

ภาคผนวก ช

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์

CERTIFICATE OF CALIBRATION

Certificate No.: C0-1808005/23 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
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

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

(Dr. Ekachai Puttithong)

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REV.02 02/24/21

Certificate No.: C0-1808005/23

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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 Kittipong

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Measurement Results (Cont.):

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

pH Standard Solution	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

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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 -

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. 17/1 to 17/9				

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.

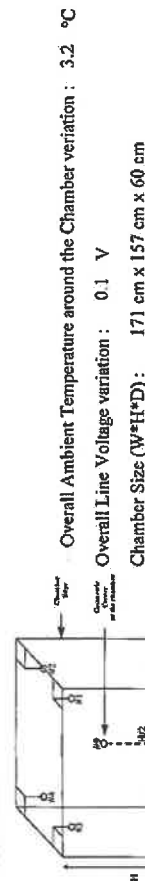


Figure 1: Sensor Installation Location

Checked by: *Thanagorn*

[MCF-Q-077; Rev.5; 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.Kanham, 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:** *Aitipong*
Thanagorn Limchaitcharoen Aitipong 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]

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

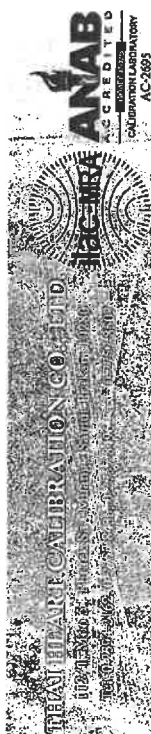
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 %.

This certificate will certify of the calibrated equipment only.

End of Certificate

Checked by: Thangam

[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, Ayutthaya 13210

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

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

Calibration Location

Received Date 19 July 2023

Calibration Date 19 July 2023

Date of Issue
20 July 2023

Condition of Artifacts

Checked by

Approved by

Act as Technical Manager

Representative of Managing Director

()	(Krisyos K.)	()	(Sakda Y.)
()	(Patiphan K.)	(✓)	(Onnapa P.)
()	(Pongsak H.)	()	(Niriphong K.)
()	(Kaung C.)	()	(Nonthachai K.)
()	(Pramong P.)	()	(Noppol P.)

(Dr. Ekachai Putitwong)

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691-JF

REV. 02 02/24/21



SV 2010052024

Cert. No. WAC-065
Page 1 of 2

Certificate No.: C0-1907007/23

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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 µS/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 (±)
147.8 µS/cm	147.5 µS/cm	0.3 µS/cm	2.5 µS/cm
1.425 mS/cm	1.427 mS/cm	-0.002 mS/cm	0.0051 mS/cm

Note : Adjustment points: 147.8µS/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 -

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.Katham, 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. Phance Yooyen)
Technician

Approved By : N. Nipon Phongsouksak
(Mr. Nipon Phongsouksak)
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. Phancee Yooyen)
Technician

Certificate of Calibration

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

Customer : Water Analysis Center Co., Ltd.
Address : 1/84 M.5, Rojana Industrial Park, T.Kanham, A.U-Thai, Ayuthaya 13210

Description : Hot Air Oven
Manufacturer : Menmert
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 Endasures.

Reference Standard Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49020086	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 multiplier coverage factor, providing a level of confidence of not less than 95%

Calibrated by : Mr.Yuttakorn Janneansri

Approved by :

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

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	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	99.99998	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 เคซีเอส จำกัด
2533 สุขุมวิท ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10250
Phone: +66 2638 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 Rachadapinaj, Kwang Sametok, Khet Huaykrang, Bangkok 10310

Tel : (02) 274 2978-9, (02) 274 2987-8 Fax : (02) 274 2518, (02) 274 2989-9

Website : www.mastercalibration.com E-mail : calibrate@mastercalibration.com

Certificate of Calibration

LIQUID BATH



NSC-TS1-17023
CALIBRATION 6115

Page 1 of 3

Certificate No.: MC 2314268

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 : Chalermit Rakphada
Chalermit Rakphada
(Calibration Engineer)
Approved by : Aittipong Kanjanasit
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.

[MCIF-Q-077 ; Rev6 ; 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.27/1 to 27/5				

Traceability :

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

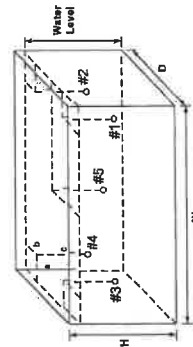
1. Calibration Procedure:

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 :

Chalermkij

[MCF-Q-077 ; 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 : Chalermkij

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

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.

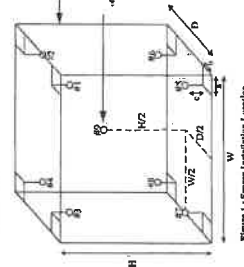


Figure 1 : Sensor Installation Location

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 :

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, Ayuthaya 13210.

Reference Job No. : 23-2833 Received Date : 15 December 2023
Description : Incubator
Manufacturer : Memmert
Serial No. : D619.0170 Model : IN260
Marking : ID. No. : WWL 0192

Method : Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2314270) has been attached to the case.

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

Environmental Conditions : Water Analysis Center Co., Ltd. ; Laboratory.

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 Kahljanlasit
(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

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

AUTOCCLAVE



Certificate No.: MC 2314269

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 : 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

Chalermkit Rakphada
(Calibration Engineer)

Approved by :

Aittipong
Aittipong Kalijarawat
(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

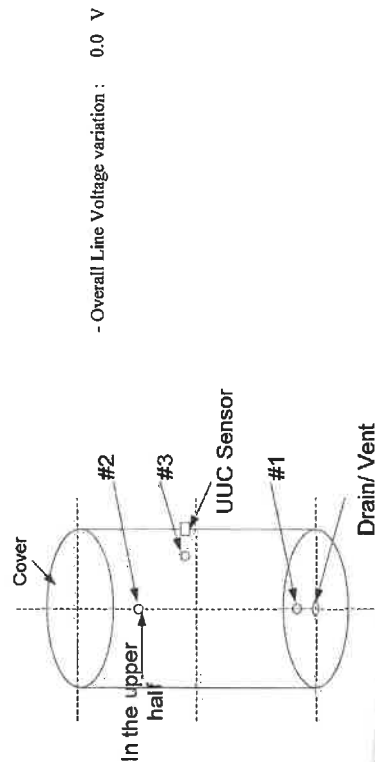
Traceability :

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



Checked by : Chalermjit

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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

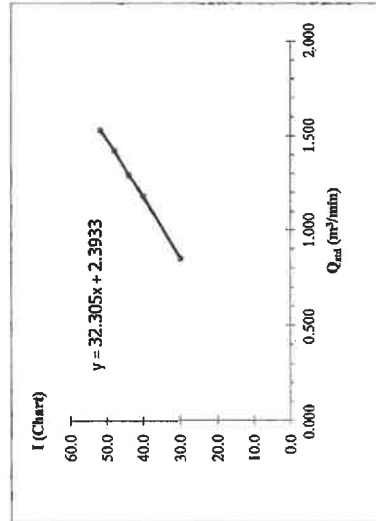
Checked by : Chalermjit

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

High Volume Air Sampler Calibration Worksheet

Project Site : นิคมอุตสาหกรรม โรงกลั่น เกล่งหิน Page 1 of 1
Location : ภายในพื้นที่โครงการ
Date of measurement : 7/5/2024
Worksheet No. : C-070524-WWL0096 Calibration Office : WWL0103
High Volume ID : WWL0096 Calibrator ID : TE-5028A
High Volume Model : TE-5170 (TSP) Calibrator Model : 3271
High Volume S/N : 2730 Calibrator S/N : 27/03/2024
Ambient Condition : 1.59945
Temperature (°C) : 26 Quality Standard Slope : -0.01874
Barometric Pressure (mmHg) : 756 Quality Standard Intercept :

Test No.	delta H ₂ O (inch)	Q _{std} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.90	1.524	52.0	51.79	Slope : 32.18 Intercept : 2.384 Correlation Coefficient : 0.9993
2	5.10	1.418	48.0	47.81	
3	4.20	1.288	44.0	43.82	
4	3.50	1.177	40.0	39.84	
5	1.80	0.847	30.0	29.88	

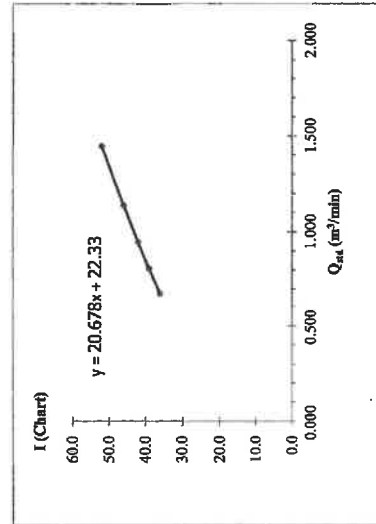


Calibrated by : [Signature] Approved by : [Signature]
Mr. JITTAWEE WONGMAKHEB Mr. RUNGSASIKORN KOSUM

High Volume Air Sampler Calibration Worksheet

Project Site : นิคมอุตสาหกรรม โรงกลั่น เกล่งหิน Page 1 of 1
Location : ภายในพื้นที่โครงการ
Date of measurement : 7/5/2024
Worksheet No. : C-070524-WWL0101 Calibration Office : WWL0103
High Volume ID : WWL0101 Calibrator ID : TE-5028A
High Volume Model : TE-6070 (PM10) Calibrator Model : 3271
High Volume S/N : 2733 Calibrator S/N : 27/03/2024
Ambient Condition : 1.00155
Temperature (°C) : 26 Quality Standard Slope : -0.01185
Barometric Pressure (mmHg) : 756 Quality Standard Intercept :

Test No.	delta H ₂ O (inch)	Q _{std} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.20	1.444	52.0	52.70	Slope : 13.00 Intercept : 14.042 Correlation Coefficient : 0.9996
2	3.20	1.135	46.0	28.93	
3	2.20	0.943	42.0	26.41	
4	1.60	0.806	39.0	24.52	
5	1.10	0.670	36.0	22.64	



Calibrated by : [Signature] Approved by : [Signature]
Mr. JITTAWEE WONGMAKHEB Mr. RUNGSASIKORN KOSUM

