

## เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์





THAI HEART CALIBRATION CO., LTD.  
109/1 Moo 5, T. Kantham,  
A. U-thai, Ayuthaya 13210  
Tel. 02-8217581  
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G.P.O. BOX 2695  
AC-2695



## CERTIFICATE OF CALIBRATION

Certificate No.: CO-1808005/23

Page 1 of total 4 pages

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

**Equipment** pH Meter  
**Manufacturer** METTLER TOLEDO  
**Serial No.** B327527211  
**Description** Range : 0 - 14 pH, Resolution : 0.01 pH

**Model** SevenCompact S220  
**ID No.** WWL 0068

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

**Calibration Location** Jayhawk Laboratory (CL&GL)

**Received Date** 18 August 2023

**Calibration Date** 18 August 2023

**Date of Issue** 21 August 2023

**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.)  
( ) (Paiphan K.) (✓) (Omaha P.)  
( ) (Pongsak H.) ( ) (Nitipong K.)  
( ) (Kanung C.) ( ) (Nonthachai K.)  
( ) (Pramong P.) ( ) (Noppol P.)

(Dr. Ekachai Putitwong)

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

FE-169

REV.02 02/24/21



THAI HEART CALIBRATION CO., LTD.  
109/1 Moo 5, T. Kantham,  
A. U-thai, Ayuthaya 13210  
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AC-2695



Certificate No.: CO-1808005/23

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**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	030822	Feb. 9, 2024	NIMT
	7.01	300522	Feb. 9, 2024	
	10.01	230822	Feb. 7, 2024	

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Documenting Process Calibrator	754	2630521	10-2412001/22	Dec. 23, 2023	THC
Digital Thermometer with Sensor	1523 / 5622	1709138 / 4605984-005	10-0806001/23	Jun. 8, 2024	

**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)

Calibrated by Kitipong

REV.02 02/24/21



Certificate No.: C0-1808005/23

Page 3 of total 4 pages

Measurement Results (Cont.):

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

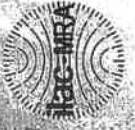
pH Standard Solution	Measured Value		Uncertainty ( $\pm$ pH)
	(pH)	(mV)	
4.01	4.01	180.0	0.013
7.01	7.00	4.0	0.013
10.01	10.01	-172.0	0.013

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.: C0-1808005/23

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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	10-0911001/22	Nov. 9, 2023	THC
Platinum Resistance Thermometer	5626	4854	C0A30047	Oct. 22, 2023	FLUKE
Liquid Bath	XORTS-40A	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 ( $^\circ\text{C}$ )	UUC Reading ( $^\circ\text{C}$ )	Correction ( $^\circ\text{C}$ )	Uncertainty ( $\pm$ $^\circ\text{C}$ )
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 Kittipong  
REV.02 02/24/21

Calibrated by Pongsak  
REV.02 02/24/21

Certificate No.: MC 2307702

Page 2 of 3

**The Reference Standard Instrument :**

Description Certificate No. Serial No. Due date Traceable thru  
Data Acquisition/Switch Unit MC 2303173 MY41010916 9 Mar 2024 MCAL  
With Thermocouple Type "T" ID. No.1771 to 1779

**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.

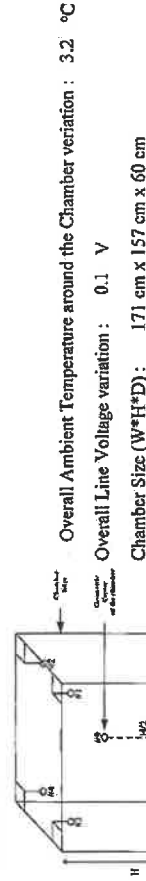


Figure 1: Static Insulation Location

Checked by: *Thanagorn*

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

**Certificate of Calibration**

TEMPERATURE  
CONTROLLER ENCLOSURES



Certificate No.: MC 2307702

Page 1 of 3

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

Reference Job No. : 23-1577 Received Date : 11 July 2023  
Description : Refrigerator  
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 2307702 ) 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 : ( 25.3 to 25.9 ) °C

Date of Calibration : 11 July 2023 Date of Issue : 12 July 2023  
Relative Humidity : ( 65.2 to 67.9 ) %

Checked by: *Thanagorn* Approved by: *Aittipong*  
Thanagorn Linchaicharoen Aittipong Kanjanawasit  
( Calibration Supervisor ) ( 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 2307702

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	
2.5	4.4	4.2	4.2	4.2	4.0	3.9	4.1	4.0	3.8	0.86

Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
2.0	2.5	1.50	1.01	3.3

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 : *Thanagorn*

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



CERTIFICATE OF CALIBRATION

Page 1 of total 2 pages

Certificate No.: C0-1907007/23

Customer

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

Jayhawks Laboratory (CL&GL)

Received Date

19 July 2023

Calibration Date

19 July 2023

Date of Issue

20 July 2023

Condition of Artifacts

Used conditions but can be calibrated

Checked by

Approved by

Act as Technical Manager

Representative of Managing Director

( ) (Krisyos I 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



AUTOMATION SERVICE CO., LTD.  
CALIBRATION LABORATORY

Cert No. WAC-065  
Page 1 of 2

SV 201005/2024

Certificate No.: CO-1907007/23

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	147.8 $\mu\text{S/cm}$	SZ220611005	Dec. 6, 2023	SCP Science
	1.425 $\text{mS/cm}$	SZ220812006	May 31, 2024	

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 ( $\pm$ )
147.8 $\mu\text{S/cm}$	147.5 $\mu\text{S/cm}$	0.3 $\mu\text{S/cm}$	2.5 $\mu\text{S/cm}$
1.425 $\text{mS/cm}$	1.427 $\text{mS/cm}$	-0.002 $\text{mS/cm}$	0.0051 $\text{mS/cm}$

Note : Adjustment points: 147.8 $\mu\text{S/cm}$  1.425 $\text{mS/cm}$

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 -

## CERTIFICATE OF CALIBRATION

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

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  $^{\circ}\text{C}$   
Humidity 58 % RH

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

Approved By : N. Nipon Phungomsak  
(Mr. Nipon Phungomsak )  
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.

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

- 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	-	-	-

- 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



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



## Certificate of Calibration

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

Customer	: Water Analysis Center Co.,Ltd.
Address	: 1/84 M.5, Rajana Industrial Park, T.Kanham, A.U-Thai, Ayuthaya 13210
Description	: Hot Air Oven
Manufacturer	: Memmert
Model	: UF 260
Serial No.	: B620.0814
Identification No.	: WWL 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	MY48020096	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.Yutakorn Jamneansri

Approved by :

Issue date :

Mr.Panuwat Phukian )  
Apr 10, 2024

This calibration certificate shall not be reproduced other than in full except with the prior written approval of Intech Metrological Center Co.,Ltd

Rev.03 / Feb 2024

FM-MT-013





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



Certificate No. : MT24-3208

Page : 2 of 2

Result : Without adjustment

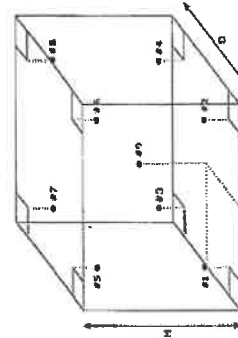
Resolution : 0.1 °C

Function : Temperature measurement

Calibration point : 104, 180 °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	179.986	179.908	180.088	180.085	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

Front view

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.

Rev.03 / Feb 2024

-oOo-

FM-MT-013



## 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 6, 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. (น้ำวิเคราะห์) 1/94 Moo 5, Rojana Industrial Park, Rojana Road, Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

Calibration By: Mr. Polawad Ruamrup  
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

*Signature*

(Mr. Polawad Ruamrup)

Person in charge

*Signature*

(Mr. Rungrod Jenkitrakulchai)

Authorized signatory

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. This report shall not be reproduced except in full without approval of DKSH Technology Limited.

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 หมู่ 5 ถนนพหลโยธิน ตำบลบางพลีใหญ่ อำเภอบางพลี จังหวัดสมุทรปราการ 10540  
Phone: +66 2839 7000 Email: [info@dksh.co.th](mailto:info@dksh.co.th) Website: [www.dksh.co.th/certificate-calib](http://www.dksh.co.th/certificate-calib)

Delivering Growth - in Asia and Beyond.

CAL-FNC-001-14- 12 Sep 2022



Certificate No.: C01241754

Page: 2 of 2

#### Calibration Results:

##### Without Adjustment

Excentric 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	Reference Points (g)				
	A	B	C	D	E
-	0.0000	0.0001	0.0000	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

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2333 Sukhumvit Road, Bangkok, Phraechin, Bangkok 10239  
Phone: 662 2539 7000 Email: info.asia@dksh.com Website: www.dksh.com/thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C01-14: 12 Sep 2022



MASTER CALIBRATION CO.,LTD.

## Master Calibration Co.,Ltd.

547 Soi Rachadaniwa, Kwang Sunseumok, 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

### 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, Ayuthaya 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 Karjanawasit  
Aittipong Karjanawasit  
( 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; Rev6; Date: 22/04/2021]

Certificate No.: MC 2314268

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**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.27/1 to 27/5

**Traceability :**

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

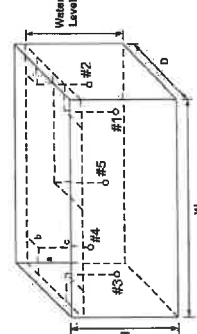
**1. Calibration Procedure:**

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 : Chalermthai

[MCF-Q-071 ; Rev 6 ; Date : 22/04/2021]

Certificate No.: MC 2314268

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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	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 : Chalermthai

[MCF-Q-071 ; Rev 6 ; Date : 22/04/2021]

Certificate No.: MC 2314270

**Reference Standard Instrument :**

Description : **Traceable thru**  
Data Acquisition/Switch Unit : MC 2214032  
Serial No. : MY41029992  
Due date : 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.

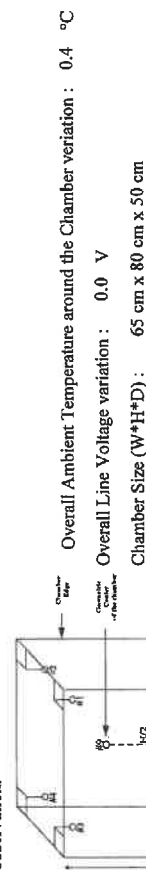


Figure 1 : Sensor Distribution Location

Checked by : **Chalermkit**

*Certificate of Calibration*

**TEMPERATURE  
CONTROLLER ENCLOSURES**



NSC-TS-17025  
CALIBRATION DIES

Page 1 of 3

Certificate No.: MC 2314270

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

Reference Job No. : 23-2833  
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 : **Chalermkit Rakphada**  
( Calibration Engineer )  
Approved by : **Aititipong**  
( 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 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



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Certificate No.: MC 2314269

Customer : Water Analysis Center Co., Ltd.  
1/94 Moo 5, T.Kanitham, A.U-Thai, Ayuthaya 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 Approved by : Aittipong  
Chalermit Rakphada Aittipong Kanjanawasit  
( Calibration Engineer ) ( 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.

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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 :

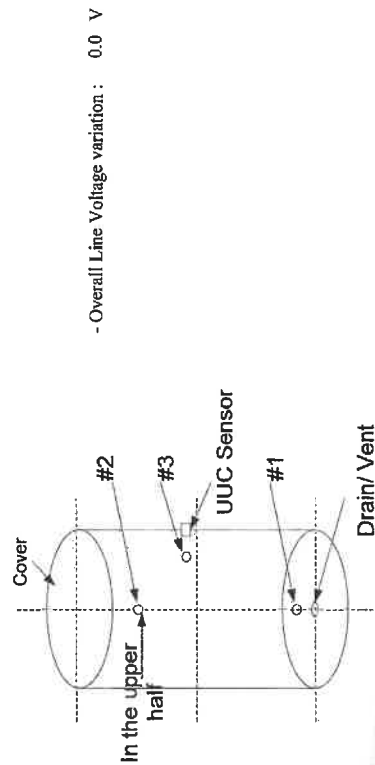
The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

## 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. MWLT-036 based on BS 2646 : 1993 : Part 5 in Tests for performance section.



- Overall Line Voltage variation : 0.0 V

Checked by : Chalermthit

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

Certificate No.: MC 2314269

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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	
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 : Chalermthit

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