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เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์

## CERTIFICATE OF CALIBRATION

Certificate No.: CO-2008004/21 Page 1 of total 4 pages



**Customer**  
WATER ANALYSIS CENTER CO., LTD.  
30/5 Soi Vipavadee 60, Vipavadee Rangsit Road,  
Kwaeng Taladbangkhen, Khet Laksi, Bangkok 10210

**Equipment**  
pH Meter  
**Manufacturer**  
METTLER TOLEDO  
**Model**  
B327527211  
**ID No.**  
WWL 0068  
**Description**  
Range : 0 - 14 pH, Resolution : 0.01 pH

**Environmental Conditions**  
Ambient Temperature: (20 ± 2) °C  
Relative Humidity: (50 ± 10) %  
Atmospheric Pressure: -

**Calibration Location**  
Jayhawks Laboratory (CL&GL)  
**Received Date**  
20 August 2021  
**Calibration Date**  
20 August 2021

**Date of Issue**  
23 August 2021

**Checked by**  **Approved by**   
Act as Technical Manager Representative of Managing Director  
( ) (Krisyosl K.) ( ) (Sakda Y.)  
( ) (Patiphan K.) ( ) (Onnapa P.)  
( ) (Pongsak H.) ( ) (Nitiphong K.)  
( ) (Kanung C.) ( ) (Nonthachai K.)  
( ) (Pramong P.) ( ) (Noppol P.)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of the Thai Heart Calibration Co., Ltd.

Certificate No.: CO-2008004/21 Page 2 of total 4 pages

Reference Method:

- The calibration method used was CP-178 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard:

Type	pH Value	Lot No.	Due Date	Traceability
pH Standard Solution	4.01	081020	Feb. 1, 2022	NIMT
	7.01	020221	Dec. 25, 2021	
	10.00	091020	Jan. 19, 2022	

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Documenting Process Calibrator	753	3101007	10-0804001/21	Apr. 7, 2022	THC
Digital Thermometer with Sensor	1523 / 5622	1709138 / 4605984-005	10-1006001/21	Jun. 10, 2022	

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- NIMT, National Institute of Metrology (Thailand).
- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:

### 1. Function Simulated pH Meter

Standard Applied (mV)	Nominal Value (pH)	UUC Reading		Uncertainty (± mV)
		pH	mV	
177.48	4.00	4.01	177.4	0.060
0.00	7.00	7.00	0.0	0.060
-177.48	10.00	10.01	-177.4	0.060

UUC : Unit Under Calibration

Note : Adjust Curve to simulate pH (4,7,10)

Certificate No.: C0-2008004/21

Page 3 of total 4 pages

Measurement Results (Cont.):

2. Calibration of pH Electrode

pH Standard Solution (pH)	Measured Value		Uncertainty (± pH)
	(pH)	(mV)	
4.01	4.00	187.0	0.013
7.01	7.00	11.1	0.013
10.00	10.02	-161.6	0.013

Note : Adjust Curve to Buffer Solution pH (4.7,10)

Temperature stability of micro bath :  $25 \pm 0.2^{\circ}\text{C}$

The above 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%.

ภาคผนวก ข-2

Certificate No.: C0-2008004/21

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Reference Method:

- The calibration method used was CP-096 based on an in-house method.
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Thermometer Readout	1529-R	B7C853	20E3985	Nov. 9, 2021	TPA
Platinum Resistance Thermometer	5626	4853	C0A30046	Oct. 28, 2023	FLUKE
Liquid Bath	XORTS-40A	XO111019	IO-0306002/21	Jun. 3, 2023	THC

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- TPA, Technology Promotion Association (Thailand-Japan).
- FLUKE, Fluke Corporation, U.S.A.
- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:

(X) Without Adjustment  
Dimension of probe : Diameter 4 mm. Sensor Type : RTD (PT100)

Immersion Depth (mm.)	Standard Reading ( $^{\circ}\text{C}$ )	UUC Reading ( $^{\circ}\text{C}$ )	Correction ( $^{\circ}\text{C}$ )	Uncertainty ( $\pm ^{\circ}\text{C}$ )
120	22.00	22.0	0.00	0.058
120	25.00	25.0	0.00	0.058
120	28.00	28.0	0.00	0.058

UUC : Unit Under Calibration

The above 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 -





THAI HEART CALIBRATION CO., LTD.

112/1 Moo 5, Phrak Sai, Muang, Samut Prakan 10280  
Tel. 0-2394-2162, 0-2757-8435, 0-2757-8496 Fax. 0-2757-8507



## CERTIFICATE OF CALIBRATION

Certificate No.: CO-2107005/21 Page 1 of total 2 pages

**Customer**  
WATER ANALYSIS CENTER CO., LTD.  
30/5 Soi Vipavadee 60, Vipavadee Rangsit Road,  
Kwaeng Taladbangkhen, Khet Laksi, Bangkok 10210

<b>Equipment</b>	Conductivity Meter
<b>Manufacturer</b>	EUTECH
<b>Serial No.</b>	2657889
<b>Description</b>	-
	<b>Model</b> CON 2700
	<b>ID No.</b> WWL 0136

**Environmental Conditions**  
Ambient Temperature:  $(20 \pm 2) ^\circ\text{C}$   
Relative Humidity:  $(50 \pm 10) \%$   
Atmospheric Pressure: -

**Calibration Location**  
Jayhawks Laboratory (CL&GL)  
**Received Date** 21 July 2021  
**Calibration Date** 21 July 2021

**Date of Issue** 22 July 2021

<b>Checked by</b>		<b>Approved by</b>	
	Act as Technical Manager		Representative of Managing Director

( )	( Krisyosol K. )	( )	( Sakda Y. )
( )	( Patiphan K. )	( )	( Onnapa P. )
( )	( Pongsak H. )	( )	( Nitiphong K. )
( )	( Kanung C. )	( )	( Nonthachai K. )
( )	( Pramong P. )	( )	( Noppol P. )

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FE-169

REV.02 02/24/21

**Certificate No :** AD2012-017-0001

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

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

STD Reading (mg/l)	UUC Reading Before (mg/l)	UUC Reading After (mg/l)	Error (mg/l)	Uncertainty ( $\pm$ mg/l)
9.046	9.07	-	0.024	0.013

STD = Standard

UUC = Unit Under Calibration

**Description of UUC :**  
Range 0.00 to 60.00 mg/l  
Resolution 0.01 mg/l

**Measurement Standards Used & Traceability :**

The International System of Units (SI) through

MIT Certificate No. L2002-756.L2002-757 for Data Logger (Lutron Temperature & Humid & Baro) Serial No. B014887, Due 28-Feb-21

MIT Certificate No. L2001-629 for Hi Accuracy Thermometer Serial No. 130508834, Due 07-Jan-21

End of Certificate

Page 2 of 2

SV 212001/2021

Cert. No. WAC-065  
 Page 1 of 2

## CERTIFICATE OF CALIBRATION

Instrument : DO Meter  
 Model : DO-31P  
 Serial No. : 780065  
 Manufacturer : TOA-DKK  
 Measuring Range : 0.00 ~ 20.00 mg/l

Machine : -  
 Location : -

Customer : Water Analysis Center Co., Ltd.  
 1/94 Moo.5 T. Kanham, A.U.-Thai  
 Ayutthaya 13210 Thailand

Date Of Received : 03 / 12 / 2021  
 Date Of Calibration : 03 / 12 / 2021

Ambient Condition : Temperature 24 °C  
 Humidity 47 % RH

Calibrated By : Pa.  
 (Ms. Phanee Yooyen )  
 Technician

Approved By : Mr. Nipon Phungsomsak  
 (Mr. Nipon Phungsomsak )  
 Technical Manager

Date Of Issue : 03 / 12 / 2021

This Certificate may not be reproduced other than in full, except with the prior written approval of the head of the industrial instruments calibration center.

Instrument : DO Meter  
 Model : DO-31P  
 Serial No. : 780065

Cert. No. WAC-065  
 Page 2 of 2

### Calibrate Procedure

- ☐ This instrument was calibrated by comparison with standard solution (PH/ORP)
  - ☐ This instrument was calibrated by comparison with scattering plate value (Turbidity)
  - ☐ This instrument was calibrated by comparison with conductivity (Conductivity)
  - ☒ This instrument was calibrated by comparison with Sodium sulfite anhydrous (DO)
- Condition of this result of calibration  
 1). Reference Standard Solution

Standard Lot No Batch. Cert. No. Due Date  
 Sodium Sulfite Power 1.06657.0500 K52300357 - 31 Mar 2022

- 2). Traceability This certification is traceable to
- ☒ Merck KGaA 64271 Darmstadt
  - ☐ DKK Corporation

### Result Of Calibration

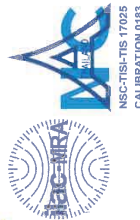
Standard Solution (mg/l) at 26.0°C	Before Adjust		After Adjust	
	Indicator	Error	Indicator	Error
Zero	0.00	+ 0.10	0.00	-
Span	7.99	+ 0.22	7.99	-

DO Electrode No. OE270AA(5) S/N 111F0029

Calibrated By : Pa.  
 (Ms. Phanee Yooyen )  
 Technician

## Certificate of Calibration

### TEMPERATURE CONTROLLER ENCLOSURES



Certificate No.: MC 2107214

Page 1 of 3

Customer : Water Analysis Center Co., Ltd.  
1/94 Moo 5, T. Kantham, A.U.-Thai, Ayutthaya 13210.

Reference Job No. : 21-1565 Received Date : 13 July 2021

Description : Refrigerator

Manufacturer : SANDEN/TERCOOL Model : SEC-1500SBD

Serial No. : SEC1500201A-0708-00304 ID. No. : WWL0038

Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number ( MC 2107214 ) has been attached to the case.

Method : In-House calibration procedure MWI-T-033 this method is reference to TLAS G-20 "Temperature Controlled Enclosures".

Location of Calibration : Water Analysis Center Co., Ltd. : Laboratory.

Environmental Conditions : Ambient Temperature : ( 26.3 ) °C

Date of Calibration : 13 July 2021 Relative Humidity : ( 56.4 to 59.3 ) %

Date of Issue : 14 July 2021

Checked by : Thanagorn  
Thanagorn Limchaicharoen  
(Calibration Supervisor)

Approved by : Aittipong  
Aittipong Kanjanawisit  
( Technical Manager )

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

This certificate is issued in accordance with the conditions of accreditation granted by the National Standardization Council of Thailand-Office of the National Standardization Council that 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. This certificate may not be reproduced other than in full except with the prior written approval of Master Calibration Co., Ltd.

Certificate No.: MC 2107214

Page 2 of 3

### The Reference Standard :

Description	Certificate No.	Serial No.	Due date
Data Acquisition/Switch Unit	MC 2009600	MY44095818	8 August 2021
With Thermocouple Type "T" ID. No.6/1 to 6/9			

This certificate is traceable to the international system of units maintained at:

- Master Calibration Co., Ltd. And Quality Reborn Co., Ltd.

### 1. Calibration Procedure:

This Instrument was calibration according to TLAS G-20 by comparison with calibrated thermocouple type T under no load condition. The Thermocouples were placed on nine points and located one thermocouple in each of the eight corners of the chamber and was away from the each wall of 5 cm to 10 cm. And placed the ninth thermocouple within 2.5 cm of the geometric center of the chamber.

**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. The reference sensor should preferably be located at the geometric center of the chamber.

**Temperature Stability** - one-half of the greatest maximum difference of measured temperatures at any one sensor.

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

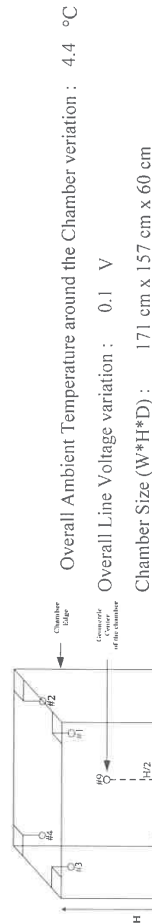


Figure 1 : Sensor Installation Location

Checked by : Thanagorn

Certificate No.: MC 2107214

Page 3 of 3

## 2. Result of calibration :

### Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations								Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9
2.6	4.0	4.0	4.1	4.0	3.9	3.8	3.7	3.8	3.4
									1.2

### Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
2.0	2.6	2.7	1.4	5.8

The 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 %.

This report will certify of the calibrated equipment only.

End of Certificate

Checked by : Thangorn

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

## TEMPERATURE CONTROLLER ENCLOSURES

Report No. : MC 2103787

Page 1 of 3



Customer : Water Analysis Center Co., Ltd.  
1/94 Moo 5, T.Kantham, A.U-Thai, Ayutthaya 13210.

Reference Job No. : 21-0710 Received Date : 25 March 2021

Description : Oven

Manufacturer : Memmert Model : UF260

Serial No. : B620.0814 ID. No. : N/A

Marking : Additionally for the purpose of identification by this laboratory a label marked with this report number ( MC 2103787 ) has been attached to the case.

Method : In-House calibration procedure MWI-T-033 this method is reference to TLAS G-20 "Temperature Controlled Enclosures".

Location of Calibration : Water Analysis Center Co., Ltd. ; Laboratory.

Environmental Conditions : Ambient Temperature : ( 31.8 to 35.3 ) °C

Relative Humidity : ( 44.7 to 55.9 ) %

Date of Calibration : 25 March 2021 Date of Issue : 26 March 2021

Checked by : Thangorn

Thangorn Limchaicharoen  
( Calibration Supervisor )

Approved by : Aitipong

Aitipong Karijana Vasiit  
( Technical Manager )

The uncertainties are for a confidence probability of approximately 95%

This certificate is issued in accordance with the condition of accreditation granted by the Thai Laboratory Accreditation Scheme 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. This certificate may not be reproduced other than in full expect with the prior written approval of the issuing laboratory.

[MCF-Q-077 ; Rev.5 ; Date : 15/07/2014]



Continuation of Report No. : MC 2103787

Page 2 of 3

## The Reference Standard :

Description	Report No.	Serial No.	Due date
Data Acquisition/Switch Unit With Thermocouple Type "T" ID. No.17/1 to 17/9	MC 2016027	MY41010916	10 January 2022

This certificate is traceable to the international system of units maintained at:

- Master Calibration Co., Ltd.

## 1. Calibration Procedure:

This Instrument was calibration according to TLAS G-20 by comparison with calibrated thermocouple type T under no load condition. The Thermocouples were placed on nine points and located one thermocouple in each of the eight corners of the chamber and was away from the each wall of 5 cm to 10 cm. And placed the ninth thermocouple within 2.5 cm of the geometric center of the chamber.

*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. The reference sensor should preferably be located at the geometric center of the chamber.

*Temperature Stability* - one-half of the greatest maximum difference of measured temperatures at any one sensor.

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

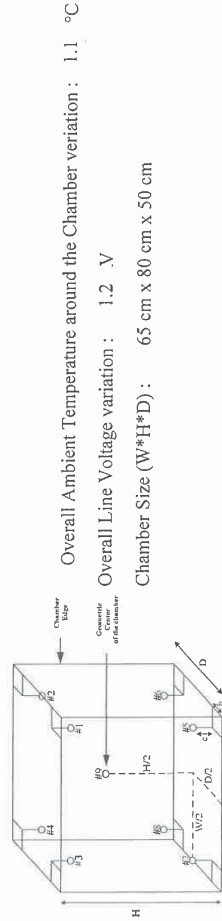


Figure 1 : Sensor Installation Location

Checked by : *Thanasorn*

[MCF-Q-077 ; Rev.5 ; Date : 15/07/2014]

Continuation of Report No. : MC 2103787

Page 3 of 3

## 2. Result of calibration :

### Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9	
104.0	103.7	103.7	103.7	103.9	104.2	104.3	104.3	104.3	104.0	0.67
180.0	179.1	179.1	179.0	179.2	180.4	180.5	180.6	180.6	180.2	0.99

### Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	104.0	0.27	0.44	1.0
180.0	180.0	0.29	1.31	1.9

## 3. Uncertainty of Measurement

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

This report will certify of the calibrated equipment only.

End of Calibration Report

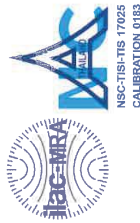
Checked by : *Thanasorn*

[MCF-Q-077 ; Rev.5 ; Date : 15/07/2014]



## Calibration Report

### TEMPERATURE CONTROLLER ENCLOSURES



Report No. : MC 2103787

Customer : Water Analysis Center Co., Ltd.  
1/94 Moo 5, T.Kantham, A.U.-Thai, Ayutthaya 13210.

Reference Job No. : 21-0710 Received Date : 25 March 2021  
Description : Oven  
Manufacturer : Memmert Model : UF260  
Serial No. : B620.0814 ID. No. : N/A  
Marking : Additionally for the purpose of identification by this laboratory a label marked with this report number ( MC 2103787 ) has been attached to the case.

Method : In-House calibration procedure MWI-T-033 this method is reference to

Location of Calibration : Water Analysis Center Co., Ltd. ; Laboratory.

Environmental Conditions : Ambient Temperature : ( 31.8 to 35.3 ) °C  
Relative Humidity : ( 44.7 to 55.9 ) %

Date of Calibration : 25 March 2021 Date of Issue : 26 March 2021

Checked by : Thanagorn  
Thanagorn Limchaicharoen  
( Calibration Supervisor )

Approved by : Aittigong  
Aittigong Kanjanawasit  
( Technical Manager )

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

This certificate is issued in accordance with the condition of accreditation granted by the Thai Laboratory Accreditation Scheme 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. This certificate may not be reproduced other than in full expect with the prior written approval of the issuing laboratory.

Continuation of Report No. : MC 2103787

Page 2 of 3

#### The Reference Standard :

Description	Report No.	Serial No.	Due date
Data Acquisition/Switch Unit	MC 2016027	MY41010916	10 January 2022
With Thermocouple Type " T " ID. No.171 to 17/9			

This certificate is traceable to the international system of units maintained at:

- Master Calibration Co., Ltd.

#### 1. Calibration Procedure:

This Instrument was calibration according to TLAS G-20 by comparison with calibrated thermocouple type T under no load condition. The Thermocouples were placed on nine points and located one thermocouple in each of the eight corners of the chamber and was away from the each wall of 5 cm to 10 cm. And placed the ninth thermocouple within 2.5 cm of the geometric center of the chamber.

**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. The reference sensor should preferably be located at the geometric center of the chamber.

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

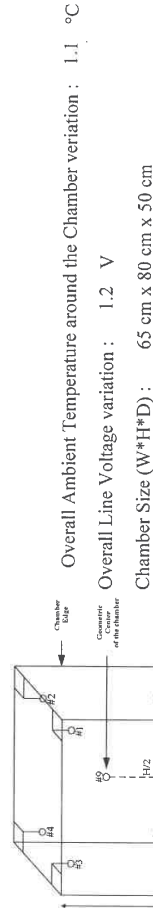


Figure 1 : Sensor Installation Location

Checked by : Thanagorn

Continuation of Report No. : MC 2103787

Page 3 of 3

## 2. Result of calibration :

### Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations								Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9
104.0	103.7	103.7	103.7	103.9	104.2	104.3	104.3	104.3	104.0
180.0	179.1	179.1	179.0	179.2	180.4	180.5	180.6	180.6	180.2
									0.67
									0.99

### Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	104.0	0.27	0.44	1.0
180.0	180.0	0.29	1.31	1.9

## 3. Uncertainty of Measurement

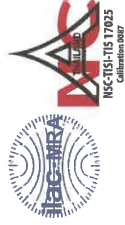
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95 %

**This report will certify of the calibrated equipment only.**

**End of Calibration Report**

Checked by : *Thanagorn*

[MCF-Q-077 ; Rev.5 ; Date : 15/07/2014]



# Certificate of Calibration

**Equipment:** Balance  
**Model:** BL210S  
**Serial No. (or ID.):** 15808131 ( WWL 0022 )  
**Manufacturer:** Sartorius  
**Condition:** In condition

**Certificate No.:** C01211841  
**Issued Date:** 24 June 2021  
**Job No.:** KSPR2107969  
**Page:** 1 of 2

**Customer:** Water Analysis Center Co., Ltd.

1/94 Moo 5, Rojana Industrial Park, Rojana Road,  
Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

**Environment Condition:** Temperature 27 °C ± 0.3 °C  
Humidity 40 %RH ± 1.7 %RH

**Calibration Place:** Water Analysis Center Co., Ltd. ( ห้างเครื่องชั่ง )  
1/94 Moo 5, Rojana Industrial Park, Rojana Road,  
Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

**Calibration By:** Mr. Phakapol Donmin

**Calibration Date:** 10 June 2021

**The Method used:** In house method, SPC-WI-47, base on UKAS Lab 14

**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C02210017

**SERT**  
บริษัท เอสอาร์ที อาร์ทิ จำกัด  
SPC RT Co., Ltd.

*Ringrod*

(Mr. Ringrod Jenkitrakulchai)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ( $k=2$ ) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of SPC RT Co., Ltd.

**Calibration Results:****Without Adjustment**

Eccentric Error: Weight to be 1/4 or 1/3 of Maximum capacity, taken from the center of the pan as a zero reference.

Nominal Test Value		Reference Points (g)				
		A	B	C	D	E
50 (g)		-	0.0000	-0.0001	-0.0001	0.0000

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00004
200	0.00005

Departure of indication from nominal value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Correction of Balance (g)	Uncertainty (g)	k
1	1.00001	1.0000	0.0000	0.00010	2.03
2	2.00002	2.0000	0.0000	0.00010	2.03
5	4.99999	5.0000	0.0000	0.00010	2.03
10	10.00000	10.0000	0.0000	0.00011	2.02
20	19.99999	20.0000	0.0000	0.00011	2.02
50	49.99997	50.0000	0.0000	0.00012	2.01
70	69.99996	70.0000	0.0000	0.00015	2.00
100	100.00000	100.0000	0.0000	0.00017	2.00
120	119.99999	120.0001	-0.0001	0.00021	2.00
150	149.99997	150.0000	0.0000	0.00023	2.00
200	199.99990	200.0003	-0.0004	0.00029	2.00

**The End of Certificate****BSC Certification Test Report**

Certificate No.: M0979/21

Customer Name: LABORATORY WATER ANALYSIS CENTER COMPANY LIMITED

 Customer Address: 1/94 Moo 5 T.Kanharm, A.U.-Thai,  
 Phra Nakhon Si Ayutthaya 13210

Equipment: Biological Safety Cabinet Class II Type A2

Manufacturer: Microtech

Model: V6-T

Serial No: 0972

ID No.: WWL0084

 Were in accordance with ☒ EN 12469 ☐ NSF 49 ☐ Manufacturer's specification

Test Date: 23/09/2021

Due Date: 23/09/2022

Test by: Mr. Puwadon Keawkla

or after HEPA filters are replaced or unit is moved

Approved by:

  
 (Mr.Kridsada Thinhutaoei)  
 Authorized Signatory

Issued Date: 24/09/2021

This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).

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Certificate No. : M0979/21

- Procedure Used :**
- European Standard EN12469 : 2000 has the status of British Standard,
  - Biotechnology Performance criteria for microbiological safety cabinets.
  - NSF International Standard / American National Standard NSF / ANSI 49-2008
  - Biosafety Cabinet : Design, Construction, Performance and Field Certification.
  - Australian Standard : AS 1807.23-2000 Determination of intensity of radiation from germicidal ultraviolet lamps.
  - Manufacturer's specification.

### 1. Downflow velocity test.

#### Measurement Information

No. of Rows	No. of Readings	Grid Spacing Front-Back	Grid Spacing Side-Side	Probe height Above sash
2	8	1/4,3/4	1/8,3/8	100 mm.

#### Measurement Data.

0.34	0.37	0.36	0.35
0.32	0.33	0.32	0.34

Average velocity 0.34 m/s ( 67 FPM.) Velocity range 0.25-0.50 m/s ( 49-98 FPM.)

Uniformity( EN: +/-20%avg. 0.27 - 0.41 m/s ( 54 - 80 FPM.)

Supply filter dimension 24 x 72 (inch x inch) Supply filter area 10.69 SQ.FT

Downflow volume (Q) 716 CFM.

Result Summary ☒ Pass ☐ Fail

Equipment used : Thermo Anemometer Model 425 S/N : 03004786 Calibration date : 23/02/2021

Certificate No. : M0979/21

### 2. Inflow velocity test.

Select method. : ☐ DIM ☒ Exhaust velocity. ☐ MFG's Specifications

0.57	0.59	0.56	0.61	0.63
0.58	0.6	0.56	0.59	0.58
0.61	0.57	0.56	0.54	0.56
0.59	0.56	0.62	0.59	0.62
0.59	0.57	0.63	0.59	0.58

Average Inflow velocity 0.50 m/s (98 FPM.) Velocity range  $\geq 0.40$  m/s (  $\geq 79$  FPM.)

Inflow dimension 8 x 72 (inch x inch) Inflow area 4.00 SQ.FT

Inflow volume(Q) 392 CFM

Result Summary ☒ Pass ☐ Fail

Adjustments Required ☐ Fan Speed ☐ Damper

Equipment used : Thermo Anemometer Model 425 S/N : 03004786 Calibration date 23/02/2021

### 3. HEPA filter leak test.

#### Measurement Data

HEPA Filter	PAO Upstream Conc.(calculated)	Specification	Measured leak penetration
Supply HEPA Filter	18 $\mu\text{g/L}$	<0.003%	<0.003%
Exhaust HEPA Filter	18 $\mu\text{g/L}$	<0.003%	<0.003%



Certificate No. : M0979/21

**Leak location**

Supply HEPA Filter  
Back



Exhaust HEPA Filter  
Back



Result Summary ☒ Pass ☐ Fail

Equipment used : Aerosol Photometer Model TDA-2H S/N : 21683 Calibration date 24/02/2021

Equipment used : Smoke Generator Model TDA-6C S/N : 21623

**4. Airflow smoke patterns test**

**Measurement Information**

1. Downflow Pattern test : Smoke shall be passed from one end of the cabinet to the other, along the centerline of the work surface, at a height of 4 inch (10 cm) above the top of the access opening
2. View screen retention test : Smoke shall be passed from one end of the cabinet to the other, 1.0 in (2.5 cm) behind the view screen, at a height 6.0 inch (15 cm) above the top of the access opening.
3. Work opening edge retention test : Smoke shall be passed along the entire perimeter of the work opening  
Particular attention should be paid to corners and vertical edges.
4. Sash/window seal test : Smoke shall be passed up the inside of the window 2 in (5 cm) from the sides and along the top of the work area.

Certificate No. : M0979/21

**Result Summary**

Downflow Pattern test ☒ Accept ☐ Non-Conforming

View screen retention test ☒ Accept ☐ Non-Conforming

Work opening edge retention test ☒ Accept ☐ Non-Conforming

Sash/window seal test ☒ Accept ☐ Non-Conforming

**5. Site installation**

Sash Alarm. ☐ Pass ☐ Fail ☒ N/A

Interlock System. ☐ Pass ☐ Fail ☒ N/A

Exhaust System Performance ☐ Pass ☐ Fail ☒ N/A

**Remark / Recommendation**

ระบบ Site installation ไม่มีการตรวจสอบ เนื่องจากตู้ไม่มีฟังก์ชันนี้

**6. Illumination Test (Lighting) : Option**

Lighting should be adequate for safe working within the cabinet. Illumination measured at the work surface.

Lux

632	1000	997	630
947	1456	1449	921

Remark :

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**7. Ultraviolet Lamp Test (UV) : Option**

Ultraviolet radiation where UV Lamp are fitted, the intensity of radiation at a wavelength of 254 nm.  
Shall be not less than 400 mW/m<sup>2</sup> when measures at work floor surface.

mW/m<sup>2</sup>

740	1580	1570	750
480	1040	1020	480

Remark :

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