

ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
1.	Ambient Air	TSP	ORIFICE TRANSFER STANDARD/Tisch	S/N 0068	17/08/2023	August 2024
			High Volume Air Sampler/TET	S/N TSP-29	03/07/2024	July 2025
			High Volume Air Sampler/TET	S/N TSP-31	03/07/2024	July 2025
			High Volume Air Sampler/TET	S/N TSP-36	03/07/2024	July 2025
		CO	Electronic Balance/XP205DR	S/N 1129273885	13/03/2025	March 2026
			CERTIFICATE OF ANALYSIS/Linder	S/N D621725	04/10/2024	October 2032
			CERTIFICATE OF ANALYSIS/Linder	S/N D025783	04/10/2024	October 2032
			CO Analyzer/Teledyne T300	S/N 4828	19/03/2025	September 2025
			CO Analyzer/Thermo 42C	S/N 448062-846337	01/04/2025	October 2025
			CO Analyzer/Teledyne 300E	S/N 1066	02/04/2025	October 2025
3.	Water	WS & WD	Wind speed and wind direction/Weather Wizard III	S/N WC71104A46	14/03/2025	March 2026
			Wind speed and wind direction/Vantage VUE	S/N Display MT220822047	19/11/2024	November 2025
			Wind speed and wind direction/Vantage VUE	S/N Display E110124A092	01/08/2024	August 2025
		pH	pH Meter/Horiba	S/N B06D0012	30/10/2024	October 2025
			Spectrophotometer/Blue Star A	S/N 1606UV1507	13/03/2025	March 2026
		Nitrate-Nitrogen	Incubator Model INE 500	E.505.1143	12-13/03/2025	March 2026
			Electronic Balance/XP 205 DR	S/N 1129273885	13/03/2025	March 2026
		SS	DO Meter/HORIBA	S/N D75J0012	10/01/2025	January 2026
		DO	Electronic Balance/XP 205 DR	S/N 1129273885	13/03/2025	March 2026
		TDS	BOD Incubator/Model i250	S/N 0408-0115-0008	12/03/2025	March 2026
		BOD	Electronic Balance/XP 205 DR	S/N 1129273885	13/03/2025	March 2026
		Oil & Grease	Incubator Model INE 500	S/N E.505.0595	12-13/03/2025	March 2026
			Incubator Model INE 500	S/N E.505.1143	12-13/03/2025	March 2026
		Sulfate	Spectrophotometer/Blue Star A	S/N 1606UV1507	13/03/2025	March 2026
		Nitrate	Spectrophotometer/Blue Star A	S/N 1606UV1507	13/03/2025	March 2026
		Sulfide	Spectrophotometer/Blue Star A	S/N 1606UV1507	13/03/2025	March 2026



JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd.  
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Accredited calibration laboratory  
ISO/IEC 17025:2017  
NSC-TISI-TIS 17025  
CALIBRATION 0367

Flow measurement laboratory  
Calibration services department.



## CERTIFICATE OF CALIBRATION

Certificate No. : COF-008-66

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice  
MANUFACTURER : TISCH  
MODEL/TYPE : TE-5025A  
SERIAL NUMBER : 0068  
ID NUMBER : -  
CONDITION AS-RECEIVED : Used item  
CUSTOMER : Thai Environmental Technic Limited.  
1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphan Sung,  
Bangkok 10240  
  
RECEIVED DATE : 08 Aug 2023  
MEASUREMENT DATE : 17 Aug 2023  
ISSUE DATE : 17 Aug 2023

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

### CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.  
Measurement Condition : The average values during measurement are 23.8 °C and 54.3 %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 VSL (National Metrology Institute of Netherlands) via Certificate number: G2211901

### 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 Jittrāporn Lertsomphol



Approved signatory: .....

Mr. Parinya Booncharoen  
Calibration Department Manager

**TET**

Thai Environmental Technic Limited  
บริษัท เทคนิกล้างแวล้อมไทย จำกัด

## High Volume TSP&PM-10 Calibration Report

Location: Thai Environmental Technic

Site ID: Bangkok

Date: 3-Jul-24

ITEM: TSP

Serial No: (No. 29 )

Calibrate By: Pipat

### Site Conditions

Barometric Pressure (mm Hg) : 760.00  
Temperature (°C) : 25.0  
Average Press. (mm Hg) : 754.4  
Average Temp (°C) : 31.5

Corrected Pressure (mm Hg) : 760.0  
Temperature (deg K) : 298.0  
Corrected Average (mm Hg) : -  
Average Temp: (Deg K) : -

### Calibration Orifice

Make : Tisch  
Model : TE-5025A  
Serial#: 0068

Qstd Slope : 1.99045  
Qstd Intercept : -0.00789  
Calibration Due Date : 16-Aug-24

### Calibration Information

Plate or Test #	ORIFICE (in H <sub>2</sub> O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 29.7752 Intercept : 5.4130 Corr. Coeff : 0.9918 # of Observations: 5
1	12.30	1.766	60.0	57.00	
2	9.80	1.577	54.0	52.00	
3	7.40	1.371	50.0	48.00	
4	5.00	1.127	40.0	40.00	
5	3.00	0.874	30.0	30.00	

### Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(Pa/Pstd)(Tstd/Ta)) - b]$$

$$IC = l[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate  
IC = corrected chart response  
l = actual chart response

m = calibrator Qstd slope  
b = calibrator Qstd intercept  
Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)  
Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:  
 $1/m\{[l][\text{Sqrt}(298/Tav)(Pav/760)] - b\}$

NOTE: Ensure calibration orifice has been certified within 12 months of use

m = sampler slope  
b = sampler intercept  
l = chart response  
Tav = daily average temperature  
Pav = daily average pressure

Calibrate By : 

Approve By : 

**TET**

Thai Environmental Technic Limited  
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

## High Volume TSP&PM-10 Calibration Report

Location: Thai Environmental Technic

Site ID: Bangkok

Date: 3-Jul-24

ITEM: TSP

Serial No: (No. 31 )

Calibrate By: Pipat

### Site Conditions

Barometric Pressure (mm Hg) : 760.00

Temperature (°C) : 25.0

Average Press. (mm Hg) : 754.5

Average Temp (°C) : 30.2

Corrected Pressure (mm Hg) : 760.0

Temperature (deg K) : 298.0

Corrected Average (mm Hg) : -

Average Temp: (Deg K) : -

### Calibration Orifice

Make: Tisch

Model: TE-5025A

Serial#: 0068

Qstd Slope : 1.99045

Qstd Intercept : -0.00789

Calibration Due Date : 16-Aug-24

### Calibration Information

Plate or Test #	ORIFICE (in H <sub>2</sub> O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 29.7233 Intercept : 5.5932 Corr. Coeff : 0.9893 # of Observations: 5
1	12.30	1.766	60.0	57.00	
2	9.80	1.577	54.0	52.00	
3	7.20	1.352	50.0	48.00	
4	5.00	1.127	40.0	40.00	
5	3.00	0.874	30.0	30.00	

### Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(Pa/Pstd)(Tstd/Ta)) - b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m(I)[\text{Sqrt}(298/Tav)(Pav/760)] - b)$$

NOTE: Ensure calibration orifice has been certified within 12 months of use

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Calibrate By : Approve By : 



Thai Environmental Technic Limited  
บริษัท เทคนิกลิ่งแวดล้อมไทย จำกัด

## High Volume TSP&PM-10 Calibration Report

Location: Thai Environmental Technic

Site ID: Bangkok

Date: 3-Jul-24

ITEM: TSP

Serial No: (No. 36)

Calibrate By: Pipat

### Site Conditions

Barometric Pressure (mm Hg): 760.00

Temperature (°C): 25.0

Average Press. (mm Hg): 754.4

Average Temp (°C): 29.8

Corrected Pressure (mm Hg): 760.0

Temperature (deg K): 298.0

Corrected Average (mm Hg): -

Average Temp: (Deg K): -

### Calibration Orifice

Make: Tisch

Model: TE-5025A

Serial#: 0068

Qstd Slope: 1.99045

Qstd Intercept: -0.00789

Calibration Due Date: 16-Aug-24

### Calibration Information

Plate or Test #	ORIFICE (in H <sub>2</sub> O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope: 29.9909 Intercept: 5.4935 Corr. Coeff: 0.9867 # of Observations: 5
1	12.30	1.766	60.0	57.00	
2	9.50	1.552	54.0	52.00	
3	7.00	1.333	50.0	48.00	
4	5.00	1.127	40.0	40.00	
5	3.00	0.874	30.0	30.00	

### Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(P_a/P_{std})(T_{std}/T_a))-b]$$

$$IC = l[\text{Sqrt}(P_a/P_{std})(T_{std}/T_a)]$$

Qstd = standard flow rate

IC = corrected chart response

l = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((l[\text{Sqrt}(298/T_a)(P_a/760)]-b)$$

NOTE: Ensure calibration orifice has been certified within 12 months of use

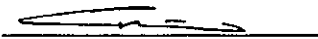
m = sampler slope

b = sampler intercept

l = chart response

Tav = daily average temperature

Pav = daily average pressure

Calibrate By : 

Approve By : 



## Certificate Of Analysis

### Special Gases Mixture

**Customer Details**

Name:	Address:	Customer Tag No.:
Thai Environmental Technic Limited	1/6 Soi Ramkhamhaeng 45, Saphansoong, Saphansoong, Bangkok 10240	-

**Certificate Details**

Number:	3121/24	Date of issue:	4-Oct-2024	Expiry date:	4-Oct-2032
<b>Material Details</b>					
Production Order:	90186604	Material Code:	498800-AL-44	Cylinder No.:	D621725
Gas content:	6.900 M <sup>3</sup>	Filling pressure:	145.0 bar	Valve:	CGA 660 SS
Cylinder Owner:	LINDE	Cylinder Material:	Aluminum	Cylinder Size:	50 L

**Laboratory Report***Analytical Result*

Component	Nominal Concentration	Analysis Result <sup>1</sup>	Uncertainty <sup>2</sup>	Method of Analysis <sup>3</sup>	Assay Date
Sulphur Dioxide	400 ppm	404 ppm	± 1% relative	(6) I-PB-352	23-Sep & 3-Oct-2024
Carbon Monoxide	400 ppm	406 ppm	± 1% relative	(6) I-PB-352	23-Sep-2024
In Nitrogen					

*Reference Standard used in Assay*

Reference Standard	Cylinder number	Concentration	Expiry date:
Sulphur Dioxide	QA0636	486.9 ± 2.4 ppm	7-Sep-2025
Carbon Monoxide	HA603	518.6 ± 2.6 ppm	16-Jul-2028
In Nitrogen			

*Analytical Instruments used in Assay*

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
FTIR Spectrometers Nicolet iS50	FTIR-SO2	27-Aug & 3-Oct-2024
FTIR Spectrometers Nicolet iS50	FTIR-CO	12-Sep-2024

**Recommend usage condition**

Minimum utilization: 5% of actual content or before expiry date whichever comes first.

Storage condition: Keep in well ventilation and secure area.

**Comments**

When reordering, please quote the material number

**Note:**

1. All results expressed in this report are on mole/mole basis, unless otherwise specified. The Assay of this Standard has been performed in accordance with the EPA Traceability Protocol EPA-600/R-12/531 for the Assay and Certification of Gaseous Calibration Standards using procedure G1
2. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The measurement of this material is traceable to the SI through the reference gas standard which is traceable to Swiss National Standard of Mass or other recognised national metrology institutes.
3. (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyzer, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Moisture Analyzer, (5) Total Hydrocarbon Analyzer, (6) Other - Specified

Sukanya Parinyasontorn

Signatory for and on behalf of Linde (Thailand) Co., Ltd.

Page 1 of 1

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PB-002/F006

Iss:M/1, 01 December 2023

บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

เลขที่ใบอนุญาตประกอบกิจการ 010753700705

ชั้น 15 อาคารทาวเวอร์ เอ 2/3 หมู่ 14 ถนนบางนา-ตราด กม. 6.5 ต.บางแก้ว

อ.บางพลี จ.สมุทรปราการ 10540 โทรศัพท์ (66) 2338-6100 โทรสาร (66) 2338-6333

โรงงานเวลโกรว์: 105 หมู่ 5 ต.บางพลี อ.บางพลี จ.สมุทรปราการ 24180

โทรศัพท์ (66) 38.570-479-93

โทรสาร (66) 38.570-323

Linde (Thailand) Public Company Limited

PLC Registration no 010753700705

15<sup>th</sup> Floor, Bangna Tower A, 2/3 Moo 14, Bangna Trad KM. 6.5 Road, Bangkaew

Bangplee, Samutprakarn 10540, Tel (66) 2338-6100 Fax (66) 2338-6333

Wellgrow Plant: 105 Moo 5, T.Bangsamak, A.Bangpakong, Chachoengsao 24180

Thailand, Tel (66) 38.570-479-93

Fax (66) 38.570-323



## Certificate Of Analysis

### Special Gases Mixture

#### Customer Details

Name:	Address:	Customer Tag No.:
Thai Environmental Technic Limited	1/6 Soi Ramkhamhaeng 45, Saphansoong, Saphansoong, Bangkok 10240	-

#### Certificate Details

Number:	3122/24	Date of Issue:	4-Oct-2024	Expiry date:	4-Oct-2032
<b>Material Details</b>					
Production Order:	90186603	Material Code:	498700-AL-44	Cylinder No.:	D025783
Gas content:	6.900 M <sup>3</sup>	Filling pressure:	145.0 bar	Valve:	CGA 660 SS
Cylinder Owner:	LINDE	Cylinder Material:	Aluminum	Cylinder Size:	50 L

#### Laboratory Report

##### Analytical Result

Component	Nominal Concentration	Analysis Result <sup>1</sup>	Uncertainty <sup>2</sup>	Method of Analysis <sup>3</sup>	Assay Date
Sulphur Dioxide	800 ppm	792 ppm	± 1% relative	(6) I-PB-352	23-Sep & 3-Oct-2024
Carbon Monoxide In Nitrogen	800 ppm	788 ppm	± 1% relative	(6) I-PB-352	23-Sep-2024

##### Reference Standard used in Assay

Reference Standard	Cylinder number	Concentration	Expiry date:
Sulphur Dioxide	QA0636	486.9 ± 2.4 ppm	7-Sep-2025
Carbon Monoxide In Nitrogen	HA603	518.6 ± 2.6 ppm	16-Jul-2028

##### Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
FTIR Spectrometers Nicolet iS50	FTIR-SO2	27-Aug & 3-Oct-2024
FTIR Spectrometers Nicolet iS50	FTIR-CO	12-Sep-2024

#### Recommend usage condition

Minimum utilization: 5% of actual content or before expire date whichever comes first.

Storage condition: Keep in well ventilation and secure area.

#### Comments

When reordering, please quote the material number

#### Note:

1. All results expressed in this report are on mole/mole basis, unless otherwise specified. The Assay of this Standard has been performed in accordance with the EPA Traceability Protocol EPA-600/R-12/531 for the Assay and Certification of Gaseous Calibration Standards using procedure G1
2. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.
- The measurement of this material is traceable to the SI through the reference gas standard which is traceable to Swiss National Standard of Mass or other recognised national metrology institutes.
3. (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyzer, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Moisture Analyzer, (5) Total Hydrocarbon Analyzer, (6) Other - Specified

Sukanya Parinyasoontorn

Signatory for and on behalf of Linde (Thailand) Co., Ltd.

บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

เลขที่ใบอนุญาตประกอบธุรกิจ 0107537000785

ชั้น 15 อาคารเดอะเวิลด์ 2/3 หมู่ 14 ถนนบางนา-ตราด กม. 6.5 แขวงแก้ว

อ.บางพลี จ.สมุทรปราการ 10540 โทรศัพท์ (66) 2338-6100 โทรสาร (66) 2338-6333

โรงงานเวลโกรว์: 105 หมู่ 5 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 24180

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Linde (Thailand) Public Company Limited

PLC Registration no. 0107537000785

15<sup>th</sup> Floor, Bangna Tower A, 2/3 Moo 14, Bangna Trad KM. 6.5 Road, Bangkaew

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**TET**

Thai Environmental Technic Limited  
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

## Analyzer Calibration Report

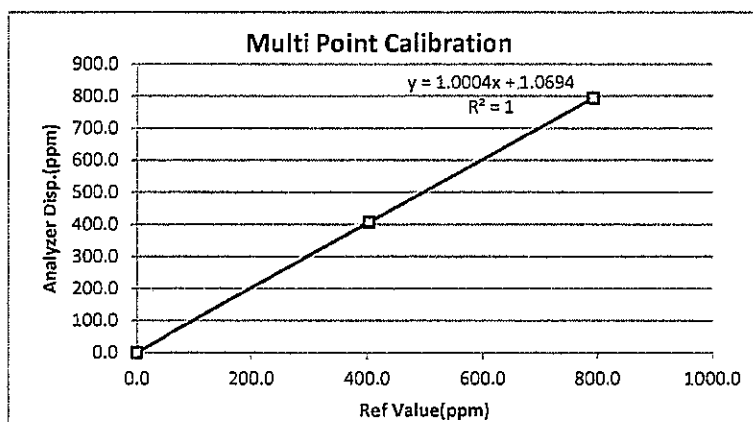
Calibrate Date	: 19-Mar-25	Temperature (°C)	: 25°C
Analyzer Type	: CO	Barometer (mmHg)	: 759.6
Brand	: Teledyne	Humidity (50±15 %)	: 52%RH
Model	: T300	Dilutor	: API M700 S/N625
Serial Number	: 4828	Zero Air	: API M701 S/N1926
Range	: 1000 ppm	Standard gas	: D621725, D025783

### Calibration of Span

Supply Gas	Ref Value(ppm)	Before of Span.(ppm)	After of Span.(ppm)	Abs% diff of Span
Zero	0.0	0.6	0.0	0.0
Span	793.0	797.0	793.0	0.0

### Multi Point Calibration

Ref Value(ppm)	Analyzer Disp.(ppm)	Output Difference		
		Diff (ppm)	Percent Diff	Abs Percent Diff
0.0	0.4	0.4	0.00	0.05
404.0	406.6	2.6	0.01	0.64
793.0	793.7	0.7	0.00	0.09
Average Diff (%)				0.26



Calibrate by: \_\_\_\_\_

Approved by: \_\_\_\_\_

แก้ไขครั้งที่ : 00

วันที่อนุมัติ 02/09/15

เลขที่แบบฟอร์ม : QF-QP16-06





Thai Environmental Technic Limited  
บริษัท เทคนิกล้างแวลด้อมไทย จ้งกัถ

## Analyzer Calibration Report

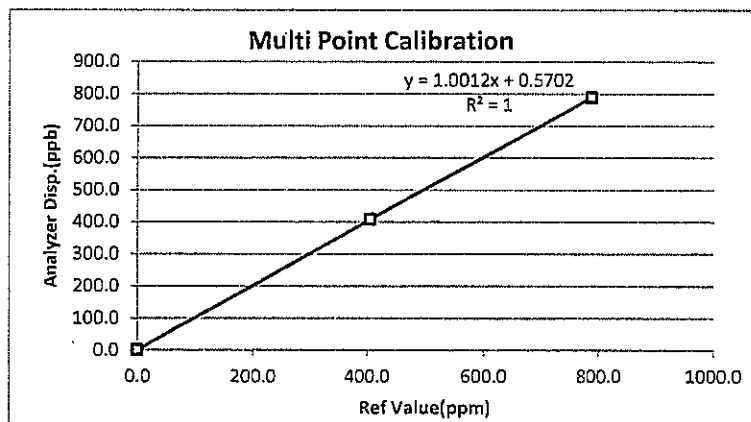
Calibrate Date	: 1-Apr-25	Temperature (°C)	: 26°C
Analyzer Type	: CO	Barometer (mmHg)	: 762
Brand	: Thermo	Humidity (50±15 %)	: 54.0
Model	: 42C	Dilutor	: API M700 S/N625
Serial Number	: 48062-846337 (No.3)	Zero Air	: API M701 S/N1926
Range	: 1000 ppm	Standard gas	: D621725, D025783

### Calibration of Span

Supply Gas	Ref Value(ppm)	Before of Span.(ppm)	After of Span.(ppm)	Abs% diff of Span
Zero	0.0	1.7	0.0	0.00
Span	788.0	795.2	788.0	0.00

### Multi Point Calibration

Ref Value(ppm)	Analyzer Disp.(ppm)	Output Difference		
		Diff (ppm)	Percent Diff	Abs Percent Diff
0.0	0.3	0.3	0.00	0.04
406.0	407.6	1.6	0.00	0.39
788.0	789.2	1.2	0.00	0.15
Average Diff (%)				0.19



Calibrate by:

Approved by:

แก้ไขครั้งที่ : 00

วันที่อนุมัติ 02/09/15

เลขที่แบบฟอร์ม : QF-QP16-06

**TET**Thai Environmental Technic Limited  
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

### Analyzer Calibration Report

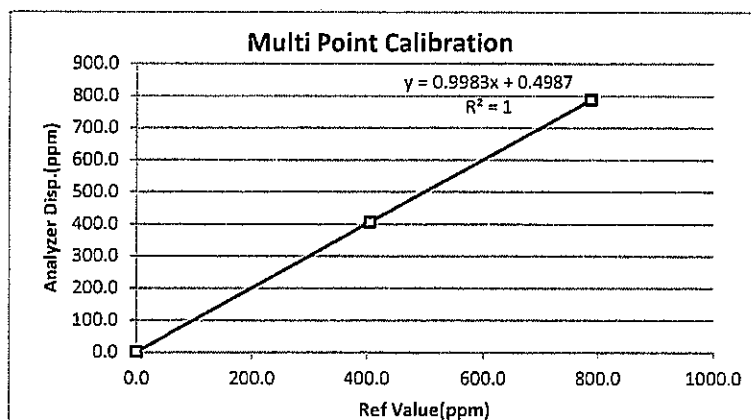
Calibrate Date	: 2-Apr-25	Temperature (°C)	: 25 °C
Analyzer Type	: CO	Barometer (mmHg)	: 758
Brand	: Tyledyne	Humidity (50±15 %)	: 58.0 %RH
Model	: 300E	Dilutor	: API M700 S/N625
Serial Number	: 1066 (No.2)	Zero Air	: API M701 S/N1926
Range	: 1000 ppm	Standard gas	: D621725, D025783

#### Calibration of Span

Supply Gas	Ref Value(ppm)	Before of Span.(ppm)	After of Span.(ppm)	Abs% diff of Span
Zero	0.0	1.3	0.0	0.00
Span	788.0	797	788.0	0.00

#### Multi Point Calibration

Ref Value(ppm)	Analyzer Disp.(ppm)	Output Difference		
		Diff (ppm)	Percent Diff	Abs Percent Diff
0.0	0.5	0.5	0.00	0.06
406.0	405.8	-0.2	0.00	0.05
788.0	787.2	-0.8	0.00	0.10
Average Diff (%)				0.07



Calibrate by:

Approved by:

แก้ไขครั้งที่ : 00

วันที่อนุมัติ 02/09/15

เลขที่แบบฟอร์ม : QF-QP16-06



# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

## Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 14 March, 2025

Certification No. 154/25

Page : 1 of 2

Object : Wind speed and Wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III

Serial No. : WC71104A46 ID No. : No.25

Customer : Thai Environmental Technic Limited.  
1/6 Soi Ramkhamhaeng 145,  
Khwaeng/Khet Saphan Sung, Bangkok 10240.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1011.9 hPa

### NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

: Standard Velocity at 0 - 20 m/sec

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Signed :

Mr. Pisood Promsut





# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

## Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 19 November, 2024

Certification No. 418/24

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Vantage VUE Model No. : #6251EU

ID No. : No.35

Serial No. : Display MT220822047 Transmitter MT231004046

Customer : Thai Environmental Technic Limited.  
1/6 Soi Ramkhamhaeng 145,  
Khwaeng/Khet Saphan Sung, Bangkok 10240.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1010.0 hPa

### NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

Calibrated by :

*Watchapol*

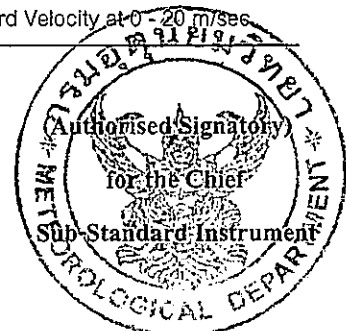
Signed :

*Pisood Promsut*

Mr. Watchapol Subwat

Mr. Pisood Promsut

Mechanical Engineer





# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

## Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 1 August, 2024

Certification No. 283/24

Page : 1 of 2

Object : Wireless Weather Station

Manufacturer : Davis Instruments Inc.

Type : Vantage VUE ID No. : No.13

Serial No. : Display E110124A092 Transmitter E110124A077

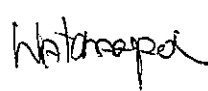
Customer : Thai Environmental Technic Limited.  
1/6 Soi Ramkhamhaeng 145,  
Khwaeng/Khet Saphan Sung, Bangkok 10240.

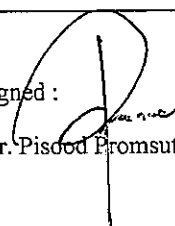
Calibration Condition : Temperature 25.1 °C Barometric Pressure 1010.8 hPa

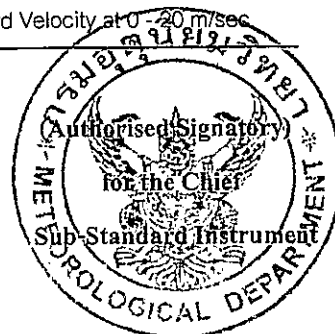
### NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119  
: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023  
N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec  
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)  
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

Calibrated by :   
Mr. Watchapol Subwat  
Mechanical Engineer

Signed :   
Mr. Pisood Promsut






TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL.0-2717-3000-29 FAX.0-2719-9484



## Certificate of Calibration

Cert.No.: 24CHO574

Page.: 1 of 2

Equipment : pH Meter  
Manufacturer : Horiba  
Model : LAQUA-PH1300  
Serial No. : B06D0012  
ID No. : Ins-LAB-026  
Condition As-Received: Used Item  
Received Date : 30 October 2024  
Calibration Date : 30 October 2024  
Reference : 2410-0784OC-6  
Submitted by : Thai Environmental Technic Limited  
1/6 Soi Ramkhamhaeng 145,  
Khwaeng/Khet Saphan Sung,  
Bangkok 10240  
Calibration Place : Laboratory (Thai Environmental Technic Limited)  
Ambient Temperature : ( 25.3 to 24.8 ) °C (On-Site)  
Relative Humidity : ( 71.7 to 77.5 ) % (On-Site)  
Calibration Procedure : In - house method :  
- CP-OCH2 by direct measurement with DC voltage  
standard and direct measurement with  
certified reference material (CRM)  
Calibrated by : Sathip Meangmai  
Approved by :   
Approved Signatory  
( ) Unnopphol Harachai  
(✓) Ponpan Paipim  
( ) Sathip Meangmai  
Issue Date : 2 November 2024

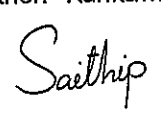
**The Uncertainties are for a confidence probability of approximately 95%**

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

## Certificate of Calibration

Cert.No.: 25CHO136

Page.: 1 of 3

**Equipment :** Spectrophotometer  
**Manufacturer :** Labtech  
**Model :** Blue Star A  
**Serial No. :** 1606UV1507  
**ID No. :** -  
**Condition As-Received:** Used Item  
**Received Date :** 12 March 2025  
**Calibration Date :** 13 March 2025  
**Reference :** 2503-0227OC-2  
**Submitted by :** Thai Environmental Technic Limited  
1/6 Soi Ramkhamhaeng 145,  
Khwaeng/Khet Saphan Sung,  
Bangkok 10240  
**Calibration Place :** Laboratory ( Thai Environment Technic Limited)  
**Ambient Temperature :** ( 26.6 to 27.0 ) °C (On-Site)  
**Relative Humidity :** ( 57 to 53 ) % (On-Site)  
**Calibration Procedure :** In - house method :  
CP-OCH4 based on ASTM E 275-08  
**Calibrated by :** Uthen Kankawi  
  
**Approved by :** \_\_\_\_\_  
Approved Signatory  
( ) Chakrit Waewwanjua  
( ) Ponpan Paipim  
(✓) Saithip Meangmai  
**Issue Date :** 15 March 2025

**The Uncertainties are for a confidence probability of approximately 95%**

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Cert. No. : 25CHO136

Page : 3 of 3

**Calibration Results : without adjustment**

**Photometric Accuracy**

Wavelength (nm)	Certified Values of Reference Material ( Abs )	UUC Reading ( Abs )	Uncertainty of Measurement ( $\pm$ Abs )	Coverage Factor <i>k</i>
420.0	Zero	0.000	0.0028	2.00
	0.5750	0.569	0.0028	2.00
	0.7156	0.710	0.0028	2.00
	1.0176	1.009	0.0028	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5234	0.520	0.0028	2.00
	0.7007	0.697	0.0028	2.00
	0.9992	0.995	0.0028	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5648	0.562	0.0028	2.00
	0.7654	0.762	0.0028	2.00
	1.0961	1.092	0.0028	2.00

**Stray Light**

* Straylight at 260.57 $\pm$ 0.11 nm	Reading at 260.57 $\pm$ 0.11 nm
Abs	2.0840
%T	0.80

**Remark**

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- Cut-off wavelength of stray light reference material (Potassium Iodide) at Wavelength 260.57  $\pm$  0.11 nm
- Result = Pass, If Absorbance > 2.00 Abs and Transmission < 1.0 %T at Wavelength 260.57  $\pm$  0.11 nm
- \* : Not NSC-ONSC Accredited
- UUC = Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.



## Certificate of Calibration

Cert. No.: 25TM387

Page.: 1 of 3

Equipment : Incubator  
Manufacturer : Memmert  
Model : INE 500  
Serial No. : E505.1143  
ID No. : -  
Submitted by : Thai Environmental Technic Limited  
1/6 Soi Ramkhamhaeng 145,  
Khwaeng/Khet Saphan Sung,  
Bangkok 10240  
Location : Bacteria Room  
Received Order : 12 March 2025  
Calibration Date : 12 - 13 March 2025  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
AC Line Voltage : ( 220 ± 22 ) V

Calibrated by : Tawatchai Pama

Approved by :

  
Approved Signatory

- ( ) Chakrit Waewwanjua  
(✓) Suwit Imjai  
( ) Kunchit Promprat

Issue Date : 24 March 2025

**The Uncertainties are for a confidence probability of approximately 95%**

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2503-0227OC-4  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

**Cert. No.:** 25TM387

**Page :** 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
35.0	35.0	35.0	0.041	0.35	0.57	2
41.5	41.5	41.5	0.046	0.51	0.75	2
44.5	44.5	44.5	0.077	0.80	0.84	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.004	35.057	35.006	34.962	34.859	35.353	34.875	35.190	35.197	0.30
41.5	41.344	41.393	41.358	41.296	41.140	41.826	41.192	41.617	41.625	0.30
44.5	44.363	44.465	44.391	44.285	43.852	44.554	44.013	44.507	44.621	0.31

**Average\* :** The average of 30 values in each position.

**Temperature stability :** One-half of the greatest maximum difference of measured temperature at any one sensor.

**Temperature uniformity :** The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

**Overall Variation :** The Difference of the maximum and minimum measured temperatures throughout observation.

**UUC\* :** Unit Under Calibration

**Note :** The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.



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สุ 2/4/25

## Certificate of Calibration

Cert.No.: 25MM27

Page.: 1 of 3

Equipment : Electronic Balance

Manufacturer : Mettler Toledo

Model : XP205DR

Serial No. : 1129273885

ID No. : -

Submitted by : Thai Environmental Technic Limited  
1/6 Soi Ramkhamhaeng 145,  
Khwaeng/Khet Saphan Sung,  
Bangkok 10240

Location : Balance Room


Received order : 12 March 2025

Calibration Date : 13 March 2025

Ambient Temperature : 15 °C to 40 °C

Relative Humidity : 30 % to 90 %

Calibrated by : Tawatchai Pama

Approved by :   
Approved Signatory

( ) Chakrit Waewwanjua

(✓) Suwit Imjai

( ) Kunchit Promprat

Issue Date : 24 March 2025

**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 head of Corporate Services 3 : Equipment Calibration and Testing Services.



Equipment : Electronic Balance  
 Condition As-Received : Used Item  
 Reference : 2503-0227OC-15

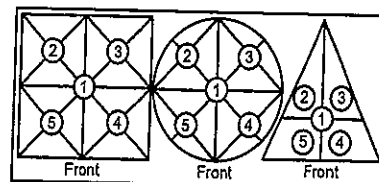
Cert.No.: 25MM27

Page: 3 of 3

### Result of calibration

#### 2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.  
 The weighing machine reading error obtained is given in the table



Maximum difference between  
 off-center and central loading  
 (g)  
 0.00010

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)
0.00000	0.00000	-0.00010	-0.00010	+0.00010

#### 3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty ( $\pm$ mg)	Coverage Factor (k)
Unload	0.00000	0.00000	0.015	2.13
0.01	0.00999	+0.00001	0.015	2.11
0.05	0.04999	+0.00001	0.015	2.11
1	1.00000	0.00000	0.018	2.04
2	2.00000	0.00000	0.019	2.03
5	4.99999	+0.00001	0.026	2
10	10.00000	0.00000	0.033	2
20	20.00000	0.00000	0.045	2
50	49.99999	+0.00001	0.080	2
80	79.99998	+0.00002	0.15	2
200	199.9999	+0.0001	0.30	2

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

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## Certificate of Calibration

Certificate Number : SPR25010086-1

Page : 1 of 3

Customer : Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan  
Sung, Bangkok 10240, Thailand.

Equipment Name : DO Meter

Manufacturer : Horiba

Model : OM-71G

Serial Number : D75J0012

ID. Number : No.07

### Environmental Conditions

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

Received Date : 08 Jan 2025

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

Calibration Date : 10 Jan 2025

Location of Calibration : In-Lab

Recommend Due Date : 10 Jan 2026

Calibration Procedure : In-House Method

Date of Issue : 11 Jan 2025

### 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.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Krittapas Kanchanajittadet

Approved by :

Calibration Officer

( Mr.Prayoon Topart )

Authorized Signatory



## Result of Calibration

Certificate Number : SPR25010086-1

Page : 3 of 3

Dissolved Oxygen Permanance Test

Unit : mg/L

Actual Standard	UUC Reading	Error	Uncertainty ( ± )
0.3	0.51	0.21	0.13
8.3	8.52	0.22	0.13

### 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 -



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## Certificate of Calibration

Cert. No.: 25TM172

Page : 1 of 3

Equipment : BOD Incubator

Manufacturer : Accuplus

Model : i250

Serial No. : 0408-0115-0008

ID No. : -

Submitted by : Thai Environmental Technic Limited  
1/6 Soi Ramkhamhaeng 145,  
Khwaeng/Khet Saphan Sung,  
Bangkok 10240

Location : Laboratory (Thai Environmental Technic Limited)

Received Order : 12 March 2025

Calibration Date : 12 March 2025

Ambient Temperature :  $(26 \pm 10) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 30) \%$

AC Line Voltage :  $(220 \pm 22) \text{ V}$

Calibrated by : Uthen Kankawi

Approved by :

Approved Signatory

- ( ) Chakrit Waewwanjua  
(☒) Suwit Imjai  
( ) Kunchit Promprat

Issue Date : 24 March 2025

**The Uncertainties are for a confidence probability of approximately 95%**

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



**Equipment :** BOD Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2503-0227OC-11  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

**Cert. No.:** 25TM172  
**Page :** 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
20.0	20.0	20.0	0.37	0.21	0.92	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.231	20.227	20.146	20.213	20.131	20.095	19.970	20.050	20.081	0.53

**Average\* :** The average of 30 values in each position.

**Temperature stability :** One-half of the greatest maximum difference of measured temperature at any one sensor.

**Temperature uniformity :** The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

**Overall Variation :** The Difference of the maximum and minimum measured temperatures throughout observation.

**UUC\* :** Unit Under Calibration

**Note :** The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

-o0o-





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TEL.0-2717-3000-29 FAX.0-2719-9484



## Certificate of Calibration

Cert. No.: 25TM386

Page : 1 of 3

**Equipment :** Incubator  
**Manufacturer :** Memmert  
**Model :** INE 500  
**Serial No. :** E505.0595  
**ID No. :** -  
**Submitted by :** Thai Environmental Technic Limited  
1/6 Soi Ramkhamhaeng 145,  
Khwaeng/Khet Saphan Sung,  
Bangkok 10240  
**Location :** Bacteria Room  
**Received Order :** 12 March 2025  
**Calibration Date :** 12 - 13 March 2025  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**AC Line Voltage :** ( 220 ± 22 ) V

**Calibrated by :** Tawatchai Pama

**Approved by :**

Approved Signatory

- ( ) Chakrit Waewwanjua  
(✓) Suwit Imjai  
( ) Kunchit Promprat

**Issue Date :** 24 March 2025

**The Uncertainties are for a confidence probability of approximately 95%**

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2503-0227OC-3  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 25TM386

Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
35.0	35.0	35.0	0.038	0.23	0.45	2
41.5	41.5	41.5	0.041	0.57	0.66	2
44.5	44.5	44.5	0.019	0.65	0.81	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ±°C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	34.986	34.862	34.882	34.860	34.837	35.179	34.784	35.171	35.002	0.30
41.5	41.577	41.425	41.489	41.457	41.065	41.492	41.004	41.641	41.555	0.30
44.5	44.673	44.533	44.541	44.514	44.013	44.469	43.876	44.498	44.514	0.30

**Average\*** : The average of 30 values in each position.

**Temperature stability** : One-half of the greatest maximum difference of measured temperature at any one sensor.

**Temperature uniformity** : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

**Overall Variation** : The Difference of the maximum and minimum measured temperatures throughout observation.

**UUC\*** : Unit Under Calibration

**Note** : The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

-o0o-