

ภาคผนวกที่ 5  
เอกสารสอบเทียบเครื่องมือตรวจวัด

ภาคผนวกที่ 5-1  
เอกสารสอบเทียบเครื่องมือตรวจวัดคุณภาพอากาศ

## CERTIFICATE OF CALIBRATION

Certificate No. : COF-017-67

Page 1 of 2 Pages

**MEASUREMENT ITEM** : Top Load Orifice  
**MANUFACTURER** : TISCH  
**MODEL/TYPE** : TE-5025A  
**SERIAL NUMBER** : 710725  
**ID NUMBER** : -  
**CONDITION AS-RECEIVED** : Used item  
**CUSTOMER** : Pacific Laboratory Co., Ltd.  
14/5358 Moo14, T.Bang Bua Thong, A.Bang Bua Thong,  
Nonthaburi 11110, Thailand.

**RECEIVED DATE** : 28 May 2024  
**MEASUREMENT DATE** : 31 May 2024  
**ISSUE DATE** : 31 May 2024

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: $23.0 \pm 3.0$	°C
Relative Humidity	: $55.0 \pm 15.0$	%RH
Atmospheric Pressure	: $1010 \pm 10$	hPa

### CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.  
Measurement Condition : The average values during measurement are 23.1 °C and 50.4 %RH.

**NOTED:** The certificate is valid only to the item calibrated on date and place of calibration.

### TABULATION OF RESULTS:

The table on next page give the measured values.

### Calibration procedure:

The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/IMC/W2-dp. The WI-CL-004 was used as a calibration guideline.

### Traceability:

This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0063-23.

### Uncertainty of Measurement:

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor  $k=2$ , Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

Calibrated by:

- ☒ Mr. Sorawit Thachalad  
☐ Miss Jitraporn Lertsomphol



Approved signatory: \_\_\_\_\_

Mr. Parinya Booncharoen  
Calibration Department Manager

**MEASUREMENT RESULTS:**

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The Humid air was used as a medium in the system. The standard conditions are 25°C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

**Table 1:** The results of  $Q$  Standard calibration data

Plate	Flow rate $m^3/min$	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	$\Delta p_{meter}$ mmHg	$\Delta p_{Orifice}$ inH <sub>2</sub> O	$\gamma$	Standard Flow [ $Q_s$ ] $m^3/min$
1	0.702	752.536	23.17	22.37	49.860	1.691	1.298	0.655
2	1.002	752.502	23.34	22.68	63.856	3.329	1.821	0.915
3	1.110	752.584	23.41	22.80	42.943	4.353	2.082	1.044
4	1.167	752.462	23.62	22.97	32.314	4.956	2.220	1.113
5	1.423	752.441	23.74	23.07	29.684	7.471	2.725	1.362

Slope ( $m$ ): 2.01598  
 Intercept ( $b$ ): -0.02301  
 Correlation coefficient ( $r$ ): 0.99985  
 Uncertainty ( $k=2$ ): 0.015  $m^3/min$

**Table 2:** The results of  $Q$  actual calibration data

Plate	Flow rate $m^3/min$	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	$\Delta p_{meter}$ mmHg	$\Delta p_{Orifice}$ inH <sub>2</sub> O	$\gamma$	Standard Flow [ $Q_s$ ] $m^3/min$
1	0.702	752.536	23.17	22.37	49.860	1.691	0.816	0.657
2	1.002	752.502	23.34	22.68	63.856	3.329	1.145	0.919
3	1.110	752.584	23.41	22.80	42.943	4.353	1.310	1.049
4	1.167	752.462	23.62	22.97	32.314	4.956	1.398	1.119
5	1.423	752.441	23.74	23.07	29.684	7.471	1.717	1.370

Slope ( $m$ ): 1.26266  
 Intercept ( $b$ ): -0.01445  
 Correlation coefficient ( $r$ ): 0.99985  
 Uncertainty ( $k=2$ ): 0.015  $m^3/min$

\*\*\*End of Certificate of Calibration\*\*\*



# 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



NSC-TISI-TIS17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 67-200273-1

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd.

14/5358 Moo 14, T.Bang Bua Thong, A.Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Electronic Balance

**Manufacturer :** SHIMADZU

**Model :** AP225WD

**Serial No. :** D316301828

**ID No. :** LAB-BL-003

**Capacity :** 220000 mg

**Resolution :** 0.01mg/102000mg, 0.1mg/220000mg

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

**Ambient Temperature :** (26.2 to 26.4) °C

**Relative Humidity :** (34.0 to 35.4) %

**Air Pressure :** 1007.0 mbar

**Date of Received :** 30 July 2024

**Date of Calibration :** 30 July 2024

**Date of Issue :** 31 July 2024

**Calibrated by :** Akaradath Thippichai

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

Edition 7 - November 2022

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

Standard Weights

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

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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



CAL-F0031-03



# CAL

Calibratech Co.,Ltd.

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

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

## Certificate of Calibration

Certificate No. : 67-200273-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

Nominal Value (mg)	Correction (mg)	Uncertainty $\pm$ (mg)
1	0.01	0.012
10	0.01	0.012
50	0.01	0.012
100	0.01	0.014
1000	0.00	0.026
2000	0.01	0.034
5000	0.00	0.043
20000	0.00	0.071
50000	0.01	0.11
100000	0.00	0.20
150000	0.0	0.38
200000	0.0	0.38

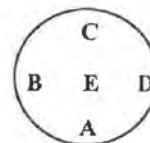
This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2.06$ , providing a level of confidence of approximately 95%

Eccentric error

Load test : 50000 mg

A	B	C	D	E	
0.00	0.00	0.01	0.00	0.00	mg



Repeatability

Load test : 200000 mg

Stdev. : 0.053 mg

Handwritten signature or initials.

- o0o -







中国认可  
国际互认  
校准  
CALIBRATION  
CNAS L1853

# 青岛市计量技术研究院

Qingdao Institute of Measurement Technology



## 校准证书

Calibration Certificate

证书编号: 

Certificate No. HX924015706-002

客户名称: Envir Service Co., Ltd  
Client

客户地址: 42 Raminthra 14 yeak 9, Tha Raeng, Bangkhen, Bangkok 10230  
Address of Client

器具名称: PM2.5/PM10 FRM AIR SAMPLER  
Name of Instrument

型号/规格: ZR-3930B  
Type/Specification

出厂编号: 3930C90053831  
Serial No.

制造单位: Qingdao Junray Intelligent Instrument Co., Ltd.  
Manufacturer

接收日期: 2024 年 05 月 16 日  
Received Date

校准日期: 2024 年 05 月 16 日  
Date of Calibration

发布日期: 2024 年 05 月 16 日  
Release Date

批准人:  
Approved by

张明

核验员:  
Checked by

刘巍

校准员:  
Calibrated by

张明



计量检定机构授权证书号: (鲁)法计(2023)37002号

地址: 青岛市崂山区科苑纬四路77号

传真: 0532-68069202

网址: www.qdjly.cn

电话: 0532-68069221/68069222

邮政编码: 266101


EMAIL: qimt16766@163.com

2018-jz-e



# 青岛市计量技术研究院校准证书

Calibration Certificate of QIMT

证书编号:   
Certificate No. HX924015706-002

本次校准所依据或参照的技术文件（代号和名称）：  
Reference Documents for the Calibration

参照 JJG 943-2011 《总悬浮颗粒物采样器检定规程》  
JJG 943-2011 《Verification Regulation of Total Suspended Particulates Sampler》

本次校准使用的主要计量标准器：  
Main Standards of Measurement Used in the Calibration

名称及编号 Name/No.	测量范围 Measuring range	不确定度或准确度 等级或最大允差 Uncertainty or accuracy Class or MPE	溯源机构及证书号 Verification or Certification Organization/Certificate No.	有效期至 Valid Until
便携式气体、粉尘、 烟尘采样仪综合校准 装置 Integrated flow rate cal ibrator 5410A19025465	罗茨流量计: (6 ~260)L/min; 皂膜流量计: (1 00~6000)mL/mi n; 小孔口: (70 ~130)L/min; 大孔口: (700~ 1200)L/min	罗茨流量计段: $U_{rel} =$ (0.37~1.1)%, $k=2$ ; 皂膜流量计段: $U_{rel} =$ (0.50~1.1)%, $k=2$ ; 孔口流量计段: $U_{rel} =$ (0.92~0.96)%, $k=2$	青岛市计量技术研究院 LR923039937-001	2024-12-27

注: 本次校准所使用的计量标准器的量值均可溯源至国家计量基（标）准。  
Standards of Measurement Used in the Calibration can be Traced to National Standard of China.

本次校准环境条件及地点：  
Environmental Condition and Place of the Calibration

温度： Temperature	23 °C	地点：本院实验室（2号楼A406） Lab A406, Building 2
湿度： Humidity	48 %RH	其它：/ Others

声明：1、我院仅对加盖“青岛市计量技术研究院校准专用章”的完整证书负责。  
2、本证书的校准结果仅对本次校准的计量器具有效。



# 青岛市计量技术研究院校准证书

Calibration Certificate of QIMT

证书编号:



Certificate No.

HX924015706-002

## 校准结果

Calibration Results

设定值/Set Value (L/min)	实测值/Measurement Result (L/min)	测量结果的扩展不确定度 Expanded uncertainty $U_{rel}(k=2)$
16.67	16.77	1.8%

以下空白/Blank below

提示: 根据客户要求和校准技术文件的规定, 建议在 2025 年 05 月 15 日之前进行再次校准。

声明: 1、我院仅对加盖“青岛市计量技术研究院校准专用章”的完整证书负责。  
2、本证书的校准结果仅对本次校准的计量器具有效。

2018-jz-e



# 计量溯源性声明

## Measurement Traceability Declaration

证书编号: HX924015706-002  
Certificate No.

原始记录号: HX924015706-002  
Record No.

根据CNAS-CL01-A025:2022的要求:“当测量标准为内部校准时,应在校准证书中描述完整的内部溯源链以及相关测量标准最终溯源到的外部机构及其参考标准。”现对本证书溯源性声明如下:

According to the requirement of CNAS-CL01-A025:2022, measurement traceability declaration of the report is stated as follow:

统一说明:图中仪器描述字段依次为仪器名称、证书编号、溯源机构,箭头方向为溯源方向。



计量技术研究院  
书骑缝专章

声明: 1、我院仅对加盖“青岛市计量技术研究院校准专用章”的完整证书负责。  
2、本证书的校准结果, 仅对被校计量器具的本次校准有效。





## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD. 42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 7 August 2024

#### Instruments Information

Analyzer Type: SO <sub>2</sub> Analyzer Model: 43C	Manufacturer Thermo Environmental S/N: 0601114-787
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#### Calibration System

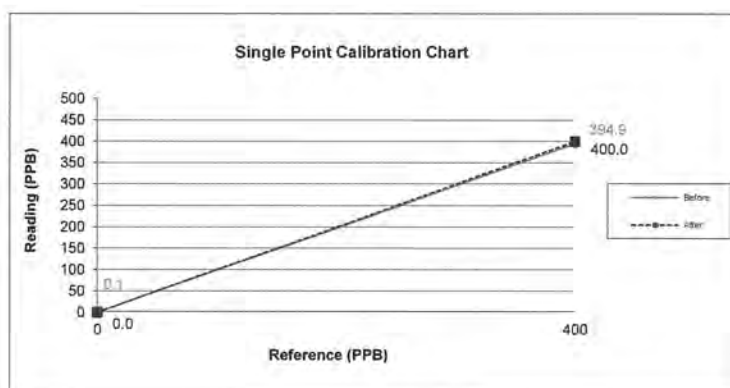
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1824	NO Conc 46.05 PPM SO <sub>2</sub> Conc 46.01 PPM CO Conc 4,487 PPM Expire Date: 19 Sep. 2020

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	394.9	-1.3
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

Mr.PASAGORN SAMOL



## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD. 42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 7 August 2024

#### Instruments Information

Analyzer Type: SO <sub>2</sub> Analyzer Model: 43C	Manufacturer Thermo Environmental S/N: 6067415770
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#### Calibration System

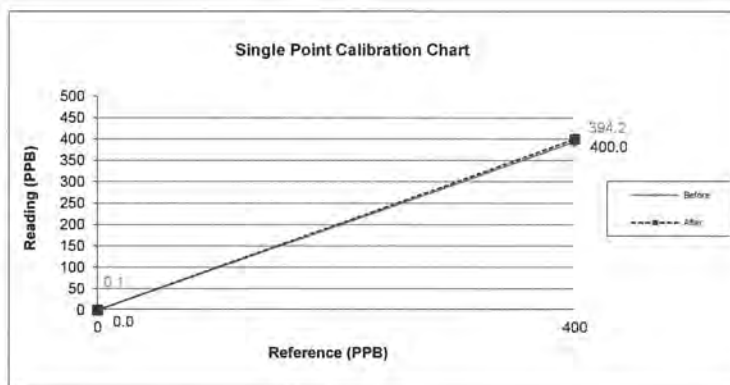
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 46.05 PPM SO <sub>2</sub> Conc 46.01 PPM CO Conc 4,487 PPM Expire Date: 19 Sep. 2020

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	394.2	-1.5
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

Mr.PASAGORN SAMOL





## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD. 42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 9 August 2024

#### Instruments Information

Analyzer Type: NO/NO <sub>2</sub> /NO <sub>x</sub> Analyzer Model: 42C	Manufacturer Thermo Environmental S/N: 65850-350
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#### Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 46.05 PPM SO <sub>2</sub> Conc 46.01 PPM CO Conc 4,487 PPM Expire Date: 19 Sep. 2020

Environment: Temperature 25.5 °C

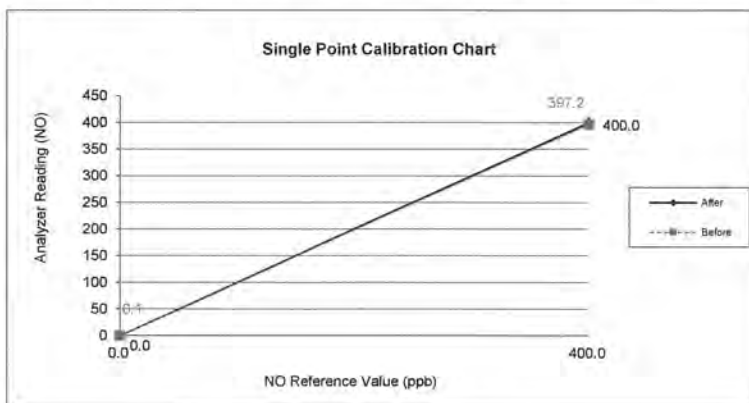
Humidity: 51 %RH

#### Calibration Check ( Before adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	397.2	400.0	-0.7
NO <sub>x</sub>	0.1	0.0	0.1	400.0	400.0	0.0

#### Calibration Check ( After adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NO <sub>x</sub>	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By : Mr. Pasagorn Samol



## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD. 42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 9 August 2024

#### Instruments Information

Analyzer Type: NO/NO <sub>2</sub> /NO <sub>x</sub> Analyzer Model: 42C	Manufacturer: Thermo Environmental S/N: 42C-63476-339
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#### Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 46.05 PPM SO <sub>2</sub> Conc 46.01 PPM CO Conc 4,487 PPM Expire Date: 19 Sep. 2020

Environment: Temperature 25.5 °C

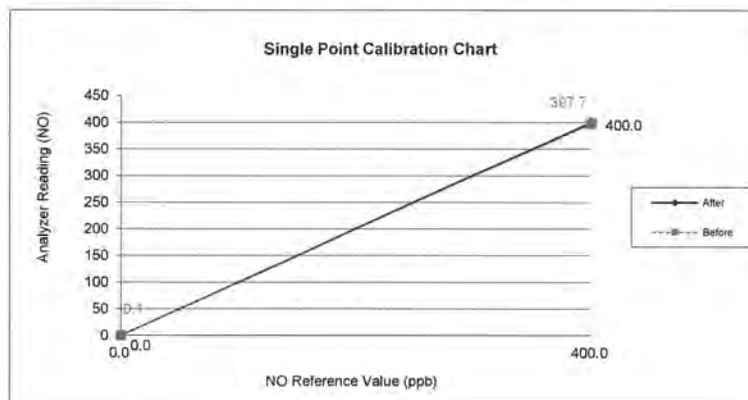
Humidity: 51 %RH

#### Calibration Check ( Before adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	397.7	400.0	-0.6
NO <sub>x</sub>	0.1	0.0	0.1	400.0	400.0	0.0

#### Calibration Check ( After adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NO <sub>x</sub>	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By : Mr. Pasagorn Samol



## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
ENVIR SERVICE CO., LTD. 42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 11 August 2024

#### Instruments Information

Analyzer Type: CO Analyzer Model: 48C	Manufacturer Thermo Environmental S/N: 052-8012
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#### Calibration System

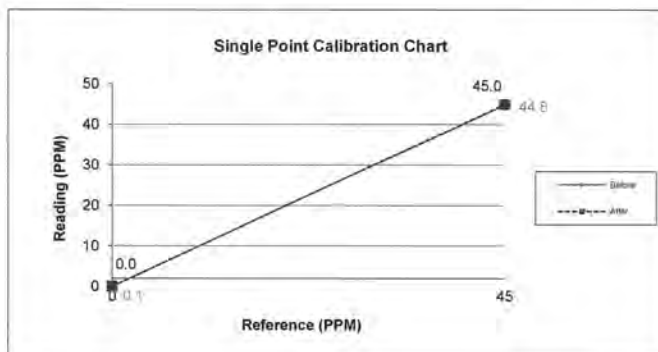
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1824	NO Conc 46.05 PPM SO2 Conc 46.01 PPM CO Conc 4,487 PPM Expire Date: 19 Sep. 2020

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.8	-0.4
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By :

Mr. PASAGORN SAMOL



บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD.

## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

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42 Ramintra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 11 August 2024

#### Instruments Information

Analyzer Type: CO Analyzer Model: 48C	Manufacturer Thermo Environmental S/N: 65774-350
--	---

#### Calibration System

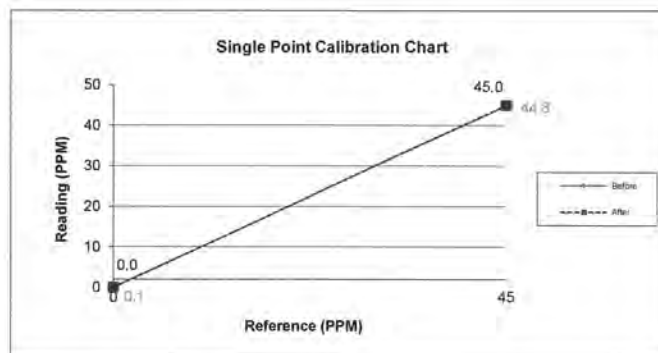
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 46.05 PPM SO2 Conc 46.01 PPM CO Conc 4.487 PPM Expire Date: 19 Sep. 2020

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.8	-0.4
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By :

Mr. PASAGORN SAMOL



# ENVIR SERVICE CO., LTD.

42 Ramintra 14 Yeak 9, Tha Raeng, Bang Khen, Bangkok 10230  
Tel. 02-9435814-5 Fax. 02-9438201 www.envirservice.co.th

## Analyzer Performance Test

Calibrated Date: 24 April 2024

### Instruments Information

Analyzer Type : Methane-NMHC Analyzer  
Model : 55C

Manufacturer : Thermo Environmental  
Serial Number : 55C-0515611965

### Calibrator Unit

Dilutor Model : Dasibi Model 5008  
Serial Number : 705  
ZERO AIR Generator : API MODEL 701  
Serial Number : 1924

### Standard Gas Concentration

Methane (CH<sub>4</sub>) 183.0 PPM  
Propane 59.1 PPM  
Cylinder number 4860  
Expire Date: 6 Dec. 2025

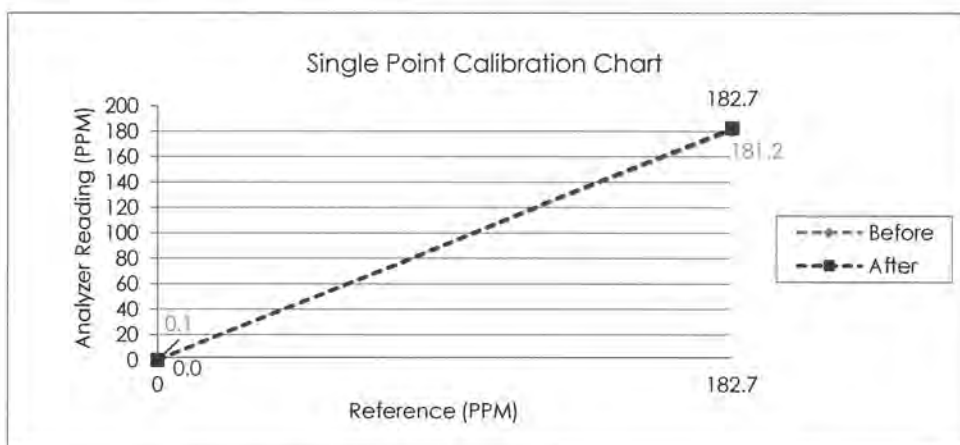
Environment : Temperature 25.5 °C Humidity: 51 %RH

### Calibration Report (Before adjust)

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Methane	0.0	0.1	0.1	183.0	181.2	-1.0
NMHC	0.0	0.1	0.1	59.1	58.3	-1.4


### Calibration Report (After adjust)

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Methane	0.0	0.0	0.0	183.0	182.7	-0.2
NMHC	0.0	0.0	0.0	59.1	59.0	-0.2



Calibrate By : กิตติศักดิ์ จันทะนาแวจนา

MR. KITTISAK JANSANGWATTANA

Approve by : 

MR. PASAGORN SAMOL

# Calibration Certificate

## FOR

**Equipment Name :** PM2.5/PM10 FRM AIR SAMPLER

**Received Date :** Mar 30, 2025

**Manufacturer :** Qingdao Junray Intelligent Instrument

**Calibration Date :** Apr 09, 2025

**Model :** ZR-3930B

**Recommended Due Date :** N/A

**Serial Number :** 3930C90053132

**Location of Calibration :** In Lab

**Customer Name :** PACIFIC LABORATORY CO., LTD.

14/5358 Moo. 14 Bang Bua Thong, Bang Bua Thong District,

Nonthaburi 11110

**Parameter of Calibration :** Air Flow Measurement

### CONDITION AS RECIVED : Normal

Environmental Conditions

Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \% \text{RH}$

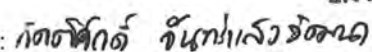
Result : Adjustment (See data attached in page 2 to the end of certificate)

1. The report applies to the item and shall not be reproduced except in full, without written approval by Calibration Laboratory, Envir Service Co., Ltd.
2. The working standard is indicated in page 2 of this certificate.
3. This result of this report only to the item calibrated.

Date of Calibration : Apr. 09, 2025


Valid to : Apr. 08, 2026



Calibrated By : 

Kittisak Jansangwattana  
(Technician)

Approved By :



Pasagorn Samol  
(Technician Manager)

Certificate No. EN-250409-03

We hereby certify that the instrument under mentioned has been certainly calibrated according to our calibration standard and the testing result in the calibration procedure has been good enough within the tolerance regulated in our specification.

### Reference Standard

Main Standard of measurement Used in the Calibration

Name/No.	Measuring range	Verification or Certification Organization/Certificate No.	Valid Until
Primary Flow Meter Model Defender 510-H Serial No. 120284	30 - 3000 mL/min	SPR25010241-1	17-Jan-26

### Calibration Result

Function : Air Flow Measurement

#### Before Calibration

Set Flow Instrument (L/Min)	Current Flow Instrument reading (L/Min)	Actual Flow Reference Standard (L/Min)	Error	Drift%
16.67	16.67	17.10	-0.43	-2.51

#### After Calibration

Set Flow Instrument (L/Min)	Current Flow Instrument reading (L/Min)	Actual Flow Reference Standard (L/Min)	Error	Drift%
16.67	16.67	16.68	-0.01	-0.06

#### 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.



ภาคผนวกที่ 5-2  
เอกสารสอบเทียบเครื่องมือตรวจวัดระดับเสียง



## Professional Calibration & Services Co., Ltd.

50/888, 50/889 Moo 2, Rungsit-Nakornnayok Rd., Bungyeetho, Thunyaburi,  
Pathumthani 12130 Thailand  
Tel : (+66)2150-6641 (Autoline), (+66)2569-5158  
Email : info@p-cal.com www.p-cal.com



# Certificate of Calibration

Page 1 of 3

Certificate Number : EL41650/24  
Control Number : PCAL153035  
Customer Control : -  
Description : Sound Calibrator  
Manufacturer : SOUNDTEK  
Model : ST-120  
Serial Number : 211203764  
Customer : Pacific Laboratory Co., Ltd.  
14/5358 Moo 14, Tambol Bang Bua Thong, Amphoe Bang Bua Thong,  
Nonthaburi 11110  
Date of Receipt : 22-Aug-24  
Date of Calibration : 23-Aug-24  
Environment : Temperature  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$   
: Relative Humidity  $50\% \pm 20\%$   
Calibration Method : Calibration Procedure Number CP-EL35  
Calibration Results : See data attached



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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Mr. Nonpawit Wiseschoo

Authorized Signature

(Mr. Manote Piwnimnual)

27-Aug-24

Issued Date

# CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : EL41650/24

Page 2 of 3

## Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Sound Level Meter	030606101	ANAB : AC-2590	EL12298/24	27-Mar-25
Sound Calibrator	125626778	NSC : Calibration 0037	EEL.BP. 161/0167	04-Feb-25

Condition as received : Normal

Definitions :-

- \* ANAB - The ANSI National Accreditation Board
- \* NSC - National Standardization Council of Thailand



# CALIBRATION REPORT

## Professional Calibration & Services Co., Ltd.

Certificate No.: EL41650/24

Page : 3 of 3

### Calibration Results

#### Sound Pressure Level Accuracy

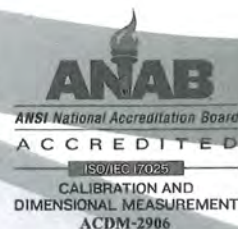
Nominal Value	Measured Value	UUC Error	Uncertainty ( ± )
94 dB	93.97 dB	0.03 dB	0.17 dB
114 dB	114.30 dB	-0.30 dB	0.17 dB

...End...



# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lam Lukka, Pathumthani 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC240209

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong,  
Nonthaburi 11110

Description	: Sound Level Meter	W/O Number	: SC240209
Manufacturer	: Scarlet Tech	Calibration Location	: Laboratory
Model	: ST-11D	Ambient Temperature	: $22 \pm 2$ °C
Serial Number	: 820968	Ambient Humidity	: $55 \pm 15$ %RH
ID. Number	: N/A	Received Date	: 20-Aug-2024

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

Description	Serial No.	Certificate No.	Traceability	Due Date
Sound Level Calibrator	141011576	CP20240179EA	TISI: 22-LB0119	14-May-25

# APTITECH

### Authority of Calibration

Approved Signatory

- ☒ Mr. Anuwat Simsiriwat [ Laboratory Manager ]  
☐ Mr. Nattaphol Boonmee [ Quality Manager ]

Calibration Date : 21-Aug-2024

Issued Date : 24-Aug-2024

Calibrated By : Ms. Hathaichanok Kaewsrisai

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.



# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthani 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC240209

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment  
Sound Level Calibration  
- Frequency Weighting : A  
- Resolution : 0.1 dB

### Sound Level Measurement (Slow Mode)

Parameter	UUC Range	Standard Value	UUC Reading	UUC Error	( $\pm$ ) Uncertainty
LFp	20-140 dB	93.86 dB	93.6 dB	-0.26 dB	0.60 dB
		113.87 dB	113.6 dB	-0.27 dB	0.60 dB
LSp	20-140 dB	93.86 dB	93.6 dB	-0.26 dB	0.60 dB
		113.87 dB	113.6 dB	-0.27 dB	0.60 dB
LIp	20-140 dB	93.86 dB	93.6 dB	-0.26 dB	0.60 dB
		113.87 dB	113.6 dB	-0.27 dB	0.60 dB

### Sound Level Measurement (Fast Mode)

Parameter	UUC Range	Standard Value	UUC Reading	UUC Error	( $\pm$ ) Uncertainty
LFp	20-140 dB	93.86 dB	93.6 dB	-0.26 dB	0.60 dB
		113.87 dB	113.5 dB	-0.37 dB	0.60 dB
LSp	20-140 dB	93.86 dB	93.6 dB	-0.26 dB	0.60 dB
		113.87 dB	113.5 dB	-0.37 dB	0.60 dB
LIp	20-140 dB	93.86 dB	93.6 dB	-0.26 dB	0.60 dB
		113.87 dB	113.5 dB	-0.37 dB	0.60 dB

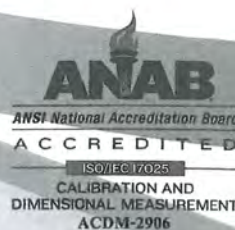
--- End of Certificate ---





# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthani 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : EI250284

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong Amphoe Bang Thong, Nonthaburi 11110

Description	: Sound Level Meter	W/O Number	: EI250284
Manufacturer	: Scarlet Tech	Calibration Location	: Laboratory
Model	: ST-11D	Ambient Temperature	: $22 \pm 2$ °C
Serial Number	: 820967	Ambient Humidity	: $55 \pm 15$ %RH
ID. Number	: N/A	Received Date	: 31-Jan-2025

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

Description	Serial No.	Certificate No.	Traceability	Due Date
Sound Level Calibrator	141011576	CP20240179EA	TISI: 22-LB0119	14-May-25

# APTITECH

### Authority of Calibration

Approved Signatory

Calibration Date : 03-Feb-2025

Issued Date : 06-Feb-2025

Calibrated By : Ms. Hathaichanok Kaewsrisai

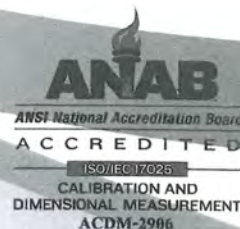
- ☒ Mr. Anuwat Simsiriwat [ Laboratory Manager ]  
☐ Mr. Kornupong Suksamran [ Technical Manager ]

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.



# APTITECH CALIBRATION CO., LTD.

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Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : EI250284

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment  
Sound Level Calibration  
- Frequency Weighting : A  
- Resolution : 0.1 dB

### Sound Level Measurement (Slow Mode)

Parameter	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
LFp	20-140 dB	93.86 dB	93.8 dB	-0.06 dB	0.60 dB
		113.87 dB	113.6 dB	-0.27 dB	0.60 dB
LSp	20-140 dB	93.86 dB	93.9 dB	0.04 dB	0.60 dB
		113.87 dB	113.6 dB	-0.27 dB	0.60 dB
LIp	20-140 dB	93.86 dB	93.8 dB	-0.06 dB	0.60 dB
		113.87 dB	113.5 dB	-0.37 dB	0.60 dB

### Sound Level Measurement (Fast Mode)

Parameter	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
LFp	20-140 dB	93.86 dB	93.8 dB	-0.06 dB	0.60 dB
		113.87 dB	113.7 dB	-0.17 dB	0.60 dB
LSp	20-140 dB	93.86 dB	93.8 dB	-0.06 dB	0.60 dB
		113.87 dB	113.6 dB	-0.27 dB	0.60 dB
LIp	20-140 dB	93.86 dB	93.9 dB	0.04 dB	0.60 dB
		113.87 dB	113.6 dB	-0.27 dB	0.60 dB

--- End of Certificate ---



# Sound Level Meter Calibration Report

Calibrate No. : SLM 003/2568

Calibrate Date : February 3, 2025

Equipment	:	Sound Calibrator
Manufacturer	:	Soundtak
Model/Type	:	ST-120
Serial No.	:	211203764
Customer Name	:	บริษัท โรงพยาบาลนครธน 2 จำกัด

[illegible]

Approved By



(Miss Sakuna Supparot)  
Technician



ภาคผนวกที่ 5-3  
เอกสารสอบเทียบเครื่องมือตรวจวัดความสั่นสะเทือน



# 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



## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2501/721A2901  
SERIAL NO. : UM13202/UM13202  
CLID. NO. : 252102517  
JOB CONTROL NO. : 241219135224  
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : PACIFIC LABORATORY CO., LTD.  
14/5358 MOO 14 TAMBOL BANG BUA THONG  
AMPHOE BANG BUA THONG NONTABURI 11110

DATE OF RECEIVED : 19 December 2024

DATE OF ISSUED : 23 December 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Suwit Phuanbusabong  
Calibration Engineer



Approved By :

Mongkol Yotsoontorn  
Authorized Signatory  
23 December 2024

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. Q24135224

F3-011-05/12-23

page 1 of 2



@clccalibration



# CALIBRATION LABORATORY Co., LTD.

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



## REPORT OF CALIBRATION FOR

NOMENCLATURE	:	VIBRATION METER
MANUFACTURER	:	INSTANTEL
MODEL / TYPE	:	721A2501/721A2901
SERIAL NO.	:	UM13202/UM13202
DATE OF CALIBRATION	:	20 December 2024

### 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, Programmable Timer/Counter, Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

### REFERENCE STANDARD USED :

1. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.

### TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 19 July 2025.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.

### 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:2022)"

Certificate No. **Q24135224**

F3-011-05/12-23

page 2 of 3



@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 : RECEIVED IN GOOD OPERATIONAL CONDITION**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

## CALIBRATION DATA

### VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm/s )	( frequency )		( mm/s )	( mm/s )	( mm/s )	$\pm$ ( % of rdg. )
10	160 Hz	peak	10.000	10.324	-0.324	1.5
20	160 Hz		20.000	20.388	-0.388	1.5
30	160 Hz		30.000	30.465	-0.465	1.5
40	160 Hz		40.000	40.572	-0.572	1.5
50	160 Hz		50.000	50.689	-0.689	1.5

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 2 of 67

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

**### End of Certificate ###**

Certificate No. Q24135224

F3-011-05/12-23

page 3 of 3



@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



## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2501/721A2901  
SERIAL NO. : UM13203/UM13202  
CLID. NO. : 251900155  
JOB CONTROL NO. : 241221136141  
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : PACIFIC LABORATORY CO., LTD.  
14/5358 MOO 14 TAMBOL BANG BUA THONG  
AMPHOE BANG BUA THONG NONTHABURI 11110

DATE OF RECEIVED : 21 December 2024

DATE OF ISSUED : 25 December 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Suwit Phuanbusabong  
Calibration Engineer



Approved By :

Mongkol Yotsoontorn  
Authorized Signatory  
25 December 2024

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. Q24136141

F3-011-05/12-23

page 1 of 1



@clccalibration



# CALIBRATION LABORATORY CO., LTD.

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



## REPORT OF CALIBRATION FOR

NOMENCLATURE	:	VIBRATION METER
MANUFACTURER	:	INSTANTEL
MODEL / TYPE	:	721A2501/721A2901
SERIAL NO.	:	UM13203/UM13202
DATE OF CALIBRATION	:	23 December 2024

### 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, Programmable Timer/Counter, Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

### REFERENCE STANDARD USED :

1. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.

### TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 19 July 2025.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.

### 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:2022)"

Certificate No. Q24136141

F3-011-05/12-23

page 2 of 3



@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 : RECEIVED IN GOOD OPERATIONAL CONDITION**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

## CALIBRATION DATA

### VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm/s )	( frequency )		( mm/s )	( mm/s )	( mm/s )	$\pm$ ( % of rdg. )
10	160 Hz	peak	10.000	10.342	-0.342	1.5
20	160 Hz		20.000	20.414	-0.414	1.5
30	160 Hz		30.000	30.497	-0.497	1.5
40	160 Hz		40.000	40.595	-0.595	1.5
50	160 Hz		50.000	50.717	-0.717	1.5

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 2 of 67

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

**### End of Certificate ###**

Certificate No. Q24136141

F3-011-05/12-23

page 3 of 3



@clccalibration



# CALIBRATION LABORATORY CO., LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2501/721A2901  
SERIAL NO. : UM13203/UM13202  
CLID. NO. : 251900155  
JOB CONTROL NO. : 241221136141  
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : PACIFIC LABORATORY CO., LTD.  
14/5358 MOO 14 TAMBOL BANG BUA THONG  
AMPHOE BANG BUA THONG NONTABURI 11110

DATE OF RECEIVED : 21 December 2024

DATE OF ISSUED : 25 December 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Suwit Phuanbusabong  
Calibration Engineer



Approved By :

Mongkol Yotsoontorn  
Authorized Signatory  
25 December 2024

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. Q24136141

F3-011-05/12-23

page 1 of 1



@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



## REPORT OF CALIBRATION FOR

NOMENCLATURE	:	VIBRATION METER
MANUFACTURER	:	INSTANTEL
MODEL / TYPE	:	721A2501/721A2901
SERIAL NO.	:	UM13203/UM13202
DATE OF CALIBRATION	:	23 December 2024

### 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, Programmable Timer/Counter, Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

### REFERENCE STANDARD USED :

1. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.

### TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 19 July 2025.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.

### 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:2022)"

Certificate No. Q24136141

F3-011-05/12-23

page 2 of 3



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# CALIBRATION LABORATORY CO., LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



**CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

## CALIBRATION DATA

### VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm/s )	( frequency )		( mm/s )	( mm/s )	( mm/s )	± ( % of rdg. )
10	160 Hz	peak	10.000	10.342	-0.342	1.5
20	160 Hz		20.000	20.414	-0.414	1.5
30	160 Hz		30.000	30.497	-0.497	1.5
40	160 Hz		40.000	40.595	-0.595	1.5
50	160 Hz		50.000	50.717	-0.717	1.5

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 2 of 67

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

**### End of Certificate ###**

Certificate No. Q24136141

F3-011-05/12-23

page 3 of 3



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## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2501/721A2901  
SERIAL NO. : UM13203/UM13203  
CLID. NO. : 252000160  
JOB CONTROL NO. : 240125008595  
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : PACIFIC LABORATORY CO., LTD.  
14/5358 MOO 14 TAMBOL BANG BUA THONG  
AMPHOE BANG BUA THONG NONTABURI 11110

DATE OF RECEIVED : 25 January 2024

DATE OF ISSUED : 30 January 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Suwit Phuanbusabong  
Calibration Engineer

Approved By :

Mongkol Yotsoontorn  
Authorized Signatory  
30 January 2024



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, Q24008595

F3-011-05/12-23

page 1 of 2



@clccalibration



# CALIBRATION LABORATORY CO., LTD.

2/10-11,14,55 Soi Prasert Manukil 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	:	721A2501/721A2901
SERIAL NO.	:	UM13203/UM13203
DATE OF CALIBRATION	:	26 January 2024

### 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, Programmable Timer/Counter,  
Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

### REFERENCE STANDARD USED :

1. Digital Multimeter, Hewlett Packard Model 34401A S/N. US36044686.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

### TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand)  
Certificate No. EE-0100-23, Due Date 01 December 2024.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd.  
Certificate No. 07-0043/23 . Due Date 12 April 2024.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand)  
Certificate No. AV-0052-23, Due Date 26 September 2024.

### 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:2022)"

Certificate No. Q24008595

F3-011-05/12-23

page 2 of 3



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# CALIBRATION LABORATORY Co., LTD.

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



**CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

## CALIBRATION DATA

### VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm/s )	( frequency )		( mm/s )	( mm/s )	( mm/s )	± ( % of rdg. )
10.0	160 Hz	peak	10.000	10.234	-0.234	1.1
20.0	160 Hz		20.000	20.341	-0.341	0.9
30.0	160 Hz		30.000	30.446	-0.446	0.9
40.0	160 Hz		40.000	40.576	-0.576	0.9
50.0	160 Hz		50.000	50.613	-0.613	0.9

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 2 of 67

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

**### End of Certificate ###**

Certificate No. Q24008595

F3-011-05/12-23

page 3 of 3



@clccalibration

ภาคผนวกที่ 5-4  
เอกสารสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำ

# 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. :** 67-420078-1

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd.

14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** pH Meter with electrode

pH meter

Manufacturer : Eutech

Model : pH 700

Range : N/A

pH

Resolution : 0.01 pH

Serial No. : 2841305

ID No. : LAB-PH-002

Electrode

Model : N/A

Serial No. : 3172493

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

Ambient Temperature : (25.0 to 26.0)<sup>o</sup> C

Relative Humidity : (40 to 45) %

**Date of Received :** 30 July 2024

**Date of Calibration :** 30 July 2024

**Date of Issue :** 03 August 2024

**Calibrated by :** Permpoon Chanpu

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

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

### 1. Multiproduct Calibrator

ID No.	Cert. No.	Due Date	Traceability
400005	SG-E-00307/66	23 Aug 2025	National Institute of Metrology Thailand (NIMT)

### 2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61293328	986281	25 Apr 2026	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.986	61281486	986283	25 Apr 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
9.997	61281073	986282	25 Apr 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03





# CAL

Calibratech Co.,Ltd.

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

## Certificate of Calibration

Certificate No. : 67-420078-1

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 ( $\pm$ mV )
			( pH )	( mV )		
4, 7, 10	177.4800	4	4.00	177.5	0.0	0.12
	0.0000	7	7.00	0.1	-0.1	0.086
	-177.4800	10	10.00	-177.4	-0.1	0.12

Function : pH meter with electrode

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

Adjustment Curve at nominal pH	Standard Buffer ( pH )	UUC Reading ( pH )	Correction ( pH )	Uncertainty ( $\pm$ pH )
4, 7, 10	4.008	4.01	0.00	0.0097
	6.986	7.00	-0.01	0.011
	9.997	10.01	-0.01	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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# CAL

Calibratech Co.,Ltd.

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



NSC-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 67-420078-2

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd.

14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** pH Meter with electrode

pH meter

Manufacturer : Eutech

Model : pH 700

Range : N/A

pH

Resolution : 0.01 pH

Serial No. : 2841305

ID No. : LAB-PH-002

Electrode

Model : N/A

Serial No. : 3052953

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

Ambient Temperature : (25.0 to 26.0)°C

Relative Humidity : (40 to 45) %

**Date of Received :** 30 July 2024

**Date of Calibration :** 30 July 2024

**Date of Issue :** 03 August 2024

**Calibrated by :** Permpoon Chanpu

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

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

### 1. Multiproduct Calibrator

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
400005	SG-E-00307/66	23 Aug 2025	National Institute of Metrology Thailand (NIMT)

### 2. Standard Buffer Solution

<u>pH</u>	<u>Cert. No.</u>	<u>Lot No.</u>	<u>Exp. Date</u>	<u>Traceability</u>
4.008	61293328	986281	25 Apr 2026	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.986	61281486	986283	25 Apr 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
9.997	61281073	986282	25 Apr 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

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. : 67-420078-2

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	0.1	-0.1	0.086
	-177.4800	10	10.00	-177.4	-0.1	0.12

Function : pH meter with electrode

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

Adjustment Curve at nominal pH	Standard Buffer ( pH )	UUC Reading ( pH )	Correction ( pH )	Uncertainty ( ± pH )
4, 7, 10	4.008	4.01	0.00	0.0097
	6.986	7.00	-0.01	0.011
	9.997	10.01	-0.01	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 measurment 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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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. :** 67-400424-1

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd

14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Digital Thermometer with Thermistor probe

Temperature Indicator

Manufacturer : Eutech

Model : pH 700

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 2841305

ID No. : LAB-PH-002

Thermistor probe

Model : N/A

Sheath Material : Stainless

Diameter : 3 mm.

Length : 115 mm.

Serial No. : PHSTEMB01P 304

ID No. : LAB-PH-002

**Environment :**

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

Ambient Temperature : (25.0 to 25.6) °C

Relative Humidity : (45 to 47) %

Line Voltage : (220.0 to 222.0) VAC

**Date of Received :** 30 July 2024

**Date of Calibration :** 30 July 2024

**Date of Issue :** 03 August 2024

**Calibrated by :** Permpon Chanpu

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

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400002	TT-0074-22	23 Aug 2025	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400033	22E569	25 Apr 2025	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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Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

## Certificate of Calibration

**Certificate No. :** 67-400424-1

**Page :** 2 of 2

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement

Immersion Depth ( mm. )	Standard Reading ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ± °C )
115	25.005	24.8	0.2	0.19

### Remark

UUC : Unit Under Calibration

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

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

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B/



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NSC-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 67-400454-3

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd

14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Temperature controlled enclosure (Incubator)

Manufacturer : Aqua Lytic

Model : TC 135S

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 0614/000033

ID No. : LAB-IB-001

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

Ambient Temperature : (25.5 to 26.0) °C

Relative Humidity : (40 to 45) %

Line Voltage : (220.0 to 222.0) V

**Date of Received :** 30 July 2024

**Date of Calibration :** 30 July 2024

**Date of Issue :** 03 August 2024

**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 RTD Probe

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
400029 & 400043	67-400245-1	27 Oct 2024	National Institute of Metrology Thailand (NIMT)

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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

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

## Certificate of Calibration

Certificate No. : 67-400454-3

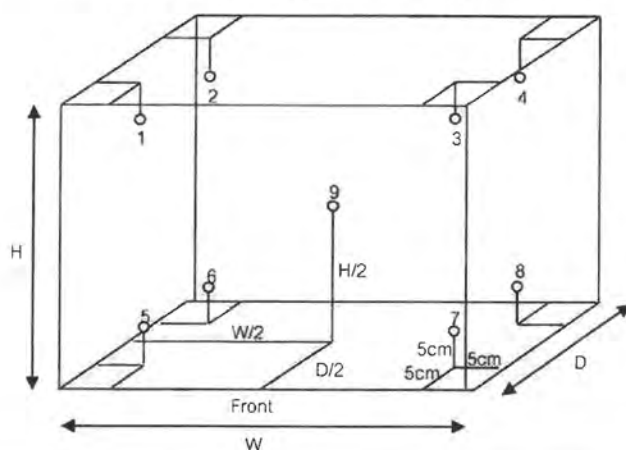
Page : 2 of 2

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 = 0.51 m

D = 0.04 m

H = 0.70 m

Capacity = 0.02 m<sup>3</sup>

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	20.5	20.5	20.07	19.92	19.95	19.93	19.93	19.92	19.92	19.96	19.88	0.67

Test Point ( ° C )	Setting Temperature ( ° C )	Indicating Temperature ( ° C )	Measured Uniformity ( ° C )	Measured Stability ( ° C )	Overall Variation ( ° C )
20.0	20.5	20.5	0.41	0.33	0.70

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%

- oOo -



# CAL

Calibratech Co.,Ltd.

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

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



NSC-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 67-400454-2

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd  
14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Water Bath  
Manufacturer : Memmert Model : WNB 22  
Range : N/A °C Resolution : 0.1 °C  
Serial No. : L514.0184 ID No. : LAB-WB-001

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd  
Ambient Temperature : (30.0 to 31.3) °C  
Relative Humidity : (60 to 65) %  
Line Voltage : (220.0 to 222.0) V

**Date of Received :** 30 July 2024

**Date of Calibration :** 30 July 2024

**Date of Issue :** 03 August 2024

**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

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
400029 & 400031	67-400244-1	24 Oct 2024	National Institute of Metrology Thailand (NIMT)

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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

## Certificate of Calibration

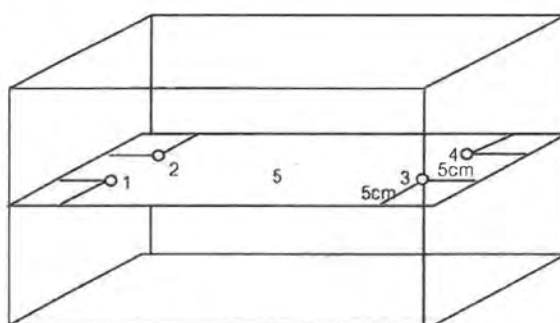
Certificate No. : 67-400454-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Front

Test Point ( " C )	Setting Temperature ( " C )	Indicating Temperature ( " C )	Measured Temperature ( " C ) @ Sensor					Uncertainty ( ± " C )	Measured Uniformity ( " C )	Measured Stability ( " C )
			No.							
			1	2	3	4	5			
65.0	65.0	65.0	64.61	64.70	64.66	64.64	64.68	0.18	0.12	0.05
95.0	95.0	95.0	94.60	94.69	94.70	94.61	94.70	0.18	0.15	0.03

Remark The uncertainty is not combine uniformity of the water bath

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

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

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NSC-TISI-TIS 17025  
CALIBRATION 0030

## Certificate of Calibration

**Certificate No. :** 67-400454-1

**Page : 1 of 2**

**Submitted by :** Pacific Laboratory Co., Ltd  
14/5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

**Equipment :** Temperature controlled enclosure (Oven)  
Manufacturer : Memmert Model : UN 55  
Range : N/A °C Resolution : 0.1 °C  
Serial No. : B214.1879 ID No. : LAB-OV-001

**Environment :** On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd  
Ambient Temperature : (30.0 to 31.3) °C  
Relative Humidity : (60 to 65) %  
Line Voltage : (220.0 to 222.0) V

**Date of Received :** 30 July 2024

**Date of Calibration :** 30 July 2024

**Date of Issue :** 03 August 2024

**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

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
400029 & 400030	67-400246-1	25 Oct 2024	National Institute of Metrology Thailand (NIMT)

Approved by :

( Surachai Promthong )

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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

## Certificate of Calibration

Certificate No. : 67-400454-1

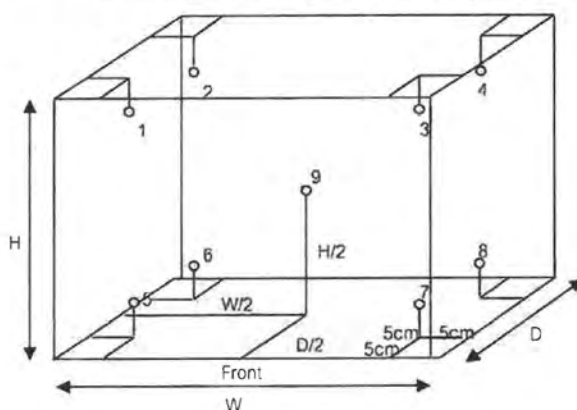
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.40 m

Capacity = 0.05 m<sup>3</sup>

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	107.0	107.0	105.1	104.9	104.8	104.8	102.9	103.6	103.7	104.1	103.9	0.84
180.0	184.0	184.0	180.5	180.5	180.3	179.7	176.8	177.2	178.1	181.2	179.5	1.4

Test Point ( °C )	Setting Temperature ( °C )	Indicating Temperature ( °C )	Measured Uniformity ( °C )	Measured Stability ( °C )	Overall Variation ( °C )
104.0	107.0	107.0	1.4	0.4	2.5
180.0	184.0	184.0	3.3	0.7	5.6

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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