

Date Certified: 19 Jan 22

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
1	5.34	1.392	50.0	49.12		
2	4.68	1.303	48.0	47.15		
3	3.66	1.154	42.0	41.26		
4	2.41	0.937	36.0	35.36	Slope = 29.2191	
5	1.36	0.706	30.0	29.47	Intercept = 8.3756	
					Corr. coeff = 0.9971	
					# of Observations: 5	
					Range of Chart at 1.1 - 1.7 m3/min.	
					42 59	



Calibrated by :

(Sanayu Jantason)
1 August 2022

Approved by :

(Tanin Huadcharoan)
1 August 2022

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Envolab Co., Ltd. 540.540/1 Soi Bangkhae 7 Bangkok Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



PM10 High Volume Sampler Calibration

Verification Report No.

HO2200025-D007 -PM 01

☐ PM ☒ Onsite

Site: โครงการก่อสร้างอาคารพักอาศัยพร้อมสิ่งอำนวยความสะดวกของ สำนักงานปลัดกระทรวงกลาโหม

UTM : 47P 1524271 N 666054 E

Sampler: NPM#11

Recorder: ECRDS01618124

Date: 1 Aug 22

Technical: Sanayu J.

Approval: 0

CONDITIONS

Barometric Press. (hPa): 1000.7

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 750.6

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

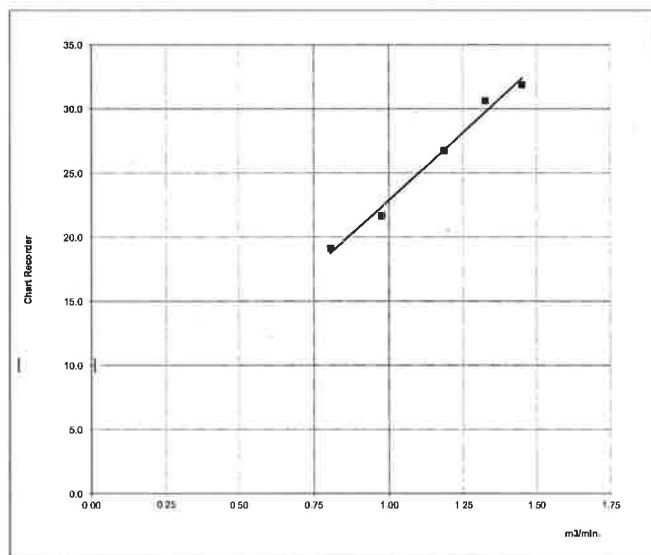
Slope: 1.02667

Intercept: -0.00753

Date Certified: 19 Jan 22

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	5.41	1.452	50.0	31.87	Slope = 21.1157
2	4.51	1.326	48.0	30.60	Intercept = 1.7295
3	3.61	1.187	42.0	26.77	Corr. coeff. = 0.9934
4	2.44	0.977	34.0	21.67	SFR = 1.151
5	1.66	0.807	30.0	19.12	SSP = 40.85
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					38
					44



Calibrated by : Sanayu Jantason
(Sanayu Jantason)
1 August 2022

Approved by : Tanin Huadcharoan
(Tanin Huadcharoan)
1 August 2022

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



ISO 9001:2015 CERTIFIED

Verification Test Report

Report No.:

HO2200025-D007 -SLM 01

☐ PM

☒ Onsite UTM :

47 P 1529770 N 666269 E

Calibrated Date: 1 August 2022

Site : โครงการก่อสร้างอาคารพักอาศัยพร้อมสิ่งอำนวยความสะดวกของ สำนักงานปลัดกระทรวงกลาโหม

Equipment: Sound Level Meter

Manufacturer: ACO

Model: 6226

Serial : 50027

Environment: Temperature 32 °C Humidity 60 %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
(Sanayu Jantason)

Date:

1 August 2022

Approve By:

Tanin Huadcharoan
(Tanin Huadcharoan)

Date:

1 August 2022

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EnviLab Co., Ltd. 540.540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10130
Tel : 02-802-3577-3 Fax : 02-802-3773 E-mail : info@evltesting.com



EnviLab Co., Ltd. 540.540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10130

PM10 High Volume Sampler Calibration

Verification Report No.

HO2200025-D007 -PM 02

☐ PM ☒ Onsite

Site: โรงพยาบาลเกษมราษฎร์ ประชาชื่น

UTM : 47P 1529602 N 666283 E

Sampler: NPM#02

Recorder: ECRDS01618124

Date: 1 Aug 22

Technical: Sanayu J.

Approval: 0

CONDITIONS

Barometric Press. (hPa): 1009.7

Temperature (deg C): 33.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.3

Temperature (deg K): 306.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5028A

Serial#: 1328

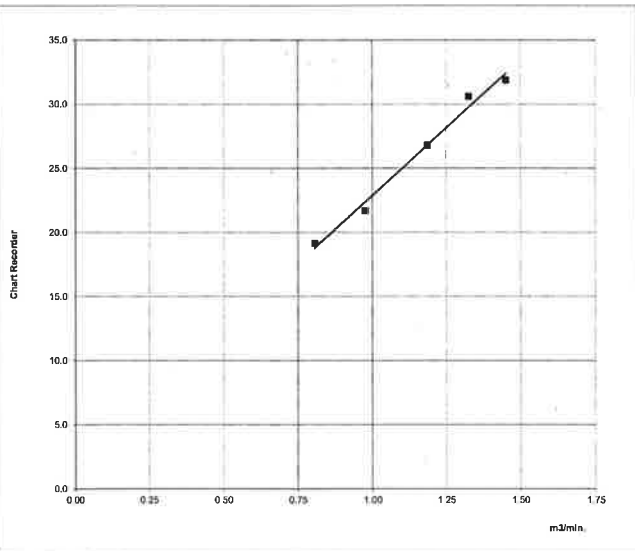
Slope: 1.02667

Intercept: -0.00753

Date Certified: 19 Jan 22

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	8.47	1.809	50.0	31.78	Slope = 11.7914
2	6.54	1.591	46.0	29.24	Intercept = 10.4807
3	4.66	1.344	42.0	26.70	Corr. coeff. = 0.9968
4	2.58	1.002	34.0	21.61	SFR = 1.145
5	1.25	0.700	30.0	19.07	SSP = 37.73
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					36
					39



Calibrated by :

(Sanayu Jantason)
1 August 2022

Approved by :

(Tanin Huadcharoan)
1 August 2022

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

Environmental responsibility with accuracy and commitment.

FE-MNT-29 Rev.00/01/08/03



TSP High Volume Sampler Calibration

Verification Report No.

HO2200025-D007 -TSP 02

☐ PM ☒ Onsite

Site: โรงพยาบาลเกษมราษฎร์ ประชาชื่น

UTM : 47P 1529602 N 666283 E

Sampler: NTSP#01

Recorder: ECRANG15315224

Date: 1 Aug 22

Technical: Sanayu J.

Approval: 0

CONDITIONS

Barometric Press. (hPa): 1009.7

Temperature (deg C): 33.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 757.3

Temperature (deg K): 306.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5028A

Serial#: 1328

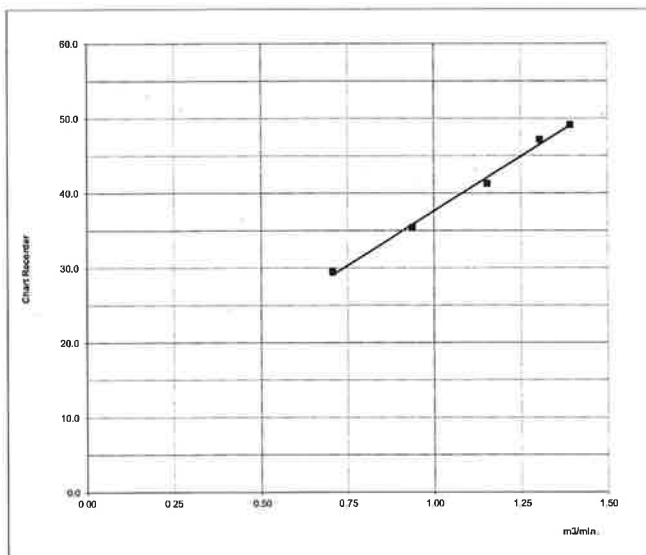
Qstd Slope: 1.63957

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	8.94	1.804	58.0	57.14	
2	6.41	1.529	50.0	49.26	Slope = 23.5990 Intercept = 13.5461 Corr. coeff. = 0.9948 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 41 54
3	4.67	1.306	44.0	43.34	
4	2.54	0.965	36.0	35.46	
5	1.37	0.711	32.0	31.52	



Calibrated by :

(Sanayu Jantason)
1 August 2022

Approved by :

(Tanin Huadcharoan)
1 August 2022

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Envilab Co., Ltd. 540,540/1 Soi Bangkapi 7 Bangkapi Bangkok Bangkok 10150
Tel : 02-802-3577-8 Fax : 02-802-3773 E-mail : info@evltesting.com



Verification Test Report

Report No.:

HO2200025-D007 -SLM 02

☒ PM

☐ Onsite UTM :

47 P 1529587 N 666247 E

Calibrated Date: 1 August 2022

Site : โรงพยาบาลเกษมราษฎร์ ประชาชื่น

Equipment: Sound Level Meter

Manufacturer: ACO

Model: 6226

Serial : 40289

Environment: Temperature 32 °C Humidity 60 %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	93.46	-0.20	93.66

Calibrated By:

Sanayu Jantason
(Sanayu Jantason)

Date:

1 August 2022

Approve By:

Tanin Huadcharoan
(Tanin Huadcharoan)

Date:

1 August 2022

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neediss

บริษัท นีดีส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.
536 ซอยรามคำแหง 7 แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10160 536 So. Rongkhro 7 Bangkok Bangkok Bangkok
Tel: 02-402-3980 Fax: 02-402-3981 Email: info@neediss.com



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6508005

Page:1/1

Calibrated Date: 2-Aug-22

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: SO2 Analyzer Model: THERMO,43C	Manufacturer THERMO S/N: ESOTE43C668327
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Calibration System

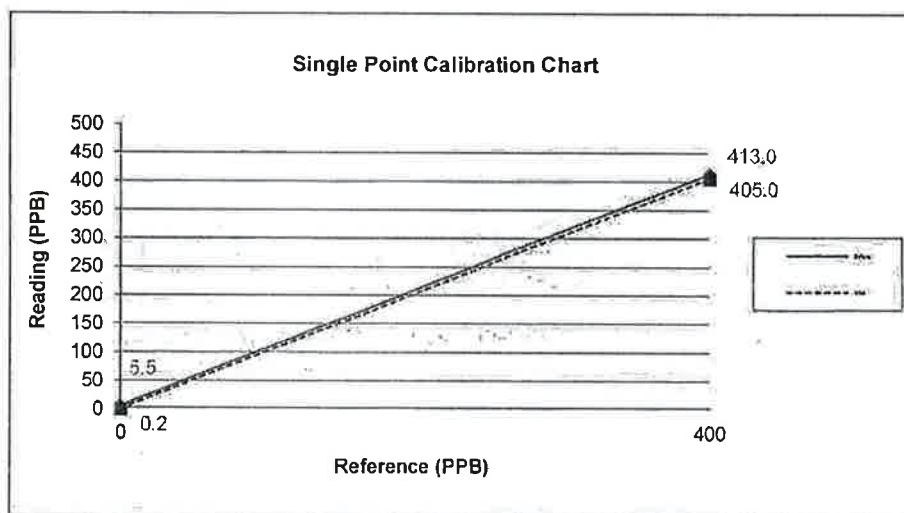
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 25.9 °C

Humidity: 49 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	5.5	5.5	400.0	413	3.3
After	0.0	0.2	0.2	400.0	405	1.3



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Neediss Co., Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 2-08-2022

S/N : ESOTE43C668327

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


neediss

Neediss Supply Instrument Co., Ltd.

Calibrate By : Sirirat Poonlak

Approve By : Tanin

Sirirat Poonlak

Tanin Huadcharoen

Date: 2-Aug-22


Date: 2-Aug-22

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 ผู้จัดการฝ่ายควบคุมคุณภาพ



NOx Analyzer Verification Test Report

Calibration Report No.: 6508006
Calibrated Date: 2-Aug-22

Page:1/2

☒ PM ☐ Onsite

Instruments Information

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

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 25.8 °C

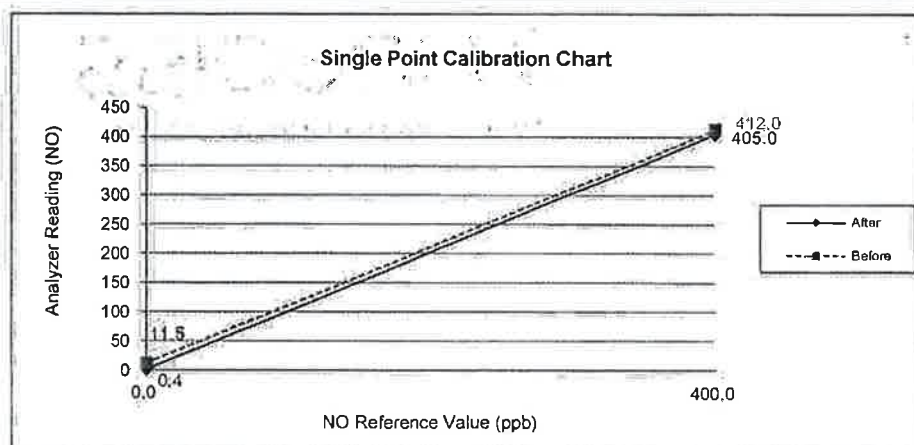
Humidity: 52 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	11.5	0.0	11.5	412	400.0	1.5
NO ₂	3.9	0.0	3.9	6.0	0.0	0.7
NOx	15.4	0.0	15.4	418	400.0	2.2

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.4	0.0	0.4	405	400.0	0.6
NO ₂	0.3	0.0	0.3	3.0	0.0	0.4
NOx	0.7	0.0	0.7	408	400.0	1.0



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ผู้จัดการฝ่ายควบคุมคุณภาพ

**neediss**บริษัท นีดีส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.255 หมู่ 10 ตำบล 255 อำเภอ 255 จังหวัด 255
Tel : 02-000-0000 Fax : 02-000-0000 Email : info@neediss.com

MODEL : NOx ANALYZER Model 42C THERMO

DATE : 2-08-2022

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

neediss

Neediss Supply Instrument Co., Ltd.

Calibrate By :

Approve By :

Sirirat Poonlak

Tanin Huadcharoen

Date:

2-Aug-22

Date:

2-Aug-22

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

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Neediss Supply Instrument Co., Ltd.

535 หมู่ 7 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10160 535 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel: 02-307-3746 Fax: 02-802-7938 Email: neediss@neediss.com



SO₂ Analyzer Verification Test Report

Calibration Report No.: 6508003

Page:1/1

Calibrated Date: 2-Aug-22

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: SO2 Analyzer Model: THERMO_43C	Manufacturer THERMO S/N: ESOTE43C801866
--	--

Calibration System

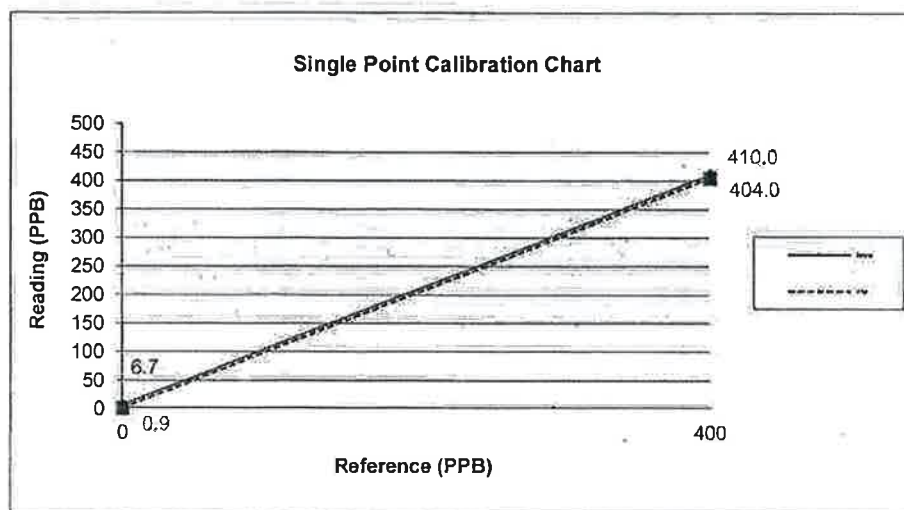
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19,2024 EB0140762

Environment: Temperature 25.9 °C

Humidity: 49 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	6.7	6.7	400.0	410	2.5
After	0.0	0.9	0.9	400.0	404	1.0



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ผู้จัดการฝ่ายควบคุมคุณภาพ



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

555 ซอยเมืองเอก 7 แขวงเมืองเอก เขตเมืองเอก กรุงเทพฯ 10160 555 50 Bangkok 7 Bangkok Bangkok Bangkok
Tel: 02-802-3980-2 Fax: 02-802-3988 E-mail: info@neediss.com



MODEL : SO2 ANALYZER Model 43C THERMO

DATE : 2-08-2022

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



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Neediss Supply Instrument Co.,Ltd.

Calibrate By :

Sirirat Poonlak

Approve By :

Tanin

Sirirat Poonlak

Tanin Huadcharoen

Date:

2-Aug-22

Date:

2-Aug-22

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Neediss Supply Instrument Co., Ltd.

535 ซอยบางเขน 7 แขวงบางเขน เขตบางเขน กรุงเทพฯ 10160 535 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel: 02-802-7760 Fax: 02-802-7761 Email: info@neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: 6508004

Page:1/2

Calibrated Date: 2-Aug-22

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: 42C	Manufacturer THERMO S/N: ENOTE42C671356
--	--

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 26.1 °C

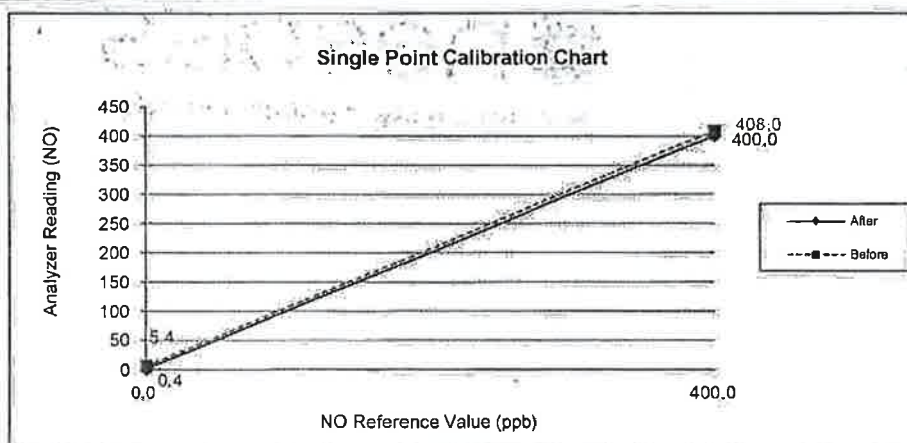
Humidity: 52 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	5.4	0.0	5.4	408	400.0	1.0
NO ₂	4.8	0.0	4.8	4.0	0.0	0.5
NOx	10.2	0.0	10.2	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	0.4	0.0	0.4	400	400.0	0.0
NO ₂	0.2	0.0	0.2	2.0	0.0	0.2
NOx	0.6	0.0	0.6	402	400.0	0.2



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รับรองสำเนาถูกต้อง

ผู้จัดการฝ่ายควบคุมคุณภาพ

**neediss**บริษัท เน็ดิส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.535 ซอยวิภาวดี 7 แขวงวิภาวดี เขตจตุจักร 10160 536 ซอยวิภาวดี 7 แขวงวิภาวดี เขตจตุจักร 10160
Tel: 02-802-0180 Fax: 02-802-0208 E-mail: info@neediss.com

MODEL : NOx ANALYZER Model 42C THERMO

DATE : 2-08-2022

S/N : ENOTE42C671356

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

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Neediss Supply Instrument Co.,Ltd.

Calibrate By :

Approve By :

Sirirat Poonlak

Tanin Huadcharoen

Date:

2-Aug-22

Date:

2-Aug-22



Envilab Co., Ltd.

รับรองสำเนาถูกต้อง

ขอจัดการด้วยความดูแลรักษา

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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 Bangkhuae 7, Bangkhuae, Bangkok 10160

Equipment : Electronic Balance

Manufacturer : Sartorius

Model : SECURA224-1S

Serial No. : 0034803270

ID No. : ELABBALANCEN04

Capacity : 220 g

Resolution : 0.0001 g

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

Ambient Temperature : (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, Sukhaphrachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

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

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

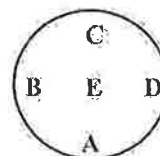
This result of calibration was found accurate as shown on date and place of calibration only.

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

- 000 -

Signature



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

The Uncertainties are for a confidence probability of approximately 95%

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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

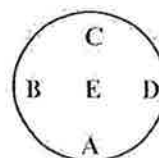
This result of calibration was found accurate as shown on date and place of calibration only.

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

- o o o -

Handwritten signature





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 Bangkhæ 7, Bangkhæ, Bangkhæ, 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/calibrated or value assigned;

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FM.BL.MTC.002 Rev.4

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Office/Laboratory

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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 3321
E-mail : sumalee@tistr.or.th

Envilab Co.,Ltd.



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. Prayate Klunypa)
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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FM.BL.MTC.002 Rev.4

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Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office

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Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 859
E-mail : sumalee@tistr.or.th



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD
Part Number: E05NI91E15A0003 Reference Number: 160-402305646-1
Cylinder Number: EB0146406 Cylinder Volume: 148.7 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12022 Valve Outlet: 660
Gas Code: CO,CO2,NO,NOX,SO2,BALN 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 18, 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



[Signature]
Approved for Release

Page 1 of 160-402305646-1



[Signature]
รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ



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. Q22008275

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14629/UM14629[EVMINMMATE4629]
CLID. NO. : 252200217
JOB CONTROL NO. : 220125008275

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. Q22008275A1

F3-012-04/01-12

page 1 of 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

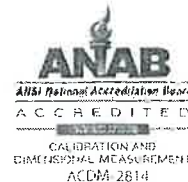


@clccalibration



CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasart 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.	:	UM14629/UM14629[EVMINMMATE4629]
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. Q22008275

F3-011-04/01-12

page 2 of 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

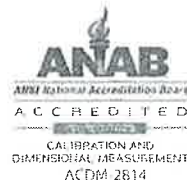


@clccalibration



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

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	1.030	-0.030	1.1
2	50 Hz		2.000	2.076	-0.076	1.0
3	50 Hz		3.000	3.091	-0.091	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	9.818	+0.182	2.3
20	50 Hz		20.000	19.782	+0.218	1.8
30	50 Hz		30.000	30.329	-0.329	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	0.031	-0.001	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. Q22008275

F3-011-04/01-12

page 3 of 3



รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ




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: XSR205DLI 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: CPW002/20

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:

- ☒ Kassakorn Tassanachaisakul
☐ Sanit Jitniyom
☐ Surachet Sukkate

Measurement Results

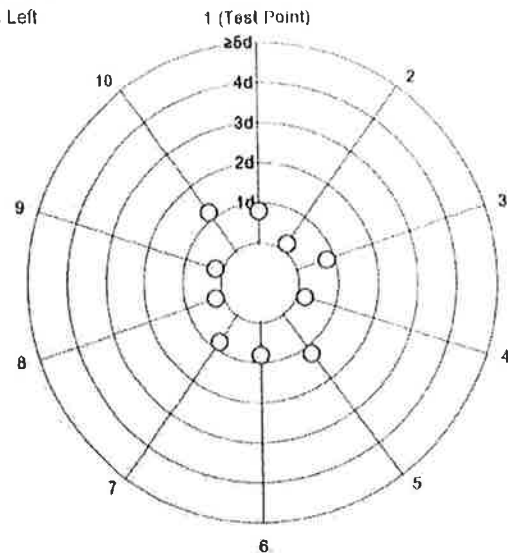
Repeatability

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

Standard Deviation	0.000008 g	N/A
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○ As Found
◆ As Left



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

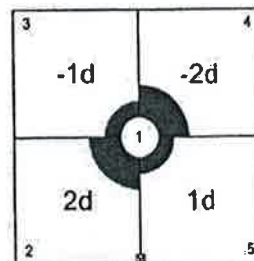
The results of this graph are based upon the absolute values of the differences from the mean value.

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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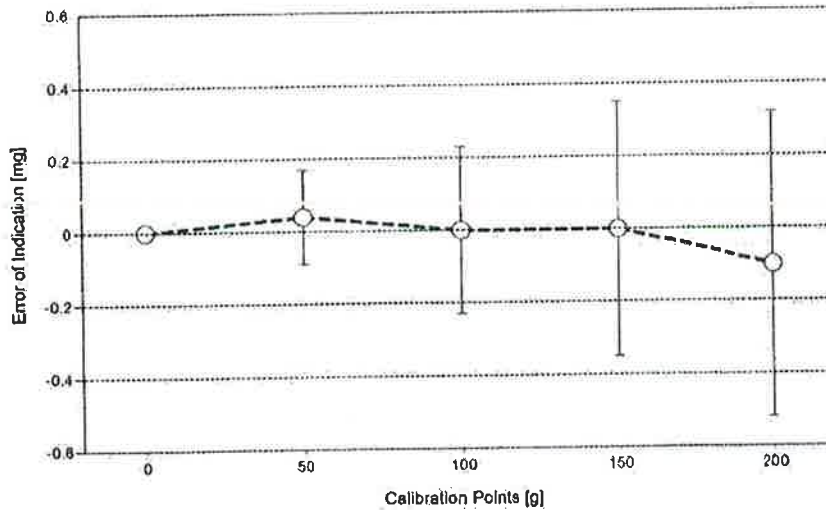
As Found:

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	0.0000 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.

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.



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: $1.5 \cdot 10^{-6} / K$

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

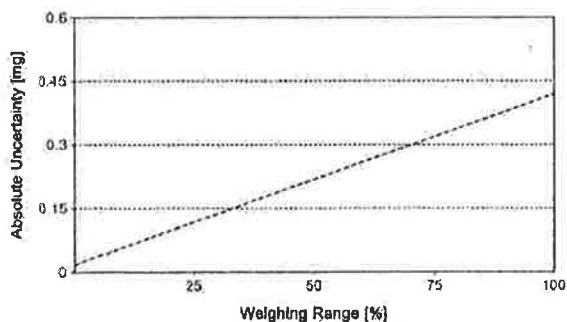
Linearization of Uncertainty Equation

	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

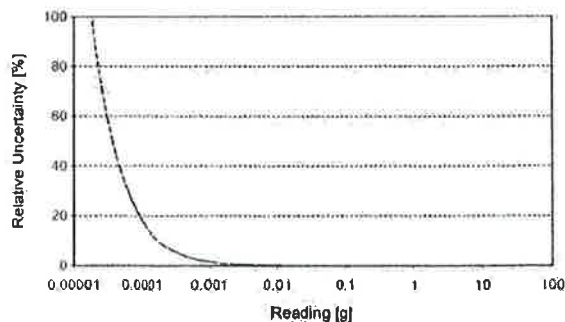
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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



As Found



As Left

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



S K SALES AND SERVICE CO.,LTD.
194/56, 194/57 Thakham Rd. Samae Dom
Bang Khun Thien 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 Toolit

☒ 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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Envilab Co.,Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ

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.

Dr. Chai
รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

ep.

Certificate of Calibration

Certificate No. : 65-420020-1

Page : 1 of 2

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

Equipment : pH Meter with electrode
pH meter
Manufacturer : Horiba Model : F-74BW-G
Range : N/A pH Resolution : 0.001 pH
Serial No. : B41J0001 ID No. : ELABPHHB74BW01
Electrode
Model : 9615S Serial No. : 9X1K0003

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

Ambient Temperature : (23.5 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

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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B





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 Bangkhao 7, Bangkhao, Bangkhao, 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 :	 Approved Signatory
	(<input checked="" type="checkbox"/>) Malee Butkruea (<input type="checkbox"/>) Saithip Meangmai (<input type="checkbox"/>) Warakorn Lernagtrakul
Issue Date :	22 March 2022



รับรองสำเนาถูกต้อง 0284369

Envilab Co.,Ltd.

ผู้จัดการฝ่ายควบคุมคุณภาพ



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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Malu.



Envilab Co., Ltd.

OW Hml

รับรองสำเนาถูกต้อง
ผู้จัดการฝ่ายควบคุมคุณภาพ

a 1100969

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

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400527-3

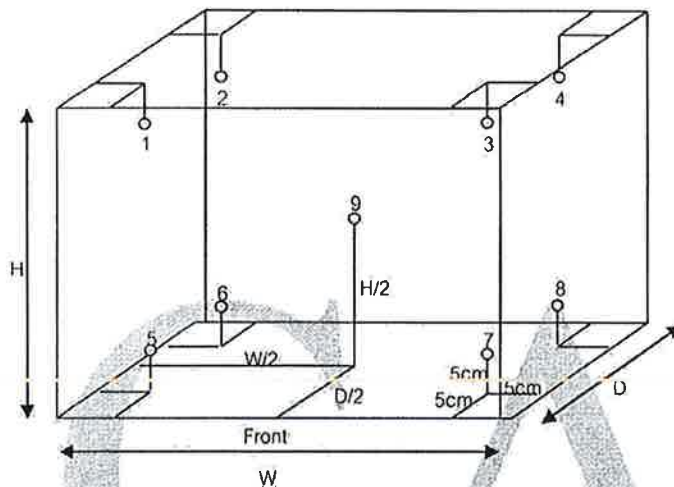
Page : 2 of 2

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%

- o o o -

Signature



Signature



CAL

Calibratech Co.,Ltd.

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

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



Certificate of Calibration

Certificate No. : 64-400569-1

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

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03



Certificate of Calibration

Certificate No. : 64-400569-1

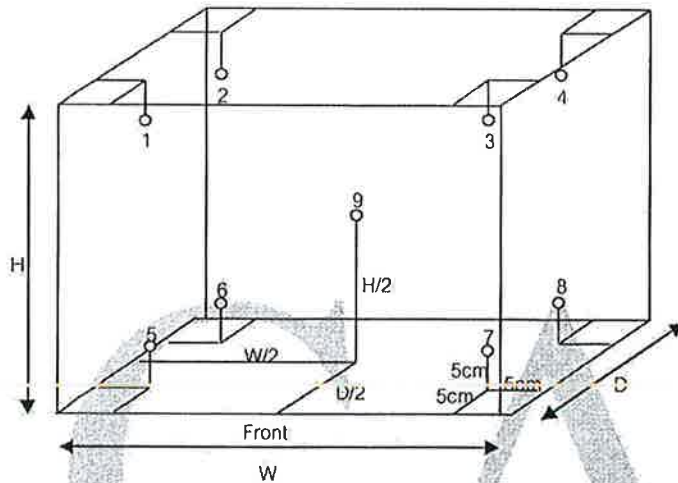
Page : 2 of 2

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%

- o0o -



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 : Perimpon 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

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 65-400155-2

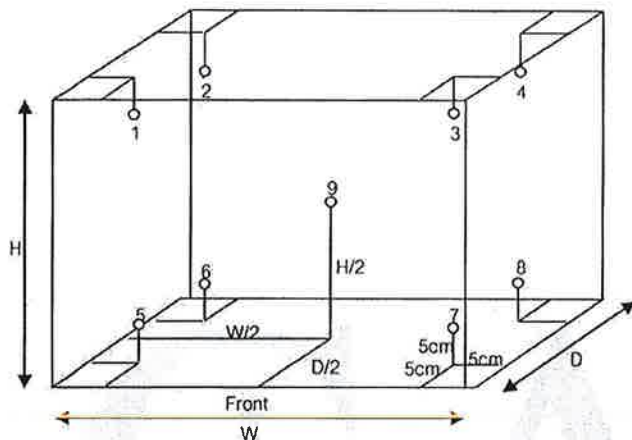
Page : 2 of 2

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 -

B

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

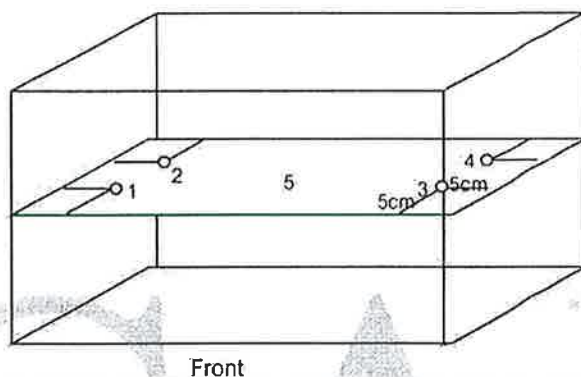
Certificate No. : 65-400053-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



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 -

B



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-TIS17025
CALIBRATION 0030

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

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
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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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%

- o0o -

D.



Ok An



Certificate of Calibration

Certificate No. : 65-300147-4

Page : 1 of 2

Submitted by : Envilab Co.,Ltd.

540, 540/1 Soi Bangkhuae 7, Bangkhuae, 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

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%

- o0o -

D



Dr. Hm



ประจำเดือนกันยายน พ.ศ. 2565

TSP High Volume Sampler Calibration

Site: Blue
 Sampler: TSP#15
 Recorder: Kimhan P.

Date: 23/08/2022
 Test: Supackak S.
 Approval: Nidida A.

CONDITIONS

Sea Level Pressure (hPa): 1008.0
 Temperature (deg C): 32.0
 Seasonal SL Press. (hPa): 1013.0
 Seasonal Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.1
 Temperature (deg K): 305.0
 Corrected Seasonal (mm Hg): 759.8
 Seasonal Temp. (deg K): 303.0

CALIBRATION ORIFICE

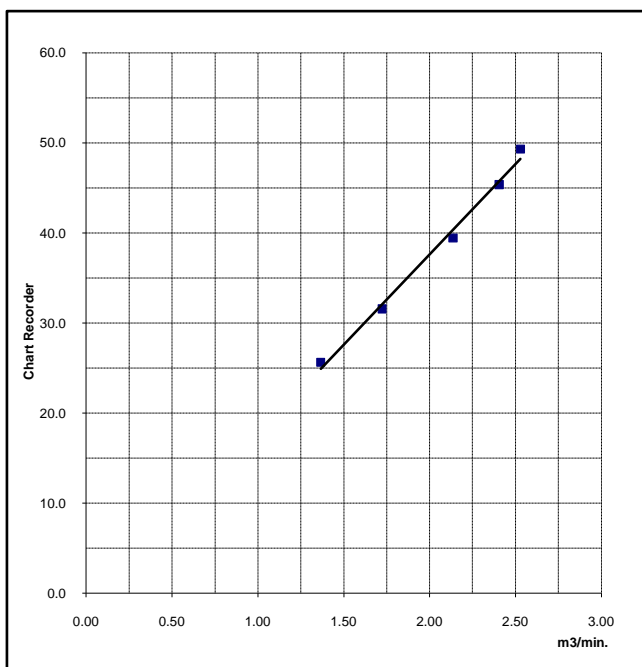
Make: Tisch
 Model:
 Serial#: 1635

Qstd Slope: 1.26614
 Qstd Intercept: -0.02116
 Date Certified: 1 Aug 22

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	<u>10.40</u>	<u>2.528</u>	<u>50.0</u>	<u>49.29</u>	Slope = <u>20.0276</u> Intercept = <u>-2.4227</u> Corr. coeff.= <u>0.9961</u> # of Observations: <u>5</u>
2	<u>9.40</u>	<u>2.404</u>	<u>46.0</u>	<u>45.35</u>	
3	<u>7.40</u>	<u>2.135</u>	<u>40.0</u>	<u>39.44</u>	
4	<u>4.80</u>	<u>1.723</u>	<u>32.0</u>	<u>31.55</u>	
5	<u>3.00</u>	<u>1.365</u>	<u>26.0</u>	<u>25.63</u>	

Range of Chart 20
 at 1.1 - 1.7 m3/min. 32



Calibrated by :



Kimhan Paepipat
 23/08/2022

Approved by :



Nidida Anansuwanchai
 23/08/2022

TSP High Volume Sampler Calibration

Site: Blue
 Sampler: TSP#36
 Recorder: Kimhan P.

Date: 23/08/2022
 Test: Supackak S.
 Approval: Nidida A.

CONDITIONS

Sea Level Pressure (hPa): 1008.0
 Temperature (deg C): 32.0
 Seasonal SL Press. (hPa): 1013.0
 Seasonal Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.1
 Temperature (deg K): 305.0
 Corrected Seasonal (mm Hg): 759.8
 Seasonal Temp. (deg K): 303.0

CALIBRATION ORIFICE

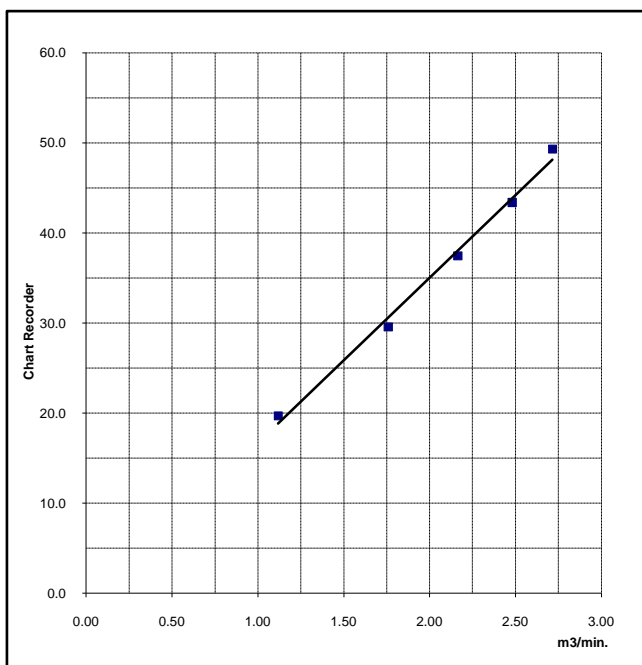
Make: Tisch
 Model:
 Serial#: 1635

Qstd Slope: 1.26614
 Qstd Intercept: -0.02116
 Date Certified: 1 Aug 22

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	12.00	2.714	50.0	49.29	Slope = 18.3489
2	10.00	2.479	44.0	43.38	Intercept = -1.6634
3	7.60	2.163	38.0	37.46	Corr. coeff.= 0.9966
4	5.00	1.758	30.0	29.58	
5	2.00	1.118	20.0	19.72	# of Observations: 5

Range of Chart 19
 at 1.1 - 1.7 m3/min. 29



Calibrated by :



Kimhan Paepipat
 23/08/2022

Approved by :



Nidida Anansuwanchai
 23/08/2022

TSP High Volume Sampler Calibration

SITE

 Site: Blue
 Sampler: PM#1
 Recorder: Kimhan P.

 Date: 23/08/2022
 Test: Supackak S.
 Approval: Nidda A.

CONDITIONS

 Sea Level Pressure (hPa): 1008.0
 Temperature (deg C): 32.0
 Seasonal SL Press. (hPa): 1013.0
 Seasonal Temp. (deg C): 30.0

 Corrected Pressure (mm Hg): 756.1
 Temperature (deg K): 305.0
 Corrected Seasonal (mm Hg): 759.8
 Seasonal Temp. (deg K): 303.0

CALIBRATION ORIFICE

 Make: Tisch
 Model:
 Serial#: 1635

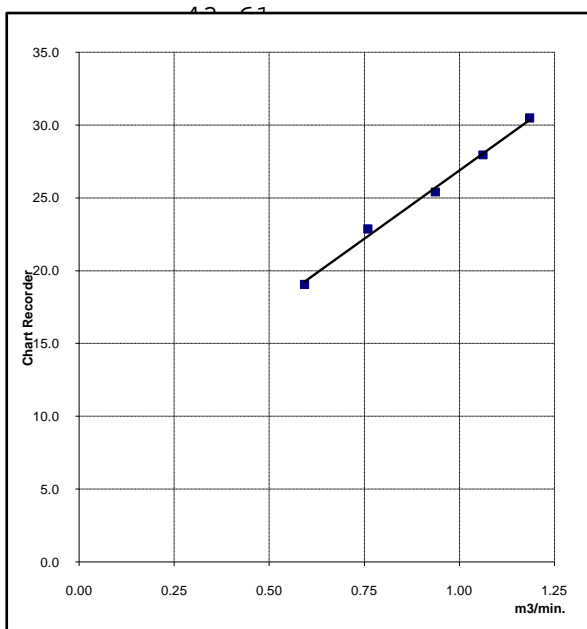
 Slope: 1.26614
 Intercept: -0.02116
 Date Certified: 1 Aug 22

TEST

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	<u>10.00</u>	<u>1.185</u>	<u>48.0</u>	<u>30.49</u>
2	<u>8.00</u>	<u>1.062</u>	<u>44.0</u>	<u>27.95</u>
3	<u>6.40</u>	<u>0.937</u>	<u>40.0</u>	<u>25.41</u>
4	<u>4.00</u>	<u>0.760</u>	<u>36.0</u>	<u>22.87</u>
5	<u>2.60</u>	<u>0.593</u>	<u>30.0</u>	<u>19.05</u>

LINEAR REGRESSION

 Slope (m)= 18.7506
 Intercept (b)= 8.1367
 Corr. coeff.(r)= 0.9975
 SFR = 1.143
 SSP = 46.56
 # of Observations: 5

 Range of Chart 44
 at SFR $\pm 10\%$ 49


Calibrated by :



 Kimhan Paepipat
 23/08/2022

Approved by :



 Nidda Anansuwanchai
 23/08/2022

TSP High Volume Sampler Calibration

SITE

 Site: Blue
 Sampler: PM#3
 Recorder: Kimhan P.

 Date: 23/08/2022
 Test: Supackak S.
 Approval: Nidda A.

CONDITIONS

 Sea Level Pressure (hPa): 1008.0
 Temperature (deg C): 32.0
 Seasonal SL Press. (hPa): 1013.0
 Seasonal Temp. (deg C): 30.0

 Corrected Pressure (mm Hg): 756.1
 Temperature (deg K): 305.0
 Corrected Seasonal (mm Hg): 759.8
 Seasonal Temp. (deg K): 303.0

CALIBRATION ORIFICE

 Make: Tisch
 Model:
 Serial#: 1635

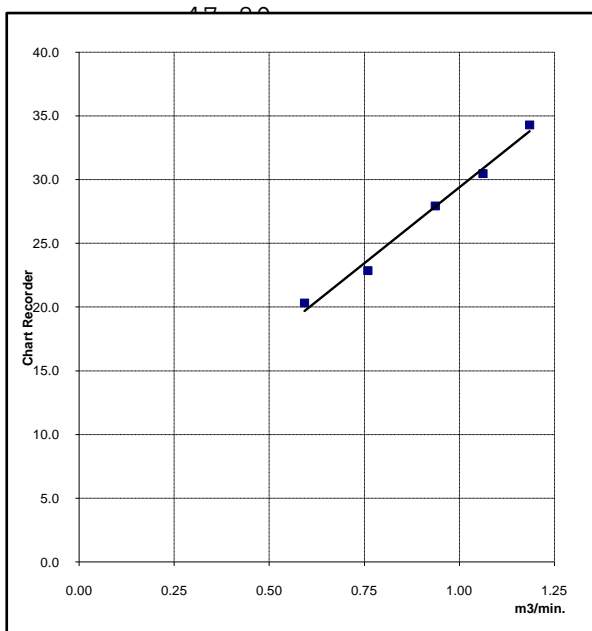
 Slope: 1.26614
 Intercept: -0.02116
 Date Certified: 1 Aug 22

TEST

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	<u>12.40</u>	<u>1.185</u>	<u>54.0</u>	<u>34.30</u>
2	<u>9.80</u>	<u>1.062</u>	<u>48.0</u>	<u>30.49</u>
3	<u>7.60</u>	<u>0.937</u>	<u>44.0</u>	<u>27.95</u>
4	<u>4.80</u>	<u>0.760</u>	<u>36.0</u>	<u>22.87</u>
5	<u>3.00</u>	<u>0.593</u>	<u>32.0</u>	<u>20.32</u>

LINEAR REGRESSION

 Slope (m)= 23.8113
 Intercept (b)= 5.5770
 Corr. coeff.(r)= 0.9943
 SFR = 1.143
 SSP = 51.64
 # of Observations: 5

 Range of Chart 48
 at SFR $\pm 10\%$ 55


Calibrated by :



 Kimhan Paepipat
 23/08/2022

Approved by :



 Nidda Anansuwanchai
 23/08/2022

Verification Test Report

Report No.:

JM-650108-1/12 -SLM 04

☒ PM ☐ Onsite UTM :

Calibrated Date: 1 September 2022

Site : บริเวณพื้นที่ก่อสร้างโครงการ

Equipment: Sound Level Meter

Manufacturer: ACO

Model: 6236

Serial : 8562

Environment: Temperature 25.2 °C Humidity 52.9 %RH

Reference Standard: Sound Calibrator Class 1 Model CEL-284/2

Serial No. 4/06920836

Date of Calibration : Nov. 18, 2021

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
113.75	113.60	-0.15	113.80

Calibrated By:

(Chuchat Sankhot)

Date:

1 September 2022

Approve By:

(Phoowanart Tumthong)

Date:

1 September 2022

Verification Test Report

Report No.:

JM-650108-1/12 -SLM 03

☒ PM ☐ Onsite UTM :

Calibrated Date: 1 September 2022

Site : บริเวณพื้นที่ โรงพยาบาลเกษมราษฎร์ ประชาชื่น

Equipment: Sound Level Meter

Manufacturer: ACO

Model: 6236

Serial : 2022

Environment: Temperature 25.2 °C Humidity 52.9 %RH

Reference Standard: Sound Calibrator Class 1 Model CEL-284/2

Serial No. 4/06920836

Date of Calibration : Nov. 18, 2021

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
113.75	113.80	0.05	113.80

Calibrated By:

(Chuchat Sankhot)

Date:

1 September 2022

Approve By:

(Phoowanart Tumthong)

Date:

1 September 2022



Certificate of Calibration

Certificate Number : SPR21110288-4

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.
142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Sound Level Calibrator

Manufacturer : CEL

Model : CEL-284/2

Serial Number : 4/06920836

ID. Number : N/A

Environmental Conditions

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

Received Date : 16 Nov 2021

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

Calibration Date : 18 Nov 2021

Location of Calibration : In-Lab

Recommend Due Date : 18 Nov 2022

Calibration Procedure : In-House Method

Date of Issue : 19 Nov 2021

Method of Calibration

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

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

Calibrated by : Mr.Chumpon Dokpikul

Approved by :

Calibration Officer

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR21110288-4

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Measuring Receiver	8902A	2950A02471	EF-0001-21	08 Jan 2022
AUDIO Analyzer	8903B	3011A09975	EL04965/21	19 Feb 2022

Traceability

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

NIMT - The National Institute of Metrology, Thailand.

PCAL - Professional Calibration & Services Co.,Ltd



Result of Calibration

Certificate No. : SPR21110288-4

Page : 3 of 3

Function : Sound Level

UUC Setting (\pm dB)	Standard Reading (dB)	Error (dB)	Uncertainty (\pm dB)
114	113.75	0.25	1.5

Note:

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

Measurement Uncertainty

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

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR21110288-6

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.
142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Primary Flow Meter

Manufacturer : BIOS

Model : DCL-ML

Serial Number : 5374

ID. Number : N/A

Environmental Conditions

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

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

Location of Calibration : In-Lab

Calibration Procedure : SP-CPM-04-13

Received Date : 16 Nov 2021

Calibration Date : 17 Nov 2021

Recommend Due Date : 17 Nov 2022

Date of Issue : 18 Nov 2021

Method of Calibration

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

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

Calibrated by : Mr.Jirasak Pumbut

Calibration Officer

Approved by :

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR21110288-6

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Mass Flow Calibrator	AFC-COMPLETE-10	12532	AD2107-244-0001	24 Jul 2022

Traceability

This certification is traceable to the International System of Unit maintained at :
MIT - Miracle International Technology Co.,Ltd.



Result of Calibration

Certificate No. : SPR21110288-6

Page : 3 of 3

Range : 0 to 5000 mL/Min

Resolution : 0.1 mL/Min

Function : Air Flow Measurement

Unit : mL/Min

Calibration Point	UUC Reading	Standard Reading	UUC Error	K Factor Value	Uncertainty (±)
1000.0	1000.0	999.85	0.15	0.9999	58
2000.0	2000.0	2000.2	-0.2	1.0001	58
3000.0	3000.0	2999.4	0.6	0.9998	58
4000.0	4000.0	3999.5	0.5	0.9999	58
5000.0	5000.0	4999.3	0.7	0.9999	58

Note:

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

Measurement Uncertainty

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

- End of Certificate -

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

โทร.0-2873-6045-6 โทรสาร 0-2873-6046

ห้องปฏิบัติการวิเคราะห์เอกชนใบอนุญาตลงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : SO₂ Analyzer

Serial No. : 2712, 3569

Brand/Model: Teledyne-API/T100

Date of Calibrate : August 30, 2022

Reference Standard

Certification Date: October 29, 2019

Component: SO₂: 55.62 ppm , NO: 57.21 ppm , CO : 4,551 ppm

Cylinder No.: EB0128767

Expiry Date: October 29, 2027

Calibration Check (Before adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
2712	-0.1	0	-0.1	398.9	400	-1.1
3569	0.2	0	0.2	400.2	400	0.2

Calibration Check (After adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
2712	0	0	0	400	400	0
3569	0	0	0	400	400	0

ในนามห้องปฏิบัติการห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์



(นางสาวนิดา อนันต์สุวรรณชัย)

ผู้จัดการห้องปฏิบัติการ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

โทร.0-2873-6045-6 โทรสาร 0-2873-6046

ห้องปฏิบัติการวิเคราะห์เอกชนใบอนุญาตลงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : NOx Analyzer

Serial No. : 3205, 17C-68152-359

Brand/Model:Teledyne-API/T200, Thermo/42C

Date of Calibrate : August 30, 2022

Reference Standard

Certification Date: October 29, 2019

Component: SO2: 55.62 ppm , NO: 57.21 ppm , CO : 4,551 ppm

Cylinder No.: EB0128767

Expiry Date: October 29, 2027

Calibration Check (Before adjust)						
Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx
3205	3.9/1.4/5.3	0/0/0	3.9/1.4/5.3	398.2/3.2/401.4	400/0/400	-1.8/3.2/1.4
17C-68152-359	4.5/1.2/5.7	0/0/0	4.5/1.2/5.7	404.0/3.9/407.9	400/0/400	4.0/3.9/7.9
Calibration Check (After adjust)						
Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx
3205	0/0/0	0/0/0	0/0/0	400/0/400	400/0/400	0/0/0
17C-68152-359	0/0/0	0/0/0	0/0/0	400/0/400	400/0/400	0/0/0

ในนามห้องปฏิบัติการห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์



(นางสาวนิดดา อนันต์สุวรรณชัย)

ผู้จัดการห้องปฏิบัติการ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
Blue Consultant
Limited Partnership



Certificate of Calibration

Certificate Number : SPR22030278-2

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.

142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 122022

ID. Number : N/A

Environmental Conditions

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

Received Date : 17 Mar 2022

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

Calibration Date : 21 Mar 2022

Location of Calibration : In-Lab

Recommend Due Date : 21 Mar 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 22 Mar 2022

Method of Calibration

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

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

Calibrated by : Mr. Surasak Vakjan

Calibration Officer

Approved by :

(Mr. Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22030278-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	SC-942	B014059	EEL.BP. 34/1264	22 Dec 2022

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR22030278-2

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.1	94.1	0.1	0.1	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.2	94.2	0.2	0.2	0.15
114	114.1	114.1	0.1	0.1	0.15

Note:

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

Measurement Uncertainty

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

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR22020414-2

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.

142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : S-08562

ID. Number : N/A

Environmental Conditions

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

Received Date : 23 Feb 2022

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

Calibration Date : 24 Feb 2022

Location of Calibration : In-Lab

Recommend Due Date : 24 Feb 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 25 Feb 2022

Method of Calibration

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

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

Calibrated by : Mr.Chumpon Dokpikul

Calibration Officer

Approved by :

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22020414-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	SC-942	B014059	EEL.BP. 34/1264	22 Dec 2022

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR22020414-2

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.2	94.2	0.2	0.2	0.15
114	114.1	114.1	0.1	0.1	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.2	94.2	0.2	0.2	0.15
114	114.2	114.2	0.2	0.2	0.15

Note:

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

Measurement Uncertainty

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

– End of Certificate –



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

81 Moo 11 Bangkruai - Sainoi Rd., Sainoi, Nonthaburi 11150 Tel. (662) 436-8789 Ext. 6155



Certificate of Calibration

Issued by : Vibration Laboratory

Certificate No. : 22V027

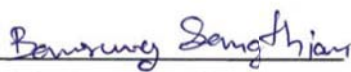
Reference No. : CBLUE01V004

Received Date : 08 March 2022

Calibrated Date : 15 March 2022

Page 1 of 5

Client : ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
Address : 32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพมหานคร 10140
Equipment : VIBRATION METER
Manufacture /Brand : INSTANTEL
Model : Micromate
Serial No./ ID No. : UM8171


(Mr. Bamrung Sangthian)

Authorised Signatory

Issue Date 16 / March 2022

This certificate is issued in accordance with the conditions of accreditation granted by The National Accreditation Council of Thailand which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the units of measurement realised at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the head of calibration services and environmental analysis department.



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V027

Page 2 of 5

Standard Used

The table below is described the calibrator through the International System of Unit.

Description	Manufacture/Model	Serial No.	Traceable No.	Due Date
Conditioning Amplifier Type 2626	Bruel & Kjaer	1242376	AV-0045-20	18 September 2022
Accelerometer Type 8305	Bruel & Kjaer	1262817	AV- 0043-20	02 December 2022
Digital Multimeter /8846A	FLUKE	4330020	21E287	20 September 2022

Ambient Environment :

The Calibration was performed in an environment of $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 10) \%$ relative humidity.

Measurement Method :

The unit under calibration was calibrated by comparison with standard accelerometer. The calibration method is based on WI-MCC-E-301 by comparison with reference accelerometer standard .

Measurement Results

The measurement results, labeled in the following pages give the calibration results and associated with measurement uncertainties.

Measurement Uncertainty

The Measurement Uncertainty are labeled on the following pages Completed the expanded uncertainty, that was calculated in accordance with the method in M3003, using coverage factor $k = 2$. The value of the measured lies within the assigned ranges of values of confidence level of approximately 95%.

Traceability :

The measurement is traceable to the International System of Unit through

- The National Institute of Metrology (Thailand)
- Metrology and Calibration Department



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V027

Page 3 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Vertical			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
* 20	10.00	10.21	0.15
*30	10.00	10.19	0.15
40	10.00	10.18	0.15
80	10.00	10.12	0.15

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16117

Condition : Installation by vertical direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V027

Page 4 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Transverse			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.22	0.15
*30	10.00	10.07	0.15
40	10.00	10.01	0.15
80	10.00	9.90	0.14

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16117

Condition : Installation by Transverse direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number.

22V027

Page 5 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Longitude			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.19	0.15
*30	10.00	10.06	0.15
40	10.00	10.04	0.15
80	10.00	9.99	0.14

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16117

Condition : Installation by Longitude direction

*** End Certificate of Calibration ***



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

81 Moo 11 Bangkrui - Sainoi Rd., Sainoi, Nonthaburi 11150 Tel. (662) 436-8789 Ext. 6155



Certificate of Calibration

Issued by : Vibration Laboratory

Certificate No. : 22V022

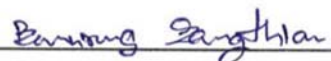
Reference No. : CBLUE01V008

Received Date : 08 March 2022

Calibrated Date : 16 March 2022

Page 1 of 5

Client : ห้างหุ้นส่วนจำกัด บอ คอนซัลแตนท์
Address : 32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพมหานคร 10140
Equipment : VIBRATION METER
Manufacture /Brand : INSTANTEL
Model : Micromate
Serial No./ ID No. : UM8882


(Mr. Bamrung Sangthian)
Authorised Signatory

Issue Date 16 / March / 2022

This certificate is issued in accordance with the conditions of accreditation granted by The National Accreditation Council of Thailand which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the units of measurement realised at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the head of calibration services and environmental analysis department.



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V022

Page 2 of 5

Standard Used

The table below is described the calibrator through the International System of Unit.

Description	Manufacture/Model	Serial No.	Traceable No.	Due Date
Conditioning Amplifier Type 2626	Bruel & Kjaer	1242376	AV-0045-20	18 September 2022
Accelerometer Type 8305	Bruel & Kjaer	1262817	AV- 0043-20	02 December 2022
Digital Multimeter /8846A	FLUKE	4330020	21E287	20 September 2022

Ambient Environment :

The Calibration was performed in an environment of $(23 \pm 2) ^\circ \text{C}$ and $(50 \pm 10) \%$ relative humidity.

Measurement Method :

The unit under calibration was calibrated by comparison with standard accelerometer. The calibration method is based on WI-MCC-E-301 by comparison with reference accelerometer standard .

Measurement Results

The measurement results, labeled in the following pages give the calibration results and associated with measurement uncertainties.

Measurement Uncertainty

The Measurement Uncertainty are labeled on the following pages Completed the expanded uncertainty, that was calculated in accordance with the method in M3003, using coverage factor $k = 2$. The value of the measured lies within the assigned ranges of values of confidence level of approximately 95%.

Traceability :

The measurement is traceable to the International System of Unit through

- The National Institute of Metrology (Thailand)
- Metrology and Calibration Department



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number.

22V022

Page 3 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Vertical			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.39	0.15
*30	10.00	10.26	0.15
40	10.00	10.20	0.15
80	10.00	10.11	0.15

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Transducer Part : ENSL 16119

Condition : Installation by vertical direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V022

Page 4 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Transverse			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.31	0.15
*30	10.00	10.10	0.15
40	10.00	10.03	0.15
80	10.00	9.94	0.14

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16119

Condition : Installation by Transverse direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V022

Page 5 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Longitude			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.36	0.15
*30	10.00	10.17	0.15
40	10.00	10.10	0.15
80	10.00	10.00	0.14

* Calibration maked "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16119

Condition : Installation by Longitude direction

* End Certificate of Calibration *

ประจำเดือนตุลาคม พ.ศ. 2565

TSP High Volume Sampler Calibration

Site: Blue
Sampler: TSP#15
Recorder: Kimhan P.

Date: 23/08/2022
Test: Supackak S.
Approval: Nidda A.

CONDITIONS

Sea Level Pressure (hPa): 1008.0
Temperature (deg C): 32.0
Seasonal SL Press. (hPa): 1013.0
Seasonal Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.1
Temperature (deg K): 305.0
Corrected Seasonal (mm Hg): 759.8
Seasonal Temp. (deg K): 303.0

CALIBRATION ORIFICE

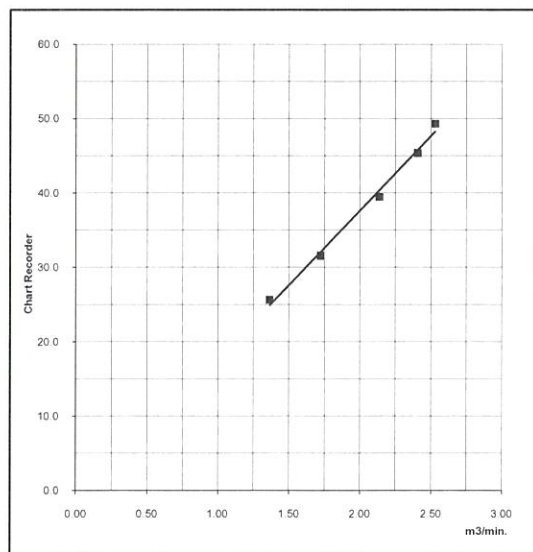
Make: Tisch
Model:
Serial#: 1635

Qstd Slope: 1.26614
Qstd Intercept: -0.02116
Date Certified: 1 Aug 22

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.40	2.528	50.0	49.29	Slope = 20.0276 Intercept = -2.4227 Corr. coeff. = 0.9961 # of Observations: 5
2	9.40	2.404	46.0	45.35	
3	7.40	2.135	40.0	39.44	
4	4.80	1.723	32.0	31.55	
5	3.00	1.365	26.0	25.63	

Range of Chart 20
at 1.1 - 1.7 m3/min. 32



Calibrated by : _____

Kimhan Paepipat
23/08/2022

Approved by : _____

Nidda Anansuwanchai
23/08/2022

TSP High Volume Sampler Calibration

Site: Blue
Sampler: TSP#36
Recorder: Kimhan P.

Date: 23/08/2022
Test: Supackak S.
Approval: Nidda A.

CONDITIONS

Sea Level Pressure (hPa): 1008.0
Temperature (deg C): 32.0
Seasonal SL Press. (hPa): 1013.0
Seasonal Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.1
Temperature (deg K): 305.0
Corrected Seasonal (mm Hg): 759.8
Seasonal Temp. (deg K): 303.0

CALIBRATION ORIFICE

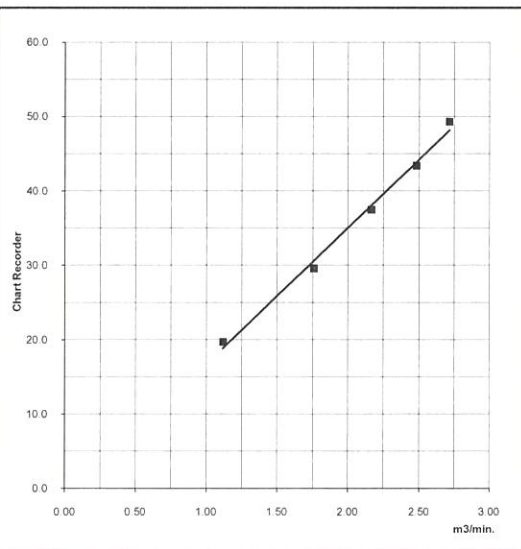
Make: Tisch
Model:
Serial#: 1635

Qstd Slope: 1.26614
Qstd Intercept: -0.02116
Date Certified: 1 Aug 22


CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	<u>12.00</u>	<u>2.714</u>	<u>50.0</u>	<u>49.29</u>	Slope = <u>18.3489</u> Intercept = <u>-1.6634</u> Corr. coeff.= <u>0.9966</u> # of Observations: <u>5</u>
2	<u>10.00</u>	<u>2.479</u>	<u>44.0</u>	<u>43.38</u>	
3	<u>7.60</u>	<u>2.163</u>	<u>38.0</u>	<u>37.46</u>	
4	<u>5.00</u>	<u>1.758</u>	<u>30.0</u>	<u>29.58</u>	
5	<u>2.00</u>	<u>1.118</u>	<u>20.0</u>	<u>19.72</u>	


Range of Chart 19
at 1.1 - 1.7 m3/min. 29



Calibrated by :


Kimhan Paepipat
23/08/2022

Approved by :


Nidda Anansuwanchai
23/08/2022

TSP High Volume Sampler Calibration

SITE

Site: Blue
Sampler: PM#1
Recorder: Kimhan P.

Date: 23/08/2022
Test: Supackak S.
Approval: Nidda A.

CONDITIONS

Sea Level Pressure (hPa): 1008.0
Temperature (deg C): 32.0
Seasonal SL Press. (hPa): 1013.0
Seasonal Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.1
Temperature (deg K): 305.0
Corrected Seasonal (mm Hg): 759.8
Seasonal Temp. (deg K): 303.0

CALIBRATION ORIFICE

Make: Tisch
Model:
Serial#: 1635

Slope: 1.26614
Intercept: -0.02116
Date Certified: 1 Aug 22

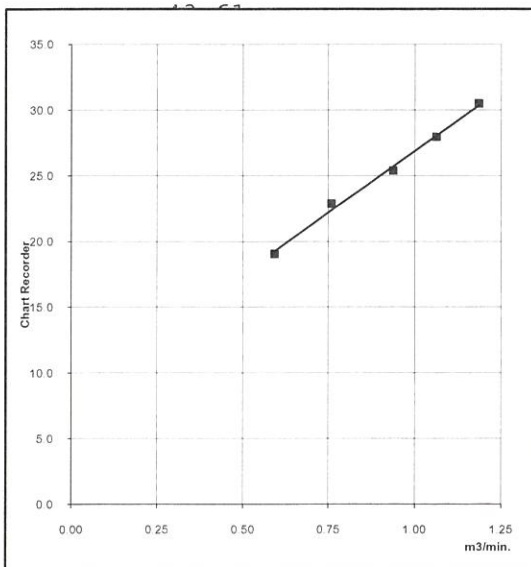
TEST

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	<u>10.00</u>	<u>1.185</u>	<u>48.0</u>	<u>30.49</u>
2	<u>8.00</u>	<u>1.062</u>	<u>44.0</u>	<u>27.95</u>
3	<u>6.40</u>	<u>0.937</u>	<u>40.0</u>	<u>25.41</u>
4	<u>4.00</u>	<u>0.760</u>	<u>36.0</u>	<u>22.87</u>
5	<u>2.60</u>	<u>0.593</u>	<u>30.0</u>	<u>19.05</u>

LINEAR REGRESSION

Slope (m) = 18.7506
Intercept (b) = 8.1367
Corr. coeff. (r) = 0.9975
SFR = 1.143
SSP = 46.56
of Observations: 5

Range of Chart 44
at SFR $\pm 10\%$ 49



Calibrated by :

Kimhan Paepipat
23/08/2022

Approved by :

Nidda Anansuwanchai
23/08/2022

TSP High Volume Sampler Calibration

SITE

Site: Blue
Sampler: PM#3
Recorder: Kimhan P.

Date: 23/08/2022
Test: Supackak S.
Approval: Nidda A.

CONDITIONS

Sea Level Pressure (hPa): 1008.0
Temperature (deg C): 32.0
Seasonal SL Press. (hPa): 1013.0
Seasonal Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 756.1
Temperature (deg K): 305.0
Corrected Seasonal (mm Hg): 759.8
Seasonal Temp. (deg K): 303.0

CALIBRATION ORIFICE

Make: Tisch
Model:
Serial#: 1635

Slope: 1.26614
Intercept: -0.02116
Date Certified: 1 Aug 22

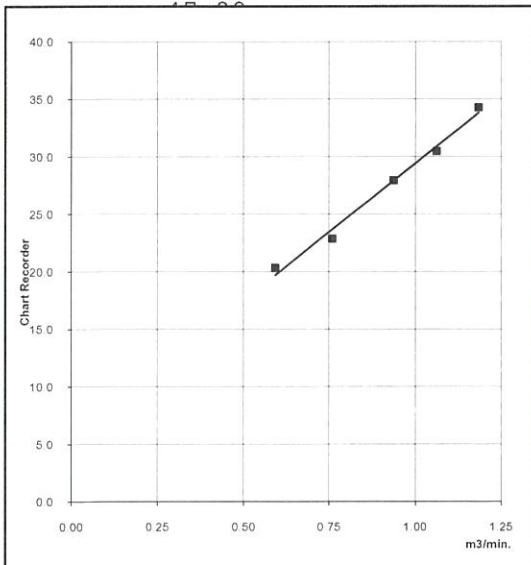
TEST

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	<u>12.40</u>	<u>1.185</u>	<u>54.0</u>	<u>34.30</u>
2	<u>9.80</u>	<u>1.062</u>	<u>48.0</u>	<u>30.49</u>
3	<u>7.60</u>	<u>0.937</u>	<u>44.0</u>	<u>27.95</u>
4	<u>4.80</u>	<u>0.760</u>	<u>36.0</u>	<u>22.87</u>
5	<u>3.00</u>	<u>0.593</u>	<u>32.0</u>	<u>20.32</u>

**LINEAR
REGRESSION**

Slope (m) = 23.8113
Intercept (b) = 5.5770
Corr. coeff. (r) = 0.9943
SFR = 1.143
SSP = 51.64
of Observations: 5

Range of Chart 48
at SFR $\pm 10\%$ 55



Calibrated by :

Kimhan Paepipat
23/08/2022

Approved by :

Nidda Anansuwanchai
23/08/2022

Verification Test Report

Report No.:

JM-650108-1/12 -SLM 04

☒ PM ☐ Onsite UTM :

Calibrated Date: 1 September 2022

Site : บริเวณพื้นที่ก่อสร้างโครงการ

Equipment: Sound Level Meter

Manufacturer: ACO

Model: 6236

Serial : 8562

Environment: Temperature 25.2 °C Humidity 52.9 %RH

Reference Standard: Sound Calibrator Class 1 Model CEL-284/2

Serial No. 4/06920836

Date of Calibration : Nov. 18, 2021

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
113.75	113.60	-0.15	113.80

Calibrated By:

(Chuchat Sankhot)

Date:

1 September 2022

Approve By:

(Phoowanart Tumthong)

Date:

1 September 2022

Verification Test Report

Report No.:

JM-650108-1/12 -SLM 03

☒ PM ☐ Onsite UTM :

Calibrated Date: 1 September 2022

Site : บริเวณพื้นที่ โรงพยาบาลเกษมราษฎร์ ประชาชื่น

Equipment: Sound Level Meter

Manufacturer: ACO

Model: 6236

Serial : 2022

Environment: Temperature 25.2 °C Humidity 52.9 %RH

Reference Standard: Sound Calibrator Class 1 Model CEL-284/2

Serial No. 4/06920836

Date of Calibration : Nov. 18, 2021

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
113.75	113.80	0.05	113.80

Calibrated By:

(Chuchat Sankhot)

Date:

1 September 2022

Approve By:

(Phoowanart Tumthong)

Date:

1 September 2022



Certificate of Calibration

Certificate Number : SPR21110288-4

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.

142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Sound Level Calibrator

Manufacturer : CEL

Model : CEL-284/2

Serial Number : 4/06920836

ID. Number : N/A

Environmental Conditions

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

Received Date : 16 Nov 2021

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

Calibration Date : 18 Nov 2021

Location of Calibration : In-Lab

Recommend Due Date : 18 Nov 2022

Calibration Procedure : In-House Method

Date of Issue : 19 Nov 2021

Method of Calibration

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

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

Calibrated by : Mr.Chumpon Dokpikul

Approved by :

Calibration Officer

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR21110288-4

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Measuring Receiver	8902A	2950A02471	EF-0001-21	08 Jan 2022
AUDIO Analyzer	8903B	3011A09975	EL04965/21	19 Feb 2022

Traceability

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

NIMT - The National Institute of Metrology, Thailand.

PCAL - Professional Calibration & Services Co.,Ltd



UUC Setting (\pm dB)	Standard Reading (dB)	Error (dB)	Uncertainty (\pm dB)
114	113.75	0.25	1.5



Certificate of Calibration

Certificate Number : SPR21110288-6

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.

142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Primary Flow Meter

Manufacturer : BIOS

Model : DCL-ML

Serial Number : 5374

ID. Number : N/A

Environmental Conditions

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

Received Date : 16 Nov 2021

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

Calibration Date : 17 Nov 2021

Location of Calibration : In-Lab

Recommend Due Date : 17 Nov 2022

Calibration Procedure : SP-CPM-04-13

Date of Issue : 18 Nov 2021

Method of Calibration

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

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

Calibrated by : Mr. Jirasak Pumbut

Approved by :

Calibration Officer

(Mr. Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR21110288-6

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Mass Flow Calibrator	AFC-COMplete-10	12532	AD2107-244-0001	24 Jul 2022

Traceability

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

MIT - Miracle International Technology Co.,Ltd.



Result of Calibration

Certificate No. : SPR21110288-6

Page : 3 of 3

Range : 0 to 5000 mL/Min

Resolution : 0.1 mL/Min

Function : Air Flow Measurement

Unit : mL/Min

Calibration Point	UUC Reading	Standard Reading	UUC Error	K Factor Value	Uncertainty (±)
1000.0	1000.0	999.85	0.15	0.9999	58
2000.0	2000.0	2000.2	-0.2	1.0001	58
3000.0	3000.0	2999.4	0.6	0.9998	58
4000.0	4000.0	3999.5	0.5	0.9999	58
5000.0	5000.0	4999.3	0.7	0.9999	58

Note:

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

Measurement Uncertainty

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

- End of Certificate -

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

โทร.0-2873-6045-6 โทรสาร 0-2873-6046

ห้องปฏิบัติการวิเคราะห์เอกซเรย์ไอออนบวกลงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : SO₂ Analyzer

Serial No. : 2712, 3569

Brand/Model: Teledyne-API/T100

Date of Calibrate : August 30, 2022

Reference Standard

Certification Date: October 29, 2019

Component: SO₂: 55.62 ppm , NO: 57.21 ppm , CO : 4,551 ppm

Cylinder No.: EB0128767

Expiry Date: October 29, 2027

Calibration Check (Before adjust)						
Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
2712	-0.1	0	-0.1	398.9	400	-1.1
3569	0.2	0	0.2	400.2	400	0.2
Calibration Check (After adjust)						
Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
2712	0	0	0	400	400	0
3569	0	0	0	400	400	0

นางสาวนิดดา อนันต์สุวรรณชัย
BLUE CONSULTANT
Limited Partnership

นางสาวนิดดา อนันต์สุวรรณชัย

(นางสาวนิดดา อนันต์สุวรรณชัย)

ผู้จัดการห้องปฏิบัติการ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

โทร.0-2873-6045-6 โทรสาร 0-2873-6046

ห้องปฏิบัติการวิเคราะห์เอกซเรย์ไอออนบวกลงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : NOx Analyzer
Serial No. : 3205, 17C-68152-359

Brand/Model:Teledyne-API/T200, Thermo/42C
Date of Calibrate : August 30, 2022

Reference Standard

Cylinder No.: EB0128767

Certification Date: October 29, 2019

Expiry Date: October 29, 2027

Component: SO2: 55.62 ppm , NO: 57.21 ppm , CO : 4,551 ppm

Calibration Check (Before adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx
3205	3.9/1.4/5.3	0/0/0	3.9/1.4/5.3	398.2/3.2/401.4	400/0/400	-1.8/3.2/1.4
17C-68152-359	4.5/1.2/5.7	0/0/0	4.5/1.2/5.7	404.0/3.9/407.9	400/0/400	4.0/3.9/7.9

Calibration Check (After adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx
3205	0/0/0	0/0/0	0/0/0	400/0/400	400/0/400	0/0/0
17C-68152-359	0/0/0	0/0/0	0/0/0	400/0/400	400/0/400	0/0/0

ในนามห้องปฏิบัติการห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
CONSULTANT
Limited Partnership



(นางสาวนิตดา อนันต์สุวรรณชัย)

ผู้จัดการห้องปฏิบัติการ



Certificate of Calibration

Certificate Number : SPR22030278-2

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.

142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 122022

ID. Number : N/A

Environmental Conditions

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

Received Date : 17 Mar 2022

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

Calibration Date : 21 Mar 2022

Location of Calibration : In-Lab

Recommend Due Date : 21 Mar 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 22 Mar 2022

Method of Calibration

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

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

Calibrated by : Mr. Surasak Vakjan

Calibration Officer

Approved by :


(Mr. Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22030278-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	SC-942	B014059	EEL.BP. 34/1264	22 Dec 2022

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR22030278-2

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.1	94.1	0.1	0.1	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.2	94.2	0.2	0.2	0.15
114	114.1	114.1	0.1	0.1	0.15

Note:

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

Measurement Uncertainty

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

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR22020414-2

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.

142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : S-08562

ID. Number : N/A

Environmental Conditions

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

Received Date : 23 Feb 2022

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

Calibration Date : 24 Feb 2022

Location of Calibration : In-Lab

Recommend Due Date : 24 Feb 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 25 Feb 2022

Method of Calibration

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

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

Calibrated by : Mr.Chumpon Dokpikul

Approved by :

Calibration Officer

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22020414-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	SC-942	B014059	EEL.BP. 34/1264	22 Dec 2022

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR22020414-2

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.2	94.2	0.2	0.2	0.15
114	114.1	114.1	0.1	0.1	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.2	94.2	0.2	0.2	0.15
114	114.2	114.2	0.2	0.2	0.15

Note:

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

Measurement Uncertainty

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

- End of Certificate -



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

81 Moo 11 Bangkruai - Sainoi Rd., Sainoi, Nonthaburi 11150 Tel. (662) 436-8789 Ext. 6155



Certificate of Calibration

Issued by : Vibration Laboratory

Certificate No. : 22V027

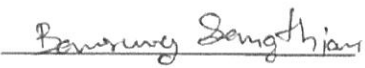
Reference No. : CBLUE01V004

Received Date : 08 March 2022

Calibrated Date : 15 March 2022

Page 1 of 5

Client : ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
Address : 32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพมหานคร 10140
Equipment : VIBRATION METER
Manufacture /Brand : INSTANTEL
Model : Micromate
Serial No./ ID No. : UM8171


(Mr. Bamrung Sangthian)

Authorised Signatory

Issue Date 16 / March / 2022

This certificate is issued in accordance with the conditions of accreditation granted by The National Accreditation Council of Thailand which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the units of measurement realised at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the head of calibration services and environmental analysis department.

FM-02/QP-MCC-09 Rev.3

e-mail : MCC@egat.co.th



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V027

Page 2 of 5

Standard Used

The table below is described the calibrator through the International System of Unit.

Description	Manufacture/Model	Serial No.	Traceable No.	Due Date
Conditioning Amplifier Type 2626	Bruel & Kjaer	1242376	AV-0045-20	18 September 2022
Accelerometer Type 8305	Bruel & Kjaer	1262817	AV- 0043-20	02 December 2022
Digital Multimeter /8846A	FLUKE	4330020	21E287	20 September 2022

Ambient Environment :

The Calibration was performed in an environment of $(23 \pm 2) ^\circ \text{C}$ and $(50 \pm 10) \%$ relative humidity.

Measurement Method :

The unit under calibration was calibrated by comparison with standard accelerometer. The calibration method is based on WI-MCC-E-301 by comparison with reference accelerometer standard .

Measurement Results

The measurement results, labeled in the following pages give the calibration results and associated with measurement uncertainties.

Measurement Uncertainty

The Measurement Uncertainty are labeled on the following pages Completed the expanded uncertainty, that was calculated in accordance with the method in M3003, using coverage factor $k = 2$. The value of the measured lies within the assigned ranges of values of confidence level of approximately 95%.

Traceability :

The measurement is traceable to the International System of Unit through

- The National Institute of Metrology (Thailand)
- Metrology and Calibration Department



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number.

22V027

Page 3 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Vertical			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
* 20	10.00	10.21	0.15
*30	10.00	10.19	0.15
40	10.00	10.18	0.15
80	10.00	10.12	0.15

* Calibration maked "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16117

Condition : Installation by vertical direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number.

22V027

Page 4 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Transverse			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.22	0.15
*30	10.00	10.07	0.15
40	10.00	10.01	0.15
80	10.00	9.90	0.14

* Calibration maked "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16117

Condition : Installation by Transverse direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number.

22V027

Page 5 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Longitude			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.19	0.15
*30	10.00	10.06	0.15
40	10.00	10.04	0.15
80	10.00	9.99	0.14

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16117

Condition : Installation by Longitude direction

* End Certificate of Calibration *



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand



81 Moo 11 Bangkruai - Sainoi Rd., Sainoi, Nonthaburi 11150 Tel. (662) 436-8789 Ext. 6155

Certificate of Calibration

Issued by : Vibration Laboratory

Certificate No. : 22V022

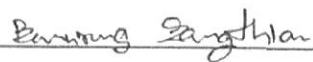
Reference No. : CBLUE01V008

Received Date : 08 March 2022

Calibrated Date : 16 March 2022

Page 1 of 5

Client : ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
Address : 32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพมหานคร 10140
Equipment : VIBRATION METER
Manufacture /Brand : INSTANTEL
Model : Micromate
Serial No./ ID No. : UM8882


(Mr. Bamrung Sangthian)

Authorised Signatory

Issue Date 16 / March / 2022

This certificate is issued in accordance with the conditions of accreditation granted by The National Accreditation Council of Thailand which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the units of measurement realised at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the head of calibration services and environmental analysis department.

FM-02/QP-MCC-09 Rev.3

e-mail : MCC@egat.co.th



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V022

Page 2 of 5

Standard Used

The table below is described the calibrator through the International System of Unit.

Description	Manufacture/Model	Serial No.	Traceable No.	Due Date
Conditioning Amplifier Type 2626	Bruel & Kjaer	1242376	AV-0045-20	18 September 2022
Accelerometer Type 8305	Bruel & Kjaer	1262817	AV- 0043-20	02 December 2022
Digital Multimeter /8846A	FLUKE	4330020	21E287	20 September 2022

Ambient Environment :

The Calibration was performed in an environment of $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 10) \%$ relative humidity.

Measurement Method :

The unit under calibration was calibrated by comparison with standard accelerometer. The calibration method is based on WI-MCC-E-301 by comparison with reference accelerometer standard .

Measurement Results

The measurement results, labeled in the following pages give the calibration results and associated with measurement uncertainties.

Measurement Uncertainty

The Measurement Uncertainty are labeled on the following pages Completed the expanded uncertainty, that was calculated in accordance with the method in M3003, using coverage factor $k = 2$. The value of the measured lies within the assigned ranges of values of confidence level of approximately 95%.

Traceability :

The measurement is traceable to the International System of Unit through

- The National Institute of Metrology (Thailand)
- Metrology and Calibration Department



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number.

22V022

Page 3 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Vertical			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.39	0.15
*30	10.00	10.26	0.15
40	10.00	10.20	0.15
80	10.00	10.11	0.15

* Calibration maked "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16119

Condition : Installation by vertical direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V022

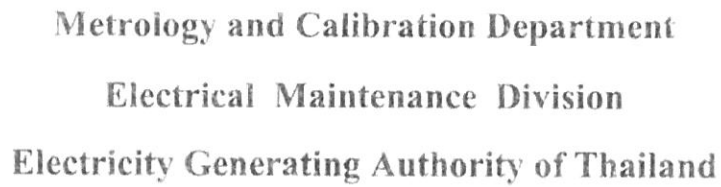
Page 4 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Transverse			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.31	0.15
*30	10.00	10.10	0.15
40	10.00	10.03	0.15
80	10.00	9.94	0.14

* Calibration maked "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16119

Condition : Installation by Transverse direction



Page 5 of 5

* End Certificate of Calibration *

ประจำเดือนพฤศจิกายน พ.ศ. 2565

TE-Wilbur Calibration Worksheet

145 South Miami Ave. Cleves, OH 45002 513.467.9000 sales@tisch-env.com

Date / Time: 1/02/22 10 : 20 Serial Number: 299 Technician: NUT

Calibrator Make/Model: BGI Deltacal Due Date: 05/22 S/N: 200042

AMBIENT TEMPERATURE (°C)

As Found	Calibrator Reading	As Left
<u>37.0</u>	<u>35.2</u>	<u>35.2</u>

FILTER TEMPERATURE (°C)

As Found	Calibrator Reading	As Left
<u>34.5</u>	<u>36.8</u>	<u>36.9</u>

BAROMETRIC PRESSURE (mmHg)

As Found	Calibrator Reading	As Left
<u>751.6</u>	<u>752.3</u>	<u>752.2</u>

FLOW CALIBRATION (Liters Per Minute)

	As Found		Calibrator Reading	As Left	
Slope:	<u>0.931</u>	1	<u>15.02</u>	<u>14.85</u>	<u>15.03</u>
Intercept:	<u>1.294</u>	2	<u>15.93</u>	<u>15.87</u>	<u>15.84</u>
R factor:	<u>0.99926</u>	3	<u>16.96</u>	<u>16.86</u>	<u>16.67</u>
		4	<u>18.91</u>	<u>19.00</u>	<u>18.34</u>
Calibration Verification:			Setpoint <u>16.67</u>	As Found <u>16.67</u>	

LEAK CHECK RESULTS

Leak Check Start Pressure: 234.8 (inches of H₂O)
 Leak Check Fail Pressure: 184.8 (inches of H₂O)
 Leak Check End Pressure: 225.1 (inches of H₂O)

Leak Check Pass / Fail

Pass ☒

Fail ☐

Technician: NUT Date: 1/02/2022

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

โทร.0-2873-6045-6 โทรสาร 0-2873-6046

ห้องปฏิบัติการวิเคราะห์เอกซเรย์ไอออนูญาตลงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Instrument : BGI PQ200 Air Sampler

Manufacturer : BGI

Model : PQ200

Date of Calibrate : November 25, 2022

Calibrator : Volumetric Air Flow Calibrator

Manufacturer : Mesa Labs

Model: DeltaCal DC1

Serial No. : 170517

Environment : Temperature 32.1°C

Humidity 36%RH

Barometric Pressure 757 mmHg

Calibration Report

No.	Serial No.	Standard Setting (LPM)	Instrument Reading (LPM)	Inspection Result
2	71011	16.67	16.70	Pass

ในนามห้องปฏิบัติการห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์



(นางสาวนิดดา อนันต์สุวรรณชัย)

ผู้จัดการห้องปฏิบัติการ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
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ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

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ห้องปฏิบัติการวิเคราะห์เอกชนใบอนุญาตลงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : SO₂ Analyzer

Serial No. : 233, 430

Brand/Model: API/100A, Teledyne-API/T100

Date of Calibrate : November 25, 2022

Reference Standard

Certification Date: October 29, 2019

Component: SO₂: 55.62 ppm , NO: 57.21 ppm , CO : 4,551 ppm

Cylinder No.: EB0128767

Expiry Date: October 29, 2027

Calibration Check (Before adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
233	0.2	0	0.2	401.0	400	1.0
430	0.3	0	0.3	400.6	400	0.6

Calibration Check (After adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
233	0	0	0	400	400	0
430	0	0	0	400	400	0

ในนามห้องปฏิบัติการห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์



(นางสาวนิดดา อนันต์สุวรรณชัย)

ผู้จัดการห้องปฏิบัติการ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
BLUE CONSULTANT
Limited Partnership

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ **Blue Consultant Limited Partnership**

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

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ห้องปฏิบัติการวิเคราะห์เอกชนใบอนุญาตลงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : SO₂ Analyzer

Brand/Model: Teledyne-API/T100

Serial No. : 2712, 3569

Date of Calibrate : August 30, 2022

Reference Standard

Cylinder No.: EB0128767

Certification Date: October 29, 2019

Expiry Date: October 29, 2027

Component: SO₂: 55.62 ppm , NO: 57.21 ppm , CO : 4,551 ppm

Calibration Check (Before adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
2712	-0.1	0	-0.1	398.9	400	-1.1
3569	0.2	0	0.2	400.2	400	0.2

Calibration Check (After adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
2712	0	0	0	400	400	0
3569	0	0	0	400	400	0

ในนามห้องปฏิบัติการห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์



(นางสาวนิดา อนันต์สุวรรณชัย)

ผู้จัดการห้องปฏิบัติการ

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โทร.0-2873-6045-6 โทรสาร 0-2873-6046

ห้องปฏิบัติการวิเคราะห์เอกซเรย์ไอออนบวกตั้งแต่วันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : NOx Analyzer

Serial No. : 3205, 17C-68152-359

Brand/Model:Teledyne-API/T200, Thermo/42C

Date of Calibrate : August 30, 2022

Reference Standard

Certification Date: October 29, 2019

Component: SO2: 55.62 ppm , NO: 57.21 ppm , CO : 4,551 ppm

Cylinder No.: EB0128767

Expiry Date: October 29, 2027

Calibration Check (Before adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx
3205	3.9/1.4/5.3	0/0/0	3.9/1.4/5.3	398.2/3.2/401.4	400/0/400	-1.8/3.2/1.4
17C-68152-359	4.5/1.2/5.7	0/0/0	4.5/1.2/5.7	404.0/3.9/407.9	400/0/400	4.0/3.9/7.9

Calibration Check (After adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx
3205	0/0/0	0/0/0	0/0/0	400/0/400	400/0/400	0/0/0
17C-68152-359	0/0/0	0/0/0	0/0/0	400/0/400	400/0/400	0/0/0

ในนามห้องปฏิบัติการห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์



(นางสาวนิดดา อนันต์สุวรรณชัย)

ผู้จัดการห้องปฏิบัติการ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
Blue Consultant
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Certificate of Calibration

Certificate Number : SPR22060406-1

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.
142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Sound Calibrator

Manufacturer : Tenmars

Model : TM-100

Serial Number : 190301467

ID. Number : N/A

Environmental Conditions

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

Received Date : 24 Jun 2022

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

Calibration Date : 09 Jul 2022

Location of Calibration : In-Lab

Recommend Due Date : 09 Jul 2023

Calibration Procedure : In-House Method

Date of Issue : 10 Jul 2022

Method of Calibration

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

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

Calibrated by : Mr.Chumpon Dokpikul

Calibration Officer

Approved by :

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22060406-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Measuring Receiver	8902A	2950A02471	EF-0005-22	01 Feb 2023
AUDIO Analyzer	8903B	3011A09975	EL05615/22	22 Feb 2023

Traceability

This certification is traceable to the International System of Unit maintained at :
NIMT - The National Institute of Metrology, Thailand.
PCAL - Professional Calibration & Services Co.,Ltd



Result of Calibration

Certificate No. : SPR22060406-1

Page : 3 of 3

Function : Sound Level

UUC Setting (\pm dB)	Standard Reading (dB)	Error (dB)	Uncertainty (\pm dB)
94	94.04	-0.04	1.5
114	113.95	0.05	1.5

Note:

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

Measurement Uncertainty

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

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR22030278-2

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.

142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 122022

ID. Number : N/A

Environmental Conditions

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

Received Date : 17 Mar 2022

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

Calibration Date : 21 Mar 2022

Location of Calibration : In-Lab

Recommend Due Date : 21 Mar 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 22 Mar 2022

Method of Calibration

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

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

Calibrated by : Mr. Surasak Vakjan

Calibration Officer

Approved by :

(Mr. Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22030278-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	SC-942	B014059	EEL.BP. 34/1264	22 Dec 2022

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR22030278-2

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.1	94.1	0.1	0.1	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.2	94.2	0.2	0.2	0.15
114	114.1	114.1	0.1	0.1	0.15

Note:

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

Measurement Uncertainty

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

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR22020414-2

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.
142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : S-08562

ID. Number : N/A

Environmental Conditions

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

Received Date : 23 Feb 2022

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

Calibration Date : 24 Feb 2022

Location of Calibration : In-Lab

Recommend Due Date : 24 Feb 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 25 Feb 2022

Method of Calibration

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

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

Calibrated by : Mr.Chumpon Dokpikul

Calibration Officer

Approved by :

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22020414-2

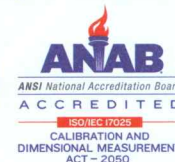
Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	SC-942	B014059	EEL.BP. 34/1264	22 Dec 2022

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR22020414-2

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.2	94.2	0.2	0.2	0.15
114	114.1	114.1	0.1	0.1	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.2	94.2	0.2	0.2	0.15
114	114.2	114.2	0.2	0.2	0.15

Note:

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

Measurement Uncertainty

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

– End of Certificate –



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

81 Moo 11 Bangkruai - Sainoi Rd., Sainoi, Nonthaburi 11150 Tel. (662) 436-8789 Ext. 6155



Certificate of Calibration

Issued by : Vibration Laboratory

Certificate No. : 22V027

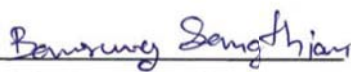
Reference No. : CBLUE01V004

Received Date : 08 March 2022

Calibrated Date : 15 March 2022

Page 1 of 5

Client : ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
Address : 32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพมหานคร 10140
Equipment : VIBRATION METER
Manufacture /Brand : INSTANTEL
Model : Micromate
Serial No./ ID No. : UM8171


(Mr. Bamrung Sangthian)

Authorised Signatory

Issue Date 16 / March 2022

This certificate is issued in accordance with the conditions of accreditation granted by The National Accreditation Council of Thailand which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the units of measurement realised at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the head of calibration services and environmental analysis department.



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V027

Page 2 of 5

Standard Used

The table below is described the calibrator through the International System of Unit.

Description	Manufacture/Model	Serial No.	Traceable No.	Due Date
Conditioning Amplifier Type 2626	Bruel & Kjaer	1242376	AV-0045-20	18 September 2022
Accelerometer Type 8305	Bruel & Kjaer	1262817	AV- 0043-20	02 December 2022
Digital Multimeter /8846A	FLUKE	4330020	21E287	20 September 2022

Ambient Environment :

The Calibration was performed in an environment of $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 10) \%$ relative humidity.

Measurement Method :

The unit under calibration was calibrated by comparison with standard accelerometer. The calibration method is based on WI-MCC-E-301 by comparison with reference accelerometer standard .

Measurement Results

The measurement results, labeled in the following pages give the calibration results and associated with measurement uncertainties.

Measurement Uncertainty

The Measurement Uncertainty are labeled on the following pages Completed the expanded uncertainty, that was calculated in accordance with the method in M3003, using coverage factor $k = 2$. The value of the measured lies within the assigned ranges of values of confidence level of approximately 95%.

Traceability :

The measurement is traceable to the International System of Unit through

- The National Institute of Metrology (Thailand)
- Metrology and Calibration Department



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V027

Page 3 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Vertical			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
* 20	10.00	10.21	0.15
*30	10.00	10.19	0.15
40	10.00	10.18	0.15
80	10.00	10.12	0.15

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Transducer Part : ENSL 16117

Condition : Installation by vertical direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V027

Page 4 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Transverse			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.22	0.15
*30	10.00	10.07	0.15
40	10.00	10.01	0.15
80	10.00	9.90	0.14

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Transducer Part : ENSL 16117

Condition : Installation by Transverse direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V027

Page 5 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Longitude			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.19	0.15
*30	10.00	10.06	0.15
40	10.00	10.04	0.15
80	10.00	9.99	0.14

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16117

Condition : Installation by Longitude direction

*** End Certificate of Calibration ***



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

81 Moo 11 Bangkrui - Sainoi Rd., Sainoi, Nonthaburi 11150 Tel. (662) 436-8789 Ext. 6155



Certificate of Calibration

Issued by : Vibration Laboratory

Certificate No. : 22V022

Reference No. : CBLUE01V008

Received Date : 08 March 2022

Calibrated Date : 16 March 2022

Page 1 of 5

Client : ห้างหุ้นส่วนจำกัด บอ คอนซัลแตนท์
Address : 32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพมหานคร 10140
Equipment : VIBRATION METER
Manufacture /Brand : INSTANTEL
Model : Micromate
Serial No./ ID No. : UM8882

Bamrung Sangthian
(Mr. Bamrung Sangthian)

Authorised Signatory

Issue Date 16 / March / 2022

This certificate is issued in accordance with the conditions of accreditation granted by The National Accreditation Council of Thailand which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the units of measurement realised at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the head of calibration services and environmental analysis department.



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V022

Page 2 of 5

Standard Used

The table below is described the calibrator through the International System of Unit.

Description	Manufacture/Model	Serial No.	Traceable No.	Due Date
Conditioning Amplifier Type 2626	Bruel & Kjaer	1242376	AV-0045-20	18 September 2022
Accelerometer Type 8305	Bruel & Kjaer	1262817	AV- 0043-20	02 December 2022
Digital Multimeter /8846A	FLUKE	4330020	21E287	20 September 2022

Ambient Environment :

The Calibration was performed in an environment of $(23 \pm 2) ^\circ \text{C}$ and $(50 \pm 10) \%$ relative humidity.

Measurement Method :

The unit under calibration was calibrated by comparison with standard accelerometer. The calibration method is based on WI-MCC-E-301 by comparison with reference accelerometer standard .

Measurement Results

The measurement results, labeled in the following pages give the calibration results and associated with measurement uncertainties.

Measurement Uncertainty

The Measurement Uncertainty are labeled on the following pages Completed the expanded uncertainty, that was calculated in accordance with the method in M3003, using coverage factor $k = 2$. The value of the measured lies within the assigned ranges of values of confidence level of approximately 95%.

Traceability :

The measurement is traceable to the International System of Unit through

- The National Institute of Metrology (Thailand)
- Metrology and Calibration Department



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number.

22V022

Page 3 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Vertical			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.39	0.15
*30	10.00	10.26	0.15
40	10.00	10.20	0.15
80	10.00	10.11	0.15

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Transducer Part : ENSL 16119

Condition : Installation by vertical direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V022

Page 4 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Transverse			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.31	0.15
*30	10.00	10.10	0.15
40	10.00	10.03	0.15
80	10.00	9.94	0.14

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Transducer Part : ENSL 16119

Condition : Installation by Transverse direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V022

Page 5 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Longitude			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.36	0.15
*30	10.00	10.17	0.15
40	10.00	10.10	0.15
80	10.00	10.00	0.14

* Calibration maked "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16119

Condition : Installation by Longitude direction

* End Certificate of Calibration *

ประจำเดือนธันวาคม พ.ศ. 2565

TE-Wilbur Calibration Worksheet

145 South Miami Ave. Cleves, OH 45002 513.467.9000 sales@tisch-env.com

Date / Time: 1/02/22 10 : 20 Serial Number: 299 Technician: NUT

Calibrator Make/Model: BGI Deltacal Due Date: 05/22 S/N: 200042

AMBIENT TEMPERATURE (°C)

As Found	Calibrator Reading	As Left
<u>37.0</u>	<u>35.2</u>	<u>35.2</u>

FILTER TEMPERATURE (°C)

As Found	Calibrator Reading	As Left
<u>34.5</u>	<u>36.8</u>	<u>36.9</u>

BAROMETRIC PRESSURE (mmHg)

As Found	Calibrator Reading	As Left
<u>751.6</u>	<u>752.3</u>	<u>752.2</u>

FLOW CALIBRATION (Liters Per Minute)

	As Found		Calibrator Reading	As Left	
Slope:	<u>0.931</u>	1	<u>15.02</u>	<u>14.85</u>	<u>15.03</u>
Intercept:	<u>1.294</u>	2	<u>15.93</u>	<u>15.87</u>	<u>15.84</u>
R factor:	<u>0.99926</u>	3	<u>16.96</u>	<u>16.86</u>	<u>16.67</u>
		4	<u>18.91</u>	<u>19.00</u>	<u>18.34</u>
Calibration Verification:			Setpoint <u>16.67</u>	As Found <u>16.67</u>	

LEAK CHECK RESULTS

Leak Check Start Pressure: 234.8 (inches of H₂O)
 Leak Check Fail Pressure: 184.8 (inches of H₂O)
 Leak Check End Pressure: 225.1 (inches of H₂O)

Leak Check Pass / Fail

Pass ☒

Fail ☐

Technician: NUT Date: 1/02/2022

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

โทร.0-2873-6045-6 โทรสาร 0-2873-6046

ห้องปฏิบัติการวิเคราะห์เอกซเรย์อนุญาตลงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Instrument : BGI PQ200 Air Sampler

Manufacturer : BGI

Model : PQ200

Date of Calibrate : November 25, 2022

Calibrator : Volumetric Air Flow Calibrator

Manufacturer : Mesa Labs

Model: DeltaCal DC1

Serial No. : 170517

Environment : Temperature 32.1°C

Humidity 36%RH

Barometric Pressure 757 mmHg

Calibration Report

No.	Serial No.	Standard Setting (LPM)	Instrument Reading (LPM)	Inspection Result
2	71011	16.67	16.70	Pass

ในนามห้องปฏิบัติการห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์



(นางสาวนิดดา อนันต์สุวรรณชัย)

ผู้จัดการห้องปฏิบัติการ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
Blue Consultant
Limited Partnership

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

โทร.0-2873-6045-6 โทรสาร 0-2873-6046

ห้องปฏิบัติการวิเคราะห์เอกซเรย์อนุญาตลงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : SO₂ Analyzer

Serial No. : 233, 430

Brand/Model: API/100A, Teledyne-API/T100

Date of Calibrate : November 25, 2022

Reference Standard

Certification Date: October 29, 2019

Component: SO₂: 55.62 ppm , NO: 57.21 ppm , CO : 4,551 ppm

Cylinder No.: EB0128767

Expiry Date: October 29, 2027

Calibration Check (Before adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
233	0.2	0	0.2	401.0	400	1.0
430	0.3	0	0.3	400.6	400	0.6

Calibration Check (After adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
233	0	0	0	400	400	0
430	0	0	0	400	400	0

ในนามห้องปฏิบัติการห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์



(นางสาวนิดดา อนันต์สุวรรณชัย)

ผู้จัดการห้องปฏิบัติการ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
BLUE CONSULTANT
Limited Partnership

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ **Blue Consultant Limited Partnership**

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

โทร.0-2873-6045-6 โทรสาร 0-2873-6046

ห้องปฏิบัติการวิเคราะห์เอกชนใบอนุญาตลงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : SO₂ Analyzer

Serial No. : 2712, 3569

Brand/Model: Teledyne-API/T100

Date of Calibrate : August 30, 2022

Reference Standard

Certification Date: October 29, 2019

Component: SO₂: 55.62 ppm , NO: 57.21 ppm , CO : 4,551 ppm

Cylinder No.: EB0128767

Expiry Date: October 29, 2027

Calibration Check (Before adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
2712	-0.1	0	-0.1	398.9	400	-1.1
3569	0.2	0	0.2	400.2	400	0.2

Calibration Check (After adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
2712	0	0	0	400	400	0
3569	0	0	0	400	400	0

ในนามห้องปฏิบัติการห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์



(นางสาวนิดดา อนันต์สุวรรณชัย)

ผู้จัดการห้องปฏิบัติการ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

โทร.0-2873-6045-6 โทรสาร 0-2873-6046

ห้องปฏิบัติการวิเคราะห์เอกซเรย์ไอออนบวกตั้งแต่วันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : NOx Analyzer

Serial No. : 3205, 17C-68152-359

Brand/Model:Teledyne-API/T200, Thermo/42C

Date of Calibrate : August 30, 2022

Reference Standard

Certification Date: October 29, 2019

Component: SO2: 55.62 ppm , NO: 57.21 ppm , CO : 4,551 ppm

Cylinder No.: EB0128767

Expiry Date: October 29, 2027

Calibration Check (Before adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx
3205	3.9/1.4/5.3	0/0/0	3.9/1.4/5.3	398.2/3.2/401.4	400/0/400	-1.8/3.2/1.4
17C-68152-359	4.5/1.2/5.7	0/0/0	4.5/1.2/5.7	404.0/3.9/407.9	400/0/400	4.0/3.9/7.9

Calibration Check (After adjust)

Serial No.	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)
	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx
3205	0/0/0	0/0/0	0/0/0	400/0/400	400/0/400	0/0/0
17C-68152-359	0/0/0	0/0/0	0/0/0	400/0/400	400/0/400	0/0/0

ในนามห้องปฏิบัติการห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์



(นางสาวนิดดา อนันต์สุวรรณชัย)

ผู้จัดการห้องปฏิบัติการ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
Blue Consultant
Limited Partnership



Certificate of Calibration

Certificate Number : SPR22060406-1

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.
142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Sound Calibrator

Manufacturer : Tenmars

Model : TM-100

Serial Number : 190301467

ID. Number : N/A

Environmental Conditions

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

Received Date : 24 Jun 2022

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

Calibration Date : 09 Jul 2022

Location of Calibration : In-Lab

Recommend Due Date : 09 Jul 2023

Calibration Procedure : In-House Method

Date of Issue : 10 Jul 2022

Method of Calibration

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

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

Calibrated by : Mr.Chumpon Dokpikul

Calibration Officer

Approved by :

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22060406-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Measuring Receiver	8902A	2950A02471	EF-0005-22	01 Feb 2023
AUDIO Analyzer	8903B	3011A09975	EL05615/22	22 Feb 2023

Traceability

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

NIMT - The National Institute of Metrology, Thailand.

PCAL - Professional Calibration & Services Co.,Ltd



Result of Calibration

Certificate No. : SPR22060406-1

Page : 3 of 3

Function : Sound Level

UUC Setting (\pm dB)	Standard Reading (dB)	Error (dB)	Uncertainty (\pm dB)
94	94.04	-0.04	1.5
114	113.95	0.05	1.5

Note:

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

Measurement Uncertainty

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

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR22030278-2

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.

142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 122022

ID. Number : N/A

Environmental Conditions

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

Received Date : 17 Mar 2022

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

Calibration Date : 21 Mar 2022

Location of Calibration : In-Lab

Recommend Due Date : 21 Mar 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 22 Mar 2022

Method of Calibration

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

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

Calibrated by : Mr. Surasak Vakjan

Calibration Officer

Approved by :

(Mr. Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22030278-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	SC-942	B014059	EEL.BP. 34/1264	22 Dec 2022

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR22030278-2

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.1	94.1	0.1	0.1	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.2	94.2	0.2	0.2	0.15
114	114.1	114.1	0.1	0.1	0.15

Note:

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

Measurement Uncertainty

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

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR22020414-2

Page : 1 of 3

Customer : MONITORING AND ACCESSORY ENVIRONMENTAL CO., LTD.

142, Soi Kalapapruek 6, Bang Wa Sub-district, Phasicharoen District,
Bangkok 10160

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : S-08562

ID. Number : N/A

Environmental Conditions

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

Received Date : 23 Feb 2022

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

Calibration Date : 24 Feb 2022

Location of Calibration : In-Lab

Recommend Due Date : 24 Feb 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 25 Feb 2022

Method of Calibration

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

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

Calibrated by : Mr.Chumpon Dokpikul

Calibration Officer

Approved by :

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22020414-2

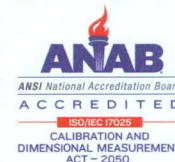
Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	SC-942	B014059	EEL.BP. 34/1264	22 Dec 2022

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR22020414-2

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.2	94.2	0.2	0.2	0.15
114	114.1	114.1	0.1	0.1	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.2	94.2	0.2	0.2	0.15
114	114.2	114.2	0.2	0.2	0.15

Note:

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

Measurement Uncertainty

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

– End of Certificate –



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

81 Moo 11 Bangkruai - Sainoi Rd., Sainoi, Nonthaburi 11150 Tel. (662) 436-8789 Ext. 6155



Certificate of Calibration

Issued by : Vibration Laboratory

Certificate No. : 22V027

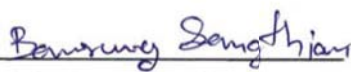
Reference No. : CBLUE01V004

Received Date : 08 March 2022

Calibrated Date : 15 March 2022

Page 1 of 5

Client : ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์
Address : 32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพมหานคร 10140
Equipment : VIBRATION METER
Manufacture /Brand : INSTANTEL
Model : Micromate
Serial No./ ID No. : UM8171


(Mr. Bamrung Sangthian)

Authorised Signatory

Issue Date 16 / March 2022

This certificate is issued in accordance with the conditions of accreditation granted by The National Accreditation Council of Thailand which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the units of measurement realised at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the head of calibration services and environmental analysis department.



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V027

Page 2 of 5

Standard Used

The table below is described the calibrator through the International System of Unit.

Description	Manufacture/Model	Serial No.	Traceable No.	Due Date
Conditioning Amplifier Type 2626	Bruel & Kjaer	1242376	AV-0045-20	18 September 2022
Accelerometer Type 8305	Bruel & Kjaer	1262817	AV- 0043-20	02 December 2022
Digital Multimeter /8846A	FLUKE	4330020	21E287	20 September 2022

Ambient Environment :

The Calibration was performed in an environment of $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 10) \%$ relative humidity.

Measurement Method :

The unit under calibration was calibrated by comparison with standard accelerometer. The calibration method is based on WI-MCC-E-301 by comparison with reference accelerometer standard .

Measurement Results

The measurement results, labeled in the following pages give the calibration results and associated with measurement uncertainties.

Measurement Uncertainty

The Measurement Uncertainty are labeled on the following pages Completed the expanded uncertainty, that was calculated in accordance with the method in M3003, using coverage factor $k = 2$. The value of the measured lies within the assigned ranges of values of confidence level of approximately 95%.

Traceability :

The measurement is traceable to the International System of Unit through

- The National Institute of Metrology (Thailand)
- Metrology and Calibration Department



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V027

Page 3 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Vertical			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
* 20	10.00	10.21	0.15
*30	10.00	10.19	0.15
40	10.00	10.18	0.15
80	10.00	10.12	0.15

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16117

Condition : Installation by vertical direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V027

Page 4 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Transverse			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.22	0.15
*30	10.00	10.07	0.15
40	10.00	10.01	0.15
80	10.00	9.90	0.14

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Transducer Part : ENSL 16117

Condition : Installation by Transverse direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V027

Page 5 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Longitude			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.19	0.15
*30	10.00	10.06	0.15
40	10.00	10.04	0.15
80	10.00	9.99	0.14

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16117

Condition : Installation by Longitude direction

*** End Certificate of Calibration ***



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

81 Moo 11 Bangkrui - Sainoi Rd., Sainoi, Nonthaburi 11150 Tel. (662) 436-8789 Ext. 6155



Certificate of Calibration

Issued by : Vibration Laboratory

Certificate No. : 22V022

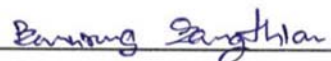
Reference No. : CBLUE01V008

Received Date : 08 March 2022

Calibrated Date : 16 March 2022

Page 1 of 5

Client : ห้างหุ้นส่วนจำกัด บอ คอนซัลแตนท์
Address : 32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพมหานคร 10140
Equipment : VIBRATION METER
Manufacture /Brand : INSTANTEL
Model : Micromate
Serial No./ ID No. : UM8882


(Mr. Bamrung Sangthian)

Authorised Signatory

Issue Date 16 / March / 2022

This certificate is issued in accordance with the conditions of accreditation granted by The National Accreditation Council of Thailand which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the units of measurement realised at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the head of calibration services and environmental analysis department.



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V022

Page 2 of 5

Standard Used

The table below is described the calibrator through the International System of Unit.

Description	Manufacture/Model	Serial No.	Traceable No.	Due Date
Conditioning Amplifier Type 2626	Bruel & Kjaer	1242376	AV-0045-20	18 September 2022
Accelerometer Type 8305	Bruel & Kjaer	1262817	AV- 0043-20	02 December 2022
Digital Multimeter /8846A	FLUKE	4330020	21E287	20 September 2022

Ambient Environment :

The Calibration was performed in an environment of (23 ± 2) °C and (50 ± 10) % relative humidity.

Measurement Method :

The unit under calibration was calibrated by comparison with standard accelerometer. The calibration method is based on WI-MCC-E-301 by comparison with reference accelerometer standard .

Measurement Results

The measurement results, labeled in the following pages give the calibration results and associated with measurement uncertainties.

Measurement Uncertainty

The Measurement Uncertainty are labeled on the following pages Completed the expanded uncertainty, that was calculated in accordance with the method in M3003, using coverage factor $k = 2$. The value of the measured lies within the assigned ranges of values of confidence level of approximately 95%.

Traceability :

The measurement is traceable to the International System of Unit through

- The National Institute of Metrology (Thailand)
- Metrology and Calibration Department



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number.

22V022

Page 3 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Vertical			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.39	0.15
*30	10.00	10.26	0.15
40	10.00	10.20	0.15
80	10.00	10.11	0.15

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Transducer Part : ENSL 16119

Condition : Installation by vertical direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V022

Page 4 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Transverse			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.31	0.15
*30	10.00	10.10	0.15
40	10.00	10.03	0.15
80	10.00	9.94	0.14

* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

Transducer Part : ENSL 16119

Condition : Installation by Transverse direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 22V022

Page 5 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Longitude			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.36	0.15
*30	10.00	10.17	0.15
40	10.00	10.10	0.15
80	10.00	10.00	0.14

* Calibration maked "Not TISI Accredited" in this Certificate have been included for completeness.

Tranducer Part : ENSL 16119

Condition : Installation by Longitude direction

* End Certificate of Calibration *