

---

## เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



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 (pH)	Measured Value		Uncertainty (± 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%.

Certificate No.: C0-1808005/23

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	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 -

*[Signature]*

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

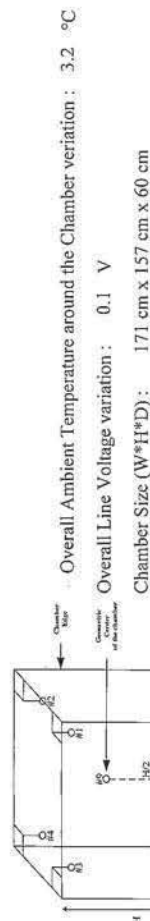
**1. Calibration Procedure:**

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.



**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]

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.Kanliam, 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 MWLT-033 this method is reference to

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

Environmental Conditions : Ambient Temperature : ( 25.3 to 25.9 ) °C

Relative Humidity : ( 65.2 to 67.9 ) %

Date of Calibration : 11 July 2023 Date of Issue : 12 July 2023

Checked by : *Thanagorn* Approved by : *Aittipong*  
Thanagorn Linchaicharoen Aittipong Kanjanawasi  
( Calibration Supervisor ) ( Technical Manager )

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: *Thangorn*

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



THAI HEART CALIBRATION CO., LTD.  
102/1 Moo 5, Prida-Sri-Sung, Samut Prakan 10280  
Tel. 0-2394-2102, 0-2394-2103, 0-2394-2104, 0-2394-2105  
Fax 0-2394-2106, 0-2394-2107, 0-2394-2108, 0-2394-2109



## CERTIFICATE OF CALIBRATION

Certificate No.: C0-1907007/23 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**  
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** *[Signature]* **Approved by** *[Signature]*  
Act as Technical Manager Representative of Managing Director  
( Dr. Ekachai Puttitwong )

( ) ( 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.

FE-169

REV.02 02/24/21



Certificate No.: C0-1907007/23

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 $\mu$ S/cm	S220611005	Dec. 6, 2023	SCP Science
	1.425 mS/cm	S220812006	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 $\mu$ S/cm	147.5 $\mu$ S/cm	0.3 $\mu$ S/cm	2.5 $\mu$ S/cm
1.425 mS/cm	1.427 mS/cm	-0.002 mS/cm	0.0051 mS/cm

Note: Adjustment points: 147.8 $\mu$ S/cm 1.425mS/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 -

Calibrated by Onnapa  
REV.02.02/24/21

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

Calibrated By :

P. Yooyen  
(Ms. Phanee Yooyen)  
Technician

Approved By :

(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.  
CALIBRATION LABORATORY

Automation

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 - - -

- 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(S) S/N 111F0029

Calibrated By

P. Yooyen

(Ms. Phanee Yooyen)  
Technician



Intech Metrological Center Co.Ltd.  
39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,  
Salmal, Bangkok 10220, Thailand  
Tel. (662) 909-3820 (Auto 10 lines) www.imcinstrument.com



Certificate of Calibration

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

Customer : Water Analysis Center Co.,Ltd.  
Address : 1/94 M.5, Rojana 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 $\pm$ 10) °C  
Humidity : (50 $\pm$ 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 2, providing a level of confidence of not less than 95%



Calibrated by : Mr.Yuttakorn Jamneansri

Approved by :

(Mr.Panuwat Phuklan)

Issue date :

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

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

FW-MT-013



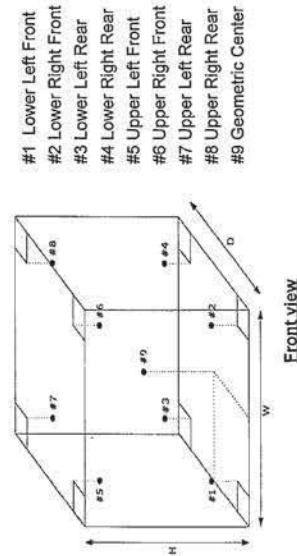
Function  
Calibration point

: Temperature measurement  
: 104, 180 °C

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



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.



## 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. ( ห้างเครื่องชั่ง )  
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

(Mr. Polawad Ruamrup)  
Person in charge

(Mr. Rungrod Jenkitrakulcha)  
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 DKSH Technology Limited.

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 หมู่ที่ 5 ถนนสาย 10000 ตำบล คลองหลวง อำเภอ คลองหลวง จังหวัด ปทุมธานี 10510  
Phone: +66 2838 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-asia

Delivering Growth - in Asia and Beyond.





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

DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok 10260  
Phone: +66 2039 7000 Email: info@dksh.co.th Website: www.dksh.com/thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C01-14; 12 Sep 2022



Master Calibration Co., Ltd.

547 Soi Ratchadapin, Kwang Samsenok, Khwa 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.Kandham, 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

Chalermkit Rakphada  
( Calibration Engineer )

Approved by : Aittipong

Aittipong Karjansa  
( 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 With Thermocouple Type "T" ID. No.27/1 to 27/5	MC 2301270	MY44020009	9 Mar 2024	MICAL

#### Traceability :

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

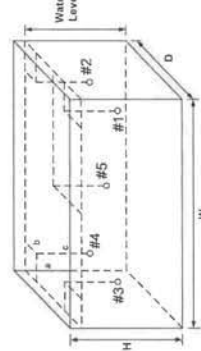
#### 1. Calibration Procedure:

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 eigh 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  
Description : Incubator  
Manufacturer : Memmert  
Serial No. : D619/0170  
Model : IN260  
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**  
Chalermkit Rakphada  
( Calibration Engineer )

Approved by : **Aittipong**  
Aittipong Kanhjanakasit  
( 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

Page 2 of 3

### 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

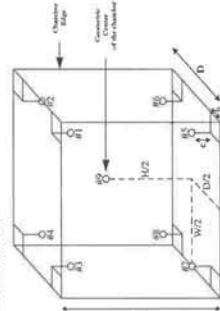


Figure 1 : Sensor Installation Location

Checked by : **Chalermkit**



Certificate No.: MC 2314270

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	
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 : Chalermkit

[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 : Chalermkit Approved by : Aittipong  
Chalermkit Rakphada Aittipong Kanjanasit  
( 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.

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

Certificate No.: MC 2314269

Page 2 of 3

#### 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 :

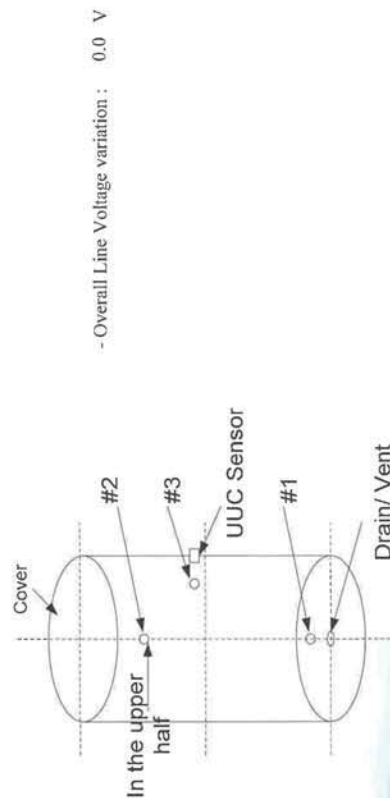
The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

#### 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.



Checked by : Chalermpol

[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 : Chalermpol

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