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## เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์

## CERTIFICATE OF CALIBRATION

Certificate No.: C0-1608001/24 Page 1 of total 4 pages

**Customer** WATER ANALYSIS CENTER CO., LTD.  
1/94 Moo 5, T.Kanham,  
A.U-thai, Ayutthaya 13210

**Equipment** pH Meter  
**Manufacturer** METTLER TOLEDO **Model** SevenCompact S220  
**Serial No.** 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** 16 August 2024

**Calibration Date** 16 August 2024

**Date of Issue** 19 August 2024

**Condition of Artifacts** Used conditions but can be calibrated

Checked by  Approved by   
Act as Technical Manager Representative of Managing Director

( ) ( Krisyos K. ) ( ) ( Sakda Y. )  
( ) ( Patiphan K. ) ( ) ( Onnappa 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.: C0-1608001/24 Page 3 of total 4 pages

Measurement Results (Cont.):

2. Calibration of pH Electrode (Serial No.: 3222623)

pH Standard Solution ( pH )	Measured Value		Uncertainty ( ± pH )
	( pH )	( mV )	
4.01	4.01	186.1	0.013
7.01	7.01	9.3	0.013
10.01	10.00	-164.5	0.013

Note : Adjust Curve to Buffer Solution pH (4,7,10)  
Temperature stability of micro bath : 25 ± 0.2 °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%.

FE-169

Calibrated by Athipat  
REV.02 02/24/21

ภาคผนวก ข-1

Certificate No.: C0-1608001/24 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	150823	Feb. 9, 2025	NIMT
	7.01	180723	Jan. 12, 2025	
	10.01	160823	Jan. 16, 2025	

Type	Serial No.	Certificate No.	Due Date	Traceability
Documenting Process Calibrator	2630521	10-2312001/23	Dec. 24, 2024	THC
Digital Thermometer with Sensor	1709138 / 4605984-005	10-0806001/24	Jun. 7, 2025	

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	177.3	0.060
0.00	7.00	7.00	-0.1	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)

FE-169

Calibrated by Athipat  
REV.02 02/24/21

Certificate No.: C0-1608001/24 Page 4 of total 4 pages

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	Serial No.	Cert. No.	Due Date	Traceability
Thermometer Readout	B7C853	10-0911001/23	Nov. 8, 2024	THC
Platinum Resistance Thermometer	4854	COA30047	Oct. 22, 2025	FLUKE
Liquid Bath	XO111019	10-2405001/23	May 25, 2025	THC

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

- THC, Thai Heart Calibration Co., Ltd.  
- FLUKE, Fluke Corporation, U.S.A.

Measurement Results:

( X ) Without Adjustment

Dimension of probe : Diameter 4 mm. Sensor Type : RTD (PT100)				
Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
120	22.00	22.2	-0.20	0.065
120	25.00	25.2	-0.20	0.065
120	28.00	28.2	-0.20	0.065

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 -

FE-169

Calibrated by Pongsak  
REV.02 02/24/21



THAI HEART CALIBRATION CO., LTD.  
112/1 Moo 5, Phrak Sa, Muang, Samut Prakan 10280  
Tel. 0-2394-2162, 0-2757-8435; 0-2757-8496 Fax: 0-2757-8507



## CERTIFICATE OF CALIBRATION

Certificate No.: C0-1607004/24 Page 1 of total 2 pages

Customer: WATER ANALYSIS CENTER CO., LTD.  
1/94 Moo 5, T.Kanham,  
A.U-thai, Ayutthaya 13210

Equipment: Conductivity Meter  
Manufacturer: EUTECH Model: CON 2700  
Serial No.: 2657889 ID No.: WWL 0136  
Description: -

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

Calibration Location: Jayhawks Laboratory (CL&GL)

Received Date: 16 July 2024

Calibration Date: 18 July 2024

Date of Issue: 18 July 2024

Condition of Artifacts: Used conditions but can be calibrated

Checked by: [Signature]  
Act as Technical Manager

Approved by: [Signature]  
Representative of Managing Director

( ) (Krisyos K.) ( ) (Sakda Y.) (Dr. Ekachai Puttitwong)  
( ) (Patiphan K.) ( ) (Onnaya P.)  
( ) (Pongsak H.) ( ) (Nitiphong K.)  
( ) (Kanung C.) ( ) (Nonthachai K.)  
( ) (Pramong P.) ( ) (Noppol P.)

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REV.02 02/24/21



THAI HEART CALIBRATION CO., LTD.  
112/1 Moo 5, Phrak Sa, Muang, Samut Prakan 10280  
Tel. 0-2394-2162, 0-2757-8435; 0-2757-8496 Fax: 0-2757-8507



Certificate No.: C0-1607004/24

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-177 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 :

Material	Batch Value	Lot Number	Due Date	Traceability
Conductivity Standard Solution	147.1 µS/cm	S230330005	Nov. 9, 2024	SCP Science
	1.423 mS/cm	S231129006	May 13, 2025	SCP Science

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

- SCP Science.

Measurement Results: (Probe Serial No.: 93X219065)

Conductivity Standard Solution	Measured Value	Correction	Uncertainty ( ± )
147.1 µS/cm	149.0 µS/cm	-1.9 µS/cm	2.5 µS/cm
1.423 mS/cm	1.425 mS/cm	-0.002 mS/cm	0.0052 mS/cm

Note : Adjustment points: 147.1µS/cm 1.423mS/cm

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 -

FE-169

Calibrated by: Athipat  
REV.02 02/24/21



## Master Calibration Co., Ltd.

547 Soi Ratchadaniw, Kwaeng Samsenok, Khet Huaykwang, Bangkok 10310  
Tel. : (02) 274 2978-9, (02) 2742987-8 Fax : (02) 274 2518, (02) 274 2989  
Website : www.mastercalibration.com E-mail : calibrate@mastercalibration.com

## Certificate of Calibration

TEMPERATURE  
CONTROLLER ENCLOSURES



Page 1 of 3

Certificate No.: MC 2407449

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

Reference Job No. : 24-1546 Received Date : 9 July 2024  
Description : Refrigerator Resolution : 0.1 °C  
Manufacturer : SANDEN INTERCOOL 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 2407449 ) has been attached to the case.  
Method : In-house calibration procedure MWI-T-033 this method Base on TLAS G-20-1/02-08 "Temperature Controlled Enclosures".  
Location of Calibration : Water Analysis Center Co., Ltd.; Laboratory.  
Environmental Conditions : Ambient Temperature : ( 25.2 to 25.4 ) °C  
Relative Humidity : ( 62.1 to 63.3 ) %  
Date of Calibration : 9 July 2024 Date of Issue : 10 July 2024

Checked by: Chalermkit  
Chalermkit Rakphada  
( Calibration Engineer )

Approved by: Aittipong  
Aittipong Kijjanasit  
( 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.

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



547 Soi Ratchadaniw, Kwaeng Samsenok, Khet Huaykwang, Bangkok 10310  
Tel. : (02) 274 2978-9, (02) 2742987-8 Fax : (02) 274 2518, (02) 274 2989  
Website : www.mastercalibration.com E-mail : calibrate@mastercalibration.com

Certificate No.: MC 2407449

Page 2 of 3

Reference Standard Instrument :

Description: Data Acquisition/Switch Unit Certificate No.: MC 2309074 Serial No.: MY44012056 Due date: 7 Aug 2024 Traceable thru: MCAL  
With Thermocouple Type " T " ID. No.14/1 to 14/9

Traceability :

The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

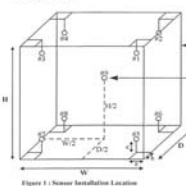
1. Calibration Procedure:

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.



Overall Ambient Temperature around the Chamber variation : 4.2 °C

Overall Line Voltage variation : 0.1 V

Chamber Size (W\*H\*D): 171 cm x 157 cm x 60 cm

Checked by: Chalermkit

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



Certificate No.: MC 2407449

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	
3.0	4.2	4.0	4.0	4.0	4.0	3.7	3.8	3.5	3.5	1.0

Chamber Characterization Result

Desired Temperature (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
4.0	3.0	3.0	0.8	0.9	2.1

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2.0$ , providing a level of confidence of approximately 95 %.

This certificate will certify of the calibrated equipment only.

End of Certificate

Checked by : Chalermki

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



SV 201005/2024

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 : 11 / 01 / 2024  
Date Of Calibration : 11 / 01 / 2024

Ambient Condition : Temperature 26 °C  
Humidity 58 % RH

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

Approved By : N. Phongsomsak  
(Mr. Nipon Phongsomsak)  
Technical Manager

Date Of Issue : 15 / 01 / 2024

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.

Automation Service Co.,Ltd. 929/929/1 Soi Pattanakarn30, Pattanakarn Rd., Suanluang, Suanluang, Bangkok 10250  
Tel : 02-319-9994 ext. 721,725 | E-mail : iso@automation.co.th, service@automation.co.th | www.automation.co.th



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	408K1405	-	-	-
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2). Traceability This certification is traceable to

- ☒ Kanto Chemical Co.,INC.
- ☐ DKK Corporation

Result Of Calibration

Standard Solution (mg/l) at 25.7°C	Before Adjust		After Adjust	
	Indicator	Error	Indicator	Error
Zero	0.00	+ 0.10	0.00	-
Span	8.02	- 1.57	8.02	-

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

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



**Certificate of Calibration**

Certificate No. : MT24-3208  
Page : 1 of 2

Customer : Water Analysis Center Co.,Ltd.  
Address : 1/94 M.5, Rojana Industrial Park, T.Kanham, A.U-Thai, Ayutthaya 13210

Description : Hot Air Oven  
Manufacturer : Memmert  
Model : UF 260  
Serial No. : B620.0814  
Identification No. : WVVL 0212  
Calibration Place : Customer Laboratory

Order No. : 1152/24  
Received date : Mar 22, 2024  
Calibration date : Mar 22, 2024  
Environment Condition :  
Temperature : (25±10) °C  
Humidity : (50±30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure CP-MT-006 According to comparison with LXI Data Acquisition Switch Unit with sensor. The calibration methods based on Euramet Calibration Guide No.20 - guidelines on the Calibration of Temperature and/or Humidity Controlled Enclosures.

Reference Standard Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49020096	MT23-7163	Nov 30, 2024

The effect that the result relate only to the items calibrated. It was found accurate as shown on date and place of calibration only.

Traceability : This measurement are traceable to the International System of Unit (SI), through National Institute of Metrology Thailand (NIMT)

The reported expanded uncertainty of measurement was based on standard uncertainty multiplied by coverage factor  $k = 2$ , providing a level of confidence of not less than 95%

Calibrated by : Mr.Yuttakorn Jamneansri

Approved by : Mr. Panuwat Phukian  
Issue date : Apr 10, 2024

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Rev.03 / Feb 2024

FM-MT-013



Inctech Metrological Center Co.Ltd.  
39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,  
Saimai, Bangkok 10220, Thailand  
Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com



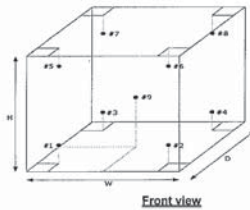
Certificate No. : MT24-3208  
Page : 2 of 2

Function : Temperature measurement  
Calibration point : 104, 180 °C

Result : Without adjustment  
Resolution : 0.1 °C

Calibration point (°C)	Temperature of UUC* at each position (°C)									Uncertainty of measurement (+/- °C)
	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ch.8	Ch.9	
104	103.494	103.933	103.871	103.988	103.990	104.081	103.843	104.217	104.022	0.45
180	179.985	179.953	180.047	179.985	179.908	180.088	180.065	180.273	180.105	0.54

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (+/- °C)	Measured uniformity (°C)	Overall variation (°C)
104.0	104.0	0.34	0.66	1.3
180.0	180.0	0.41	0.86	1.2



#1 Lower Left Front  
#2 Lower Right Front  
#3 Lower Left Rear  
#4 Lower Right Rear  
#5 Upper Left Front  
#6 Upper Right Front  
#7 Upper Left Rear  
#8 Upper Right Rear  
#9 Geometric Center

UUC\* = Unit under calibration

Uniformity = Maximum and Minimum difference of measured temperature at any probes and the measured temperature at the reference and same time.

Overall Variation = Difference of temperature value between the maximum and minimum any time.

Stability = One half of the maximum difference of measured temperatures at any one probe.

-oOo-

Rev.03 / Feb 2024

FM-MT-013



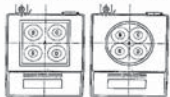
Certificate No.: C01241754

Page: 2 of 2

#### Calibration Results:

Without Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.



Nominal Test Value 100 (g)				
Reference Points (g)				
A	B	C	D	E
-	0.0000	0.0001	0.0000	-0.0002

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

Nominal test value (g)	Standard Deviation
20	0.00004
200	0.00006

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.00001	1.0000	0.0000	0.00011	2.04
2	2.00002	2.0000	0.0000	0.00011	2.04
5	5.00002	5.0000	0.0000	0.00011	2.04
10	10.00001	10.0000	0.0000	0.00011	2.04
20	20.00001	20.0000	0.0000	0.00012	2.03
50	50.00003	50.0000	0.0000	0.00013	2.02
70	70.00004	70.0000	0.0000	0.00016	2.01
100	99.99996	100.0001	0.0001	0.00017	2.01
120	119.99997	120.0002	0.0002	0.00021	2.00
150	149.99999	150.0002	0.0002	0.00024	2.00
200	199.99996	200.0004	0.0004	0.00030	2.00

The End of Certificate

ชื่อย่อ: Inctech Metrological Center Co.Ltd.  
39/1 หมู่ 5 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110  
Phone: +66 2039 7000 Email: info@inctech.com Website: www.inctech.com

Delivering Growth - in Asia and Beyond.

CAL-FM-C01-14: 12 Sep 2022



## Certificate of Calibration

Equipment: Balance  
Model: BL 210S  
Serial No. (or ID.): 15808131 (WWL 0022)  
Manufacturer: Sartorius  
Condition: In condition

Certificate No.: C01241754  
Issued Date: 05 June 2024  
Job No.: WO-00030302  
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 26 °C ± 0.2 °C  
Humidity 50 %RH ± 2.6 %RH

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

Calibration By: Mr. Polawad Ruaminup

Calibration Date: 05 June 2024

The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02240400

(Mr. Polawad Ruaminup)

Person in charge

This certificate is issued by 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 DKSH Technology Limited.

ชื่อย่อ: Inctech Metrological Center Co.Ltd.  
39/1 หมู่ 5 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110  
Phone: +66 2039 7000 Email: info@inctech.com Website: www.inctech.com

Delivering Growth - in Asia and Beyond.

CAL-FM-C01-14: 12 Sep 2022



## MEGAFIL CO., LTD.

99/183 Moo 3 Tambon Bang Rak Noi Amphur Muang Nonthaburi 11000  
Tel. 0-2528-6081-2 Fax. 0-2528-6083, 0-2525-7034  
www.megafil.co.th E-mail : megafil.group@gmail.com

## BSC Certification Test Report

Page 1 of 6

Certificate No. : M1439/24

Customer Name : LABORATORY WATER ANALYSIS CENTER COMPANY LIMITED

Customer Address : 1/94 Moo 5 Khan Ham Subdistrict,  
Uthai District, Phra Nakhon Si Ayutthaya 13210

Equipment : Biological Safety Cabinet Class II Type A2

Manufacturer : Microtech

Model : V6-T

Serial No. : 0972k097272

ID No. : WWL 0084

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

Test Date : 15/10/2024

Due Date : 15/10/2025 or after HEPA filters are replaced or unit is moved

Test by : Mr. Pawut Wongnarakomkul

Approved by :

(Mr.Krudsada Thinhuatoei)

Authorized Signatory

Issued Date : 16/10/2024

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

This certificate may not be reproduced other than in full except with the prior written approval of the Megafil Company Limited.

Certificate No. : M1439/24

**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	100mm

Measurement Data. ( m/s. )

0.37	0.43	0.41	0.39
0.36	0.35	0.32	0.34

Average velocity 0.37 m/s ( 73 FPM.) Velocity range 0.25-0.50 m/s ( 49-98 FPM.)

Uniformity( EN: +/-20%avg.) 0.30 - 0.44 m/s ( 58 - 88 FPM.)

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

Downflow volume (Q) 780 CFM.

Result Summary ☒ Pass ☐ Fail

Equipment used : Thermo Anemometer Model 425 S/N : 02968605 Calibration date : 10/05/2024

Certificate No. : M1439/24

#### 2. Inflow velocity test.

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

MGF's Specifications method

0.54	0.57	0.55	0.54	0.55
0.56	0.55	0.56	0.57	0.54
0.59	0.53	0.54	0.57	0.56
0.53	0.6	0.56	0.55	0.58
0.55	0.58	0.54	0.53	0.55

(m/s. )

Average Inflow velocity 0.47 m/s (93 FPM.) Velocity range ≥0.40 m/s ( ≥79 FPM.)

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

Inflow volume(Q) 372 CFM

Result Summary ☒ Pass ☐ Fail

Adjustments Required ☐ Fan Speed ☐ Damper

Equipment used : Thermo Anemometer Model 425 S/N : 02968605 Calibration date : 10/05/2024

#### 3. HEPA filter leak test.

##### Measurement Data

HEPA Filter	PAO Upstream Conc.(calculated)	Specification	Measured leak penetration
Supply HEPA Filter	<u>18</u> µg/l.	<0.01%	<0.01%
Exhaust HEPA Filter	<u>18</u> µg/l.	<0.01%	<0.01%

Certificate No. : M1439/24

#### Leak location

Supply HEPA Filter  
Back

Exhaust HEPA Filter  
Back

Result Summary ☒ Pass ☐ Fail

Equipment used : Aerosol Photometer Model TDA-2H S/N : 20138 Calibration date : 08/05/2024

Equipment used : Smoke Generator Model TDA-6C S/N : 20192

#### 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. : M1439/24

#### 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

585	936	917	514
849	1400	1465	755

Equipment used : Digital Light Meter Model Easy View 31 S/N : 160404993 Calibration date : 08/05/2024

Remark :



Certificate No. : M1439/24

**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>

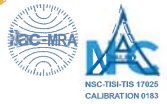
630	1450	1480	690
380	920	930	390

**Equipment used :** UVC LIGHT METER **Model** UVC-254SD **S/N :** Q879819 **Calibration date :** 08/05/2024

**Remark :**

-000-

## Certificate of Calibration

**LIQUID BATH**


Certificate No.: MC 2314268

Page 1 of 3


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

**Reference Job No. :** 23-2833 **Received Date :** 15 December 2023  
**Description :** Water Bath  
**Manufacturer :** ESSTELL **Model :** EWB-122D  
**Serial No. :** 20180508122 **ID No. :** WWL 0214  
**Marking :** Additionally for the purpose of identification by this laboratory a label marked with this certificate number ( MC 2314268 ) has been attached to the case.  
**Method :** In-House calibration procedure MWI-T-029 this method is reference to ASTM E715 "Liquid Bath".  
**Location of Calibration :** Water Analysis Center Co., Ltd. ; Laboratory.  
**Environmental Condition :** Ambient Temperature : ( 29.4 to 29.8 ) °C  
 Relative Humidity : ( 49.0 to 52.0 ) %  
**Date of Calibration :** 15 December 2023 **Date of Issue :** 19 December 2023

**Checked by :** Chalermkit Rakphada  
 Chalermkit Rakphada  
 ( Calibration Engineer )

**Approved by :** Aittipong Karanachaisit  
 Aittipong Karanachaisit  
 ( 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.

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

Certificate No.: MC 2314268

Page 2 of 3

**Reference Standard Instrument :**

Description	Certificate No.	Serial No.	Due date	Traceable thru
Data Acquisition/Switch Unit	MC 2301270	MY44020009	9 Mar 2024	MCAL

 With Thermocouple Type " T " ID. No.271/ to 27/5

**Traceability :**

The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

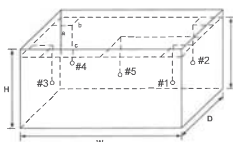
**1. Calibration Procedure:**

This Instrument was calibration according to ASTM E715 - 2007 by comparison with calibrated sensor under no load condition. The sensor were placed on five points and located one sensor 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 five sensor 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.



- Overall Ambient Temperature around the Chamber variation : 1.3 °C
- Overall Line Voltage variation : 0.0 V
- Chamber Size (W\*H\*D) : 50 cm x 12 cm x 30 cm
- Water Level : 7 cm

Checked by : Chalermkit

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

Certificate No.: MC 2314268

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	Ref. #5	
45.0	44.5	44.4	44.5	44.5	44.6	0.45

**Chamber Characterization Result**

Desired Temperature (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
44.5	45.0	45.0	0.62	0.88	1.5

 The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2.0$ , providing a level of confidence of approximately 95 %.

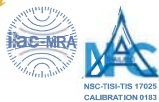
**This certificate will certify of the calibrated equipment only.**
**End of Certificate**

Checked by : Chalermkit

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

## Certificate of Calibration

### TEMPERATURE CONTROLLER ENCLOSURES



Page 1 of 3



Certificate No.: MC 2314270

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

Reference Job No. : 23-2833 Received Date : 15 December 2023  
Description : Incubator  
Manufacturer : Memmert Model : IN260  
Serial No. : D619.0170 ID. No. : WWL 0192  
Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number ( MC 2314270 ) 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 : ( 25.2 to 25.6 ) °C  
Relative Humidity : ( 65.4 to 66.2 ) %  
Date of Calibration : 15 December 2023 Date of Issue : 19 December 2023

Checked by : Chalermit  
Chalermit Rakphada  
( Calibration Engineer )

Approved by : Aittipong  
Aittipong Kanjanasit  
( 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.

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

Certificate No.: MC 2314270

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### Reference Standard Instrument :

Description	Certificate No.	Serial No.	Due date	Traceable thru
Data Acquisition/Switch Unit	MC 2214032	MY41029992	26 Dec 2023	MCAL

With Thermocouple Type " T " ID. No.31/1 to 31/9

### Traceability :

The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

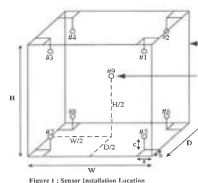
### 1. Calibration Procedure:

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.



Overall Ambient Temperature around the Chamber variation : 0.4 °C

Overall Line Voltage variation : 0.0 V

Chamber Size (W\*H\*D) : 65 cm x 80 cm x 50 cm

Checked by : Chalermit

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

Certificate No.: MC 2314270

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### 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	
35.0	35.2	35.2	35.2	35.2	35.1	35.1	35.0	35.1	35.1	0.44

#### Chamber Characterization Result

Desired Temperature (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.0	35.0	0.13	0.21	0.4

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 certificate will certify of the calibrated equipment only.

End of Certificate

Checked by : Chalermit

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

## Certificate of Calibration

### AUTOCLAVE



Page 1 of 3



Certificate No.: MC 2314269

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

Reference Job No. : 23-2833 Received Date : 15 December 2023  
Description : Autoclave  
Manufacturer : TOMY Model : Autoclave ES-315  
Serial No. : 51135128 ID. No. : WWL 0083  
Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number ( MC 2314269 ) has been attached to the case.  
Method : In-House calibration procedure MWI-T-036 this method is reference to based on BS 2646 : 1993 Part 5 "Autoclave".  
Location of Calibration : Water Analysis Center Co., Ltd. ; Laboratory.  
Environmental Condition : Ambient Temperature : ( 29.4 to 30.7 ) °C  
Relative Humidity : ( 50.0 to 52.0 ) %  
Date of Calibration : 15 December 2023 Date of Issue : 19 December 2023

Checked by : Chalermit  
Chalermit Rakphada  
( Calibration Engineer )

Approved by : Aittipong  
Aittipong Kanjanasit  
( 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.

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



Certificate No.: MC 2314269

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**Reference Standard Instrument :**

Description	Certificate No.	Serial No.	Due date	Traceable thru
Temperature Recorder RTD 100 Ohm	MC 2300163	M79252	9 Jan 2024	MCAL
Temperature Recorder RTD 100 Ohm	MC 2300164	5978194	9 Jan 2024	MCAL
Temperature Recorder RTD 100 Ohm	MC 2300165	M79251	9 Jan 2024	MCAL

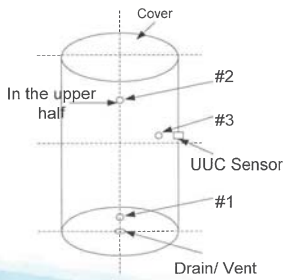
**Traceability :**

The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

**1. Calibration Procedure:**

The equipment list above was calibrated an accuracy of temperature in a chamber of the sterilizer.  
The calibration was performed by direct measurement of generated temperatures using the standard thermometer with three temperature sensors. The data was recorded in a period of fifteen minutes of the sterilizing status. The temperature scale used was based on ITS-90.

The calibration of sterilizer was carried out at the point indicated by following the In-house calibration method No. MWI-T-036 based on BS 2646 : 1993 : Part 5 in Tests for performance section.



- Overall Line Voltage variation : 0.0 V

Checked by : *Chalermpit*

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

Certificate No.: MC 2314269

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	
121	121.72	121.73	121.95	0.61

**Characterization Result**

Desired Temperature (°C)	Setting Temperature (°C)	Timer Setting ( min )	Indicating Temperature (°C)	Indicating Pressure ( kPa )	Measured Stability (±°C)	Measured Uniformity (°C)	Overall Variation (°C)
121	121	15.0	121	120	0.60	0.35	1.35

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 certificate will certify of the calibrated equipment only.**

**End of Certificate**

Checked by : *Chalermpit*

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