



องค์การบริหารส่วนจังหวัดภูเก็ต

รายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อม
และมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม

โครงการทำเทียบเรือท่องเที่ยวอ่าวฉลอง จังหวัดภูเก็ต

ฉบับประจำเดือนมกราคมถึงมิถุนายน พ.ศ. 2566

ภาคผนวก จ

ใบรับรองการสอบเทียบเครื่องมือ

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Sea Water	BOD	Incubator	SGK_CL0028	25-Jan-22	26-Jul-23	18
Sea Water	BOD	DO/BOD Analyser	SGK_CL0073	21-Nov-22	21-May-24	18
Sea Water	pH at 25 °C	pH meter	SGK_CL0030	9-Nov-21	10-May-23	18
Sea Water	Temperature	pH meter	PHK_FS0002	23-Feb-22	23-Feb-23	12
Sea Water	Total Suspended Solids	Electronic Top-Loading Balance	SGK_CL0045	25-Jan-23	25-Jan-24	12
Sea Water	Total Suspended Solids	Oven	SGK_CL0024	9-Nov-21	10-May-23	18
Sea Water	Salinity	Conductivity meter	SGK_CL0032	9-May-22	9-May-23	12
Sea Water	Turbidity	Turbidity Meter	SGK_FS0045	20-Jun-22	20-Jun-23	12
Sea Water	Total Coliform	Autoclave	SGK_ML0001	5-Jan-23	5-Jul-24	18
Sea Water	Total Coliform	Incubator	SGK_ML0013	6-Aug-22	6-Feb-24	18
Sea Water	Total Coliform	pH Meter	SGK_ML0016	5-Jan-23	5-Jul-24	18
Sea Water	Total Coliform	Water Bath	SGK_ML0021	6-Aug-21	4-Feb-23	18
Sea Water	Floatable Oil & Grease	Electronic Top-Loading Balance	BKK_EN0002	25-Feb-22	25-Feb-23	12
Sea Water	Floatable Oil & Grease	Water Bath	BKK_EN0148	31-Jan-22	1-Aug-23	18
Songkhla Lab	BOD	Incubator	SGK_CL0028	25-Jan-22	26-Jul-23	18
Songkhla Lab	BOD	DO/BOD Analyser	SGK_CL0073	21-Nov-22	21-May-24	18
Songkhla Lab	pH at 25 °C	pH meter	SGK_CL0030	28-Apr-23	28-Oct-24	18
Songkhla Lab	Oil & Grease	Electronic Top-Loading Balance	SGK_CL0045	25-Jan-23	25-Jan-24	12
Songkhla Lab	Oil & Grease	Oven	SGK_CL0024	28-Apr-23	28-Oct-24	18
Songkhla Lab	Oil & Grease	Water Bath	SGK_CL0035	5-Feb-22	6-Aug-23	18
Songkhla Lab	Total Suspended Solids	Electronic Top-Loading Balance	SGK_CL0045	25-Jan-23	25-Jan-24	12
Songkhla Lab	Total Suspended Solids	Oven	SGK_CL0024	28-Apr-23	28-Oct-24	18
Water Lab	<i>Escherichia coli</i>	Autoclave	BKK_ML0041	20-May-22	20-Nov-23	18
Water Lab	<i>Escherichia coli</i>	Incubator	BKK_ML0010	21-Jan-22	22-Jul-23	18
Water Lab	<i>Escherichia coli</i>	Hot Air Oven	BKK_ML0013	21-Nov-22	21-May-24	18
Water Lab	<i>Escherichia coli</i>	Water Bath	BKK_ML0056	20-Apr-23	20-Apr-24	12



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM75

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : Memmert
Model : ICP 750
Serial No. : F816.0063
ID No. : SGK_CL0028
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Songkhla Branch.
114/1 Moo 8, Kanjanavanij Rd., Banphru,
Hatyai, Songkhla 90250, Thailand
Location : BOD Room
Received Order : 24 January 2022
Calibration Date : 25 January 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Kunchit Promprat

REVIEW BY Ananta B.
APPROVED BY Kanitta H.
NEXT CAL. DATE 26/7/23

Approved by :

Malee
Approved Signatory

- () Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date :

7 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0037405



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2201-0617OC-3
 Procedure Used :-

Cert. No.: 22TM75

Page.: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013823	21LM3/1	26 Feb 2022

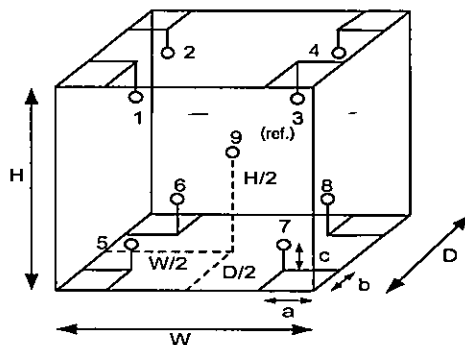
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	28
REL.Humid. (%)	57	52
AC Supply (Volt)	231	231

Probe Installation Details :

a = 10 cm
 b = 10 cm
 c = 10 cm

Dimension of Chamber :

D = 0.60 m
 W = 1.0 m
 H = 1.2 m
 Capacity = 0.75 m³

Position :	Ref. Std. ID No.:
1	21-17RTD-01
2	21-17RTD-02
3	17RTD-03
4	17RTD-04
5	17RTD-05
6	17RTD-06
7	17RTD-07
8	17RTD-08
9 (ref.)	17RTD-09

Malu.



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2201-0617OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 22TM75

Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
20.0	20.0	20.1	0.094	0.50	0.83	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.280	20.370	20.363	20.378	19.915	19.925	19.673	19.727	20.098

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

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.

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

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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Cert. No.: 22LM162

Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor

Manufacturer : YSI

Model : 5000

Serial No. : 17B101473

ID No. : SGK_CL0073

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Songkhla Branch.
114/1 Moo 8, Kanjanavanij Rd., Banphru,

Location : TPA Chemistry Calibration Lab.2

Received Order : 18 November 2022

Calibrated Date : 21 November 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Warakorn Lerngagtrakul

REVIEW BY	Ananta B.
APPROVED BY	Kanitta H.
NEXT CAL. DATE	21 Nov 24.

Approved by :

Malu.

Approved Signatory

- () Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date :

22 November 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0047729



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2111-0663DSC-2

Cert. No.: 22LM162

Page.: 2 of 2

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Digital Thermometer	1523	3240076	221249	02 Mar 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 17B100103

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (± °C)	<u>Coverage Factor</u> <i>k</i>
20.00	60	20.001	19.88	-0.121	0.15	2.00

UUC* : Unit Under Calibration

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

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Cert.No.: 22TW259

Page.: 1 of 2

Certificate of Testing

Equipment :	DO Meter
Manufacturer :	YSI
Model :	5000
Serial No. :	17B101473
ID No. :	SGK_CL0073
Received Date :	18 November 2022
Test Date :	21 November 2022
Reference :	2211-0663DSC-1
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Songkhla Branch. 114/1 Moo 8, Kanjanavanij Rd., Banphru, Hatyai, Songkhla 90250, Thailand
Laboratory Condition :	Temperature (25 ± 5) °C Humidity (50 ± 20) %
Test Procedure :	In - house method : CP-CH9 by Comparison Technique with Azide Modification Method
Tested by :	Walalak Sirithean

Approved by :

Malee
Approved Signatory

(☒) Malee Butkruea
(☐) Saithip Meangmai
(☐) Warakorn Lerngagtrakul

Issue Date :

22 November 2022



Cert.No.: 22TW259

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Burette	-	130BU10	21CG1389	25 Mar 2023
2) Balance	1126143764	140RC004	22MM50	20 Sep 2023

2. Standard Material :-

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 17B100103

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.12	8.12	0.0045

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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a 1136621



CALIBRATION CERTIFICATE

Issued Date : 12-Nov-2021

Certificate No. : 21PH192

CSR No. : A012/00583

Page. : 1 of 2

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8 Karnchanawanich Rd. T.Ban Phru,
A. Hat Yai, Songkhla 90250 TH

Calibration Place : Chemical Laboratory

Instrument Name : pH meter

Manufacturer : Mettler Toledo

Model : S220

Serial No. : B625631849

ID No. : SGK_CL0030

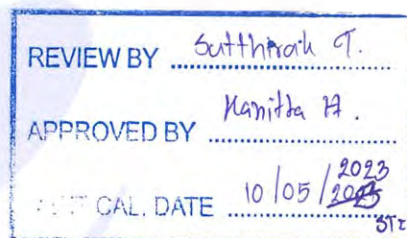
Electrode No. : 6404000

Received Date : 9-Nov-2021

Calibrated Date : 9-Nov-2021

Ambient Temperature : $(25 \pm 3) ^\circ\text{C}$

Relative Humidity : $(55 \pm 15) \%$



Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.008 based on direct measurement by using certified reference Material (CRM)

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- HACH : LANGE United For Water Quality
- WK : WK Electric Co., Ltd.
- Q Reborn : Quality Reborn Co.,Ltd.

Calibrated by : Jessadagon Lemhud

Approved by :

Sakeereen Heemhad / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Standard Solution	4.005	C02840	1617	24-Aug-2022
Standard Solution	7.000	C02841	1618	24-Aug-2022
Standard Solution	10.012	C02843	1619	24-Aug-2022
Temperature/Electrical Calibrator	MC2-MF	23642	WK2102-006-229	21-Feb-2022
Digital Thermometer With Sensor	1529	B4C223	QR21-2009	15-Sep-2022

2. The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration : (✓) Without Adjustment () After Adjustment

1. Electrical Measurement

Applied Voltage (mV)	pH meter Reading (mV)	Correction (mV)	Uncertainty (± mV)
177.48	177.5	-0.02	0.17
0.00	0.0	0.00	0.13
-177.48	-177.5	0.02	0.17

2. Sample Test Measurement

Standard Buffer Solutions (pH)	pH meter Reading (pH)	Correction (pH)	Uncertainty (± pH)
4.007	3.99	0.017	0.011
6.999	7.02	-0.021	0.014
10.011	10.01	0.001	0.036

3. Temperature Measurement

Cal Point (°C)	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
25	24.93	25.0	-0.07	0.11

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

... End ...



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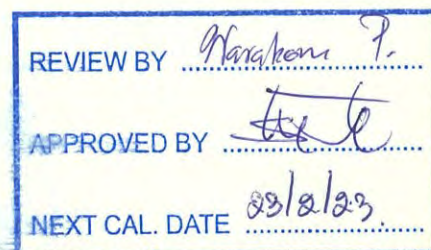


Cert.No.: 22CH280

Page.: 1 of 3

Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Mettler Toledo
Model :	Seven2Go
Serial No. :	B850937439
ID No. :	PHK_FS0002
Condition As-Received:	Used Item
Received Date :	22 February 2022
Calibration Date :	23 February 2022
Reference :	2202-0728DSC-2
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM) - CP-CH8 by comparison with standard thermometer



Calibrated by : Warakorn Lerngagtrakul

Approved by :

Approved Signatory

- (✓) Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date : 2 March 2022
The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0038450



Cert.No.: 22CH280

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	21E2682	25 Aug 2022
2) Ref. Standard Thermometer	A5A339	60RC020	21I842	18 Aug 2022

This certification is traceable to the International System of Unit maintained at:-

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	766820	23 Sep 2023
pH 6.983	CPA chem	766822	04 Sep 2022
pH 10.015	CPA chem	766824	04 Sep 2022

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: B850937439	4.00	177.48	177	4.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.00	0.58	2.00

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Cert.No.: 22CH280

Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement ($\pm$)	Coverage factor k
pH Electrode	4.008	4.01	188	0.0071	2.00
S/N.: 8453148	6.983	6.98	13	0.0099	2.00
	10.015	10.02	-163	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLab Expert Go-ISM

- Serial No. : 8453148

Dimension of probe;

- Length : 120 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm.

Calibration Point ($^{\circ}\text{C}$)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of measurement ($\pm$ $^{\circ}\text{C}$)	Coverage factor k
25.0	25.002	25.3	0.298	0.13	2.00
30.0	30.003	30.3	0.297	0.13	2.00
45.0	45.003	45.3	0.297	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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Malu.

Sartorius (Thailand) Co., Ltd.

129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310

Tel: +66 2643 8361-6 , e-mail: service.thailand@sartorius.com

**SARTORIUS**

Certificate

of Calibration

REVIEW BY Ananta B.
APPROVED BY Kanitta H.
NEXT CAL. DATE 25/1/23/24

Model Number : MSE224S-100-DUCertificate No. : 23BCI0044Description : Analytical BalanceIssued Date : Friday, January 27, 2023Serial Number : 0034705158Reference No. : 202361ID No. : SGK_CL0045Manufacturer : SartoriusPage No. : 1 of 2Customer Name : ALS Laboratory Group (Thailand) Co., Ltd.Songkhla Branch: 114/1 Moo 8 Karnchanawanich Rd., T. Ban Phru, A. Hat Yai, Songkhla. 90250.Calibrated Place : Balance Room.Calibrated By : Mr. Chonchai InthanaCalibration Date : Wednesday, January 25, 2023

Calibration

Procedure No. : This calibration was conducted byUsing in-house calibration procedure number (WI-003)Based on UKAS LAB 14 : 2019

Metrological data :

Capacity : 220 g Readability : 0.0001 g

Ambients Conditions:

Temperature : 22.4 °C ± 3.0 °CHumidity : 65.0 % RH ± 5.0 % RHPressure : ±

Reasons for calibration

☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ MaintenanceEquipment Condition: ☒ Good Operate ☐ Fair

Measurement Method UKAS Publication Ref :Lab 14

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). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 1kg E2 s/n 37929119	SPC-RT	C02212565	14-Sep-2023
MHB-382SD	Humidity/Barometer/Temp Lutron MHB-382SD	DKSH	C19220444	5-Sep-2023

This certificate relate and apply this equipment only.

This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division
Sartorius (Thailand) Co., Ltd.

Mr. Chonchai Inthana (Technical Manager)

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T
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Certificate of Calibration

Model Number : MSE224S-100-DU

Certificate No. : 23BCI0044

Description : Analytical Balance

Issued Date : Friday, January 27, 2023

Serial Number : 0034705158

Reference No. : 202361

ID No. SGK_CL0045

Manufacturer : Sartorius

Page No. : 2 of 2

Calibration Results : Without Adjustment

Repeatability

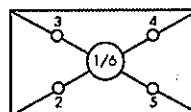
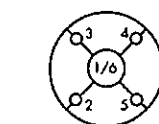
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.

Nominal Value : (Low Load)	20.0000	200.0000
20 g	20.0001	200.0000
Tolerance	20.0000	200.0000
0.0001 g	20.0000	200.0000
	20.0000	200.0001
Nominal Value : (High Load)	20.0000	200.0000
200 g	20.0000	200.0001
Tolerance	20.0000	200.0000
0.0001 g	20.0000	200.0001
	20.0000	200.0001
Standard Deviation	0.00003	0.00005

Eccentricity (Off-center loading error)

The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).

Nominal value : 50 g
Tolerance 0.0004 g



	Difference
1	—
2	0.0001
3	0.0000
4	0.0000
5	0.0000
6	—

Linearity

The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolerance 0.0002 g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00013
0.1	0.1000	0.1000	0.0000	0.00013
1	1.0000	1.0000	0.0000	0.00014
2	2.0000	2.0000	0.0000	0.00014
5	5.0000	5.0000	0.0000	0.00014
10	10.0000	10.0000	0.0000	0.00014
20	20.0000	20.0000	0.0000	0.00014
50	50.0000	50.0000	0.0000	0.00015
100	100.0000	100.0000	0.0000	0.00019
200	200.0000	200.0001	0.0001	0.00030

End of Report.



CALIBRATION CERTIFICATE

Issued Date : 12-Nov-2021

Certificate No. : 21OV733

CSR No. : A012/00583

Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8 Karnchanawanich Rd. T.Ban Phru,
A. Hat Yai, Songkhla 90250 TH

Calibration Place : Chemical Laboratory

Instrument Name : Hot Air Oven

Manufacturer : Memmert

Model : UF110

Serial No. : B416.3387

ID No. : SGK_CL0024

Resolution : 0.1 °C

Received Date : 9-Nov-2021

Calibrated Date : 9-Nov-2021

Ambient Temperature : (30 ± 10) °C

Relative Humidity : (50 ± 30) %

REVIEW BY Sutthirak O.
APPROVED BY Kanitta H.
NEXT CAL. DATE 10/05/2023

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.012 based on G-20

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- Q Reborn : Quality Reborn Co.,Ltd.

Calibrated by : Ibrorhim Saleemin

Approved by :

Sakeereen Heemhad / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of Southern Calibration Service Co., Ltd.

Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data logger With Sensor	34970A	MY44064411	QR21-0314	9-Feb-2022

2. The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

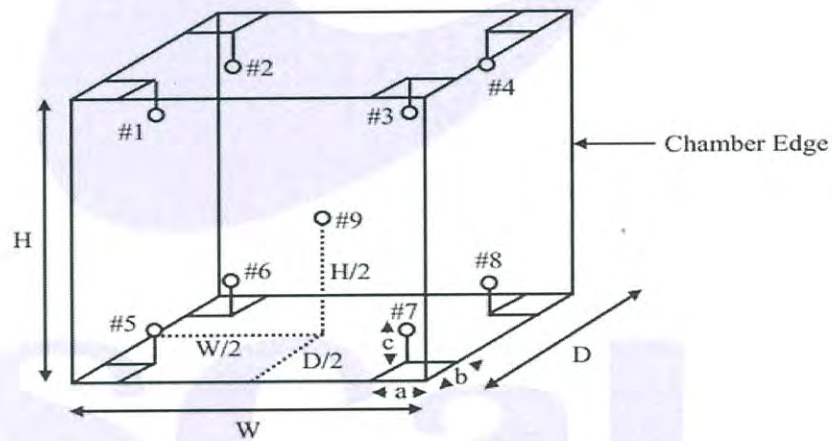
4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration ∴

(✓) Without Adjustment

() After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details

a = 5.0 cm

b = 5.0 cm

c = 5.0 cm

Dimension of the chamber

W = 40.0 cm

H = 40.0 cm

D = 33.0 cm

Result of Calibration :

2. Temperature Measurement Accuracy Test

The measurement results of the Hot Air Oven and associates are reported in the manner as shown below

Cal point (°C)	Measured Standard Temperature At Spread Locations (°C)									Uncertainty (± °C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	
40	39.85	39.81	39.68	39.57	39.94	39.80	39.81	39.93	39.69	0.36
70	70.53	70.23	70.08	69.74	70.51	70.37	70.43	69.79	70.15	0.36
103	103.47	102.96	102.95	102.77	103.40	103.46	103.33	102.73	102.83	0.36
104	104.47	103.92	103.95	103.77	104.33	104.46	104.30	103.73	103.80	0.36
105	105.34	104.85	104.85	104.67	105.16	105.27	105.07	104.81	105.06	0.36
180	180.04	180.03	179.99	179.86	180.11	180.28	180.27	180.16	180.26	0.41

3. Performance Result

The performance of the Hot Air Oven are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (± °C)	Temperature Uniformity (°C)	Overall Variation (°C)
40	40.0	40.0	0.10	0.34	0.47
70	70.0	70.0	0.10	0.48	0.82
103	103.0	103.0	0.10	0.71	0.74
104	104.0	104.0	0.10	0.71	0.74
105	105.0	105.0	0.20	0.39	0.70
180	180.0	180.0	0.20	0.53	0.62

- UUC = Unit Under Calibration

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

... End ...



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH699

Page.: 1 of 2

Certificate of Calibration

Equipment :	Conductivity Meter
Manufacturer :	Mettler Toledo
Model :	Seven Compact S230
Serial No. :	B608134488
ID No. :	SGK_CL0032
Condition As-Received:	Used Item
Received Date :	03 May 2022
Calibration Date :	09,20 May 2022
Reference :	2205-0039DSC-1
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Songkhla Branch. 114/1 Moo 8 Karnchanawanich Rd., T.Ban Phru, A.Hat Yai, Songkhla 90250 Thailand
Ambient Temperature :	(25 $\pm$ 2.5) °C
Relative Humidity :	(50 $\pm$ 15) %
Calibration Procedure:	In -house method : - CP-CH6 : based on direct measurement by using certified reference material (CRM)

REVIEW BY	Ananta B.
APPROVED BY	Kanitta H.
NEXT CAL. DATE	9/05/2023

Calibrated by : Warakorn Lerngagtrakul

Approved by :

Malee

Approved Signatory

- (☒) Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date : 23 May 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0041454



Cert.No.: 22CH699

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instrument :-

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1) Thermometer	9549224	130RC003	221484	17 Apr 2023

This certification is traceable to the International System of Unit maintained at:-

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials :-

- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Conductivity Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
*84 $\mu\text{S/cm}$	Thermo Scientific	361/01	10 Sep 2022
1413.0 $\mu\text{S/cm}$	CPA Chem	766815	04 Sep 2022
12.880 mS/cm	CPA Chem	766816	04 Sep 2022

- Control Conductivity calibration solution temperature by Water bath (25 ± 0.1) $^{\circ}\text{C}$

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration results**Function : Conductivity Measurement**(*) After Adjustment at 1413.0 $\mu\text{S/cm}$

Conductivity Electrode Serial No.: 5820120321

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement ($\pm$)	Coverage factor k
*84 $\mu\text{S/cm}$	14.61 $\mu\text{S/cm}$	84.5 $\mu\text{S/cm}$	4.3 $\mu\text{S/cm}$	2.00
1413.0 $\mu\text{S/cm}$	242 $\mu\text{S/cm}$	1413 $\mu\text{S/cm}$	9.2 $\mu\text{S/cm}$	2.00
12.880 mS/cm	2.19 mS/cm	12.80 mS/cm	0.086 mS/cm	2.00

Remark

- Cell constant = 0.571855 cm^{-1}
- Cal date : 09 May 2022
- * : Not NSC - ONSC Accredited

(*) After Adjustment at 1413.0 $\mu\text{S/cm}$

Conductivity Electrode Serial No.: 5816340156

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement ($\pm$)	Coverage factor k
*84 $\mu\text{S/cm}$	84.9 $\mu\text{S/cm}$	89.4 $\mu\text{S/cm}$	4.3 $\mu\text{S/cm}$	2.00
1413.0 $\mu\text{S/cm}$	1320 $\mu\text{S/cm}$	1413 $\mu\text{S/cm}$	9.2 $\mu\text{S/cm}$	2.00

Remark

- Cell constant = 0.107270 cm^{-1}
- Cal date : 20 May 2022
- * : Not NSC - ONSC Accredited
- UUC* = Unit Under Calibration

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

Walu .

-o0o-

a 1109618



Internal Calibration

REVIEW BY	Somsak J.
APPROVED BY	Kanitta H.
NEXT CAL. DATE	20/06/23

Equipment :	Turbidity Meter	Manufacture :	HACH
ID No. :	SGK_FS0045	Model :	2100Q/QIS
Calibrate Date :	June 20, 2022	Serial No. :	19010C073443

Calibration Point	1st (NTU)	2nd (NTU)	3rd (NTU)	AVG (NTU)	Specifications	Evaluate
Standard 20 NTU	20.0	20.2	20.1	20.1	19 to 21 NTU	Pass
Standard 100 NTU	99.6	99.8	99.8	99.7	95 to 105 NTU	Pass
Standard 800 NTU	791.0	793.0	794.0	792.7	760 to 840 NTU	Pass

Calibrated by Somsak J.
(Scientist 2)

Approved by : Kanitta H.
(Section Head)

Certificate of Analysis List

For request number 1568060

Catalog Number Entered	Lot Number Entered	Related Catalog Number	Related Lot Code	Description
2660501 STANDARD	1236R 800 NTU	2659405-TH	1291	STABLCAL sup TS sup0 FORMAZIN
2684701	1284	2659405-TH	1291	<0.1 NTU Calibration Solution
2684801 STANDARD	1265 20 NTU	2659405-TH	1291	STABLCAL sup TS sup0 FORMAZIN
2684901 STANDARD	1246 100 NTU	2659405-TH	1291	STABLCAL sup TS sup0 FORMAZIN

Total Enclosures: 4



An ISO 9001 Certified Company

Certificate of Analysis***This is a Component of 2659405-TH lot A1291***

Page 1

COMMODITY: <0.1 NTU Calibration Solution

COMMODITY NUMBER: 2684701

MANUFACTURE DATE:

DATE OF ANALYSIS:

LOT NUMBER: A1284

10/21/2021

10/22/2021

<i>TEST</i>	<i>SPECIFICATIONS</i>	<i>RESULTS</i>
Turbidity	0 to 0.1 NTU	0.06 NTU

The expiration date is Jan 2023

Formazin and StablCal® solutions provided by Hach are not NIST traceable because the NI does not carry turbidity standards. However, the use of Formazin and StablCal® as used in Hach method 8195 are accepted by the EPA as a primary standard to be used in the calibration of turbidity instruments.

Certified by

Scott Als
Analytical Services Chemist



An ISO 9001 Certified Company

Certificate of Analysis***This is a Component of 2659405-TH lot A1291***

Page 1

COMMODITY: **STABLCAL|sup|TS|sup0 FORMAZIN STANDARD** 20 NTU
COMMODITY NUMBER: **2684801** MANUFACTURE DATE: DATE OF ANALYSIS:
LOT NUMBER: **A1265** 10/21/2021 10/28/2021

<i>TEST</i>	<i>SPECIFICATIONS</i>	<i>RESULTS</i>
Turbidity	19 to 21 NTU	20.4 NTU

The expiration date is Jan 2023

Formazin and StablCal® solutions provided by Hach are not NIST traceable because the NI does not carry turbidity standards. However, the use of Formazin and StablCal® as us in Hach method 8195 are accepted by the EPA as a primary standard to be used in the calibration of turbidity instruments.

Certified by

Scott Als
Analytical Services Chemist



An ISO 9001 Certified Company

Certificate of Analysis**This is a Component of 2659405-TH lot A1291**

Page 1

COMMODITY: **STABLCAL|sup|TS|sup0 FORMAZIN STANDARD 100 NTU**
COMMODITY NUMBER: **2684901** MANUFACTURE DATE: DATE OF ANALYSIS:
LOT NUMBER: **A1246** 11/5/2021 11/11/2021

TEST	SPECIFICATIONS	RESULTS
Turbidity	95 to 105 NTU	103.0 NTU

The expiration date is Feb 2023

Formazin and StablCal® solutions provided by Hach are not NIST traceable because the NI does not carry turbidity standards. However, the use of Formazin and StablCal® as used in Hach method 8195 are accepted by the EPA as a primary standard to be used in the calibration of turbidity instruments.

Certified by

Scott Als
Analytical Services Chemist

***Certificate of Analysis******This is a Component of 2659405-TH lot A1291***

Page 1

COMMODITY: STABLCAL|sup|TS|sup0 FORMAZIN STANDARD 800 NTU

COMMODITY NUMBER: 2660501

MANUFACTURE DATE:

DATE OF ANALYSIS:

LOT NUMBER: A1236R

9/10/2021

9/10/2021

<i>TEST</i>	<i>SPECIFICATIONS</i>	<i>RESULTS</i>
Turbidity	760 to 840 NTU	819.0 NTU

The expiration date is Jan 2023

Formazin and StablCal® solutions provided by Hach are not NIST traceable because the NI does not carry turbidity standards. However, the use of Formazin and StablCal® as used in Hach method 8195 are accepted by the EPA as a primary standard to be used in the calibration of turbidity instruments.

Certified by

Scott Als
Analytical Services Chemist



Southern Calibration Service Co., Ltd.

669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com



CALIBRATION CERTIFICATE

Issued Date : 8-Jan-2023

Certificate No. : 23TH0050

CSR No. : A047/02339

Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Karnchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

Calibration Place : Microbiological Laboratory

Instrument Name : Autoclave

Manufacturer : TOMY

Model : SX-700

Serial No. : 52134079

ID No. : SGK_ML0001

Resolution : 1 °C

Received Date : 5-Jan-2023

Calibrated Date : 5-Jan-2023

Ambient Temperature : (30 ± 10) °C

Relative Humidity : (50 ± 30) %

REVIEW BY	Nattawut P.
APPROVED BY	Kanitta H.
NEXT CAL. DATE	Jul 05-May-2024

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.16.013 based on BS 2646 : 1993 (part 5)

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- ScaL : Sounthern Calibration Service Co., Ltd.,

Calibrated by : Ibrorhim Saleemin

Approved by :


Kanyarat Chaipet / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of Southern Calibration Service Co., Ltd.

Details of Calibration

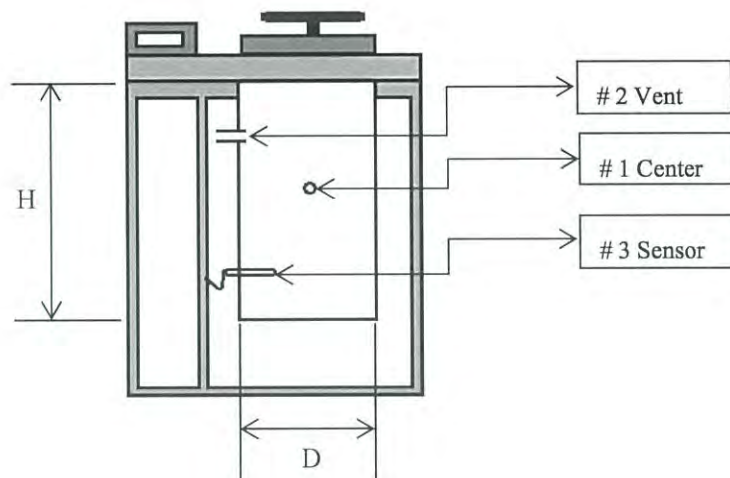
1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data logger With Sensor	GL220	C90432223	22SDAT005	4-May-2023

- The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.
- This certificate is not certified any commercial transaction
- Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration : (✓) Without Adjustment () After Adjustment

1. Sensor Installation Diagram



Chamber Diameter (D) : 30 cm

Chamber Height (H) : 70 cm

Result of Calibration :

2. Temperature Measurement Accuracy Test

The measurement results of the Autoclave and associates are reported in the manner as shown below

Cal point (°C)	Measured Standard Temperature At Spread Locations (°C)			Pressure Reading	Uncertainty (± °C)
	Center #1	Vent #2	Sensor #3		
115	115.5	115.4	115.5	0.07 MPa	0.76
118	118.7	118.9	119.1	0.09 MPa	0.76
121	122.0	122.1	122.1	0.11 MPa	0.76

3. Performance Result

The performance of the Autoclave are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (± °C)	Temperature Uniformity (°C)	Overall Variation (°C)
115	115	115	0.20	0.30	0.30
118	118	118	0.70	0.70	0.90
121	121	121	0.50	0.40	0.60

- Operating Time = 1800.65 sec

- UUC = Unit Under Calibration

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

... End ...



Southern Calibration Service Co., Ltd.

669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com



CALIBRATION CERTIFICATE

Issued Date : 9-Aug-2022

Certificate No. : 22OV529

CSR No. : A037/01847

Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Kamchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

Calibration Place : Microbiological Laboratory

Instrument Name : Incubator

Manufacturer : Memmert

Model : ICP750

Serial No. : F816.0061

ID No. : SGK_ML0013

Resolution : 0.1 °C

Received Date : 6-Aug-2022

Calibrated Date : 6-Aug-2022

Ambient Temperature : (30 ± 10) °C

Relative Humidity : (50 ± 30) %

REVIEW BY	APPROVED BY
APPROVED BY	APPROVED BY
NEXT CAL. DATE	

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.012 based on G-20

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- SCaL : Sounthern Calibration Service Co., Ltd.,

Calibrated by : Ibrorhim Saleemin

Approved by :

Kanyarat Chaipet / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data Acquisition/Switch Unit	34970A	MY58009813	22SDAT004	24-May-2023

2. The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

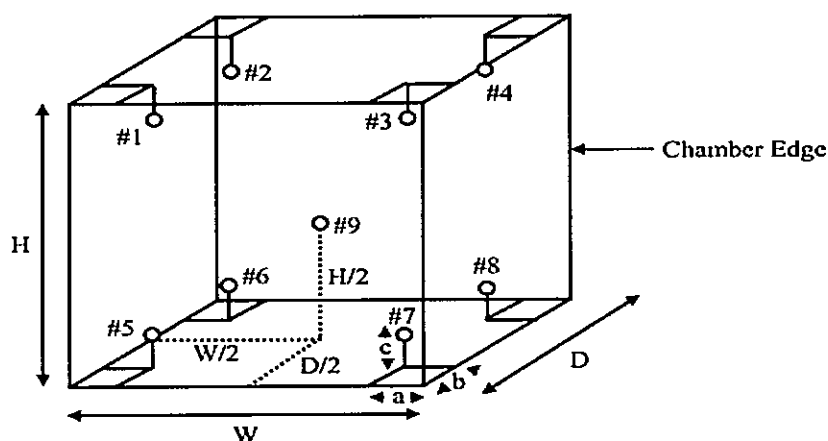
4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration :

(☒) Without Adjustment

(☐) After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details

a = 5.0 cm

b = 5.0 cm

c = 5.0 cm

Dimension of the chamber

W = 104.0 cm

H = 120.0 cm

D = 60.0 cm



Certificate No. : 22OV529

CSR No. : A037/01847

Page. : 3 of 3

Result of Calibration .:

2. Temperature Measurement Accuracy Test

The measurement results of the Incubator and associates are reported in the manner as shown below

Cal point (°C)	Measured Standard Temperature At Spread Locations (°C)									Uncertainty (± °C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	
35	34.99	34.92	34.95	34.88	34.96	35.00	34.94	34.94	34.94	0.38

3. Performance Result

The performance of the Incubator are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (± °C)	Temperature Uniformity (°C)	Overall Variation (°C)
35	35.0	35.0	0.10	0.12	0.19

- UUC = Unit Under Calibration

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

... End ...



Southern Calibration Service Co., Ltd.

669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com



CALIBRATION CERTIFICATE

Issued Date : 8-Jan-2023

Certificate No. : 23CH0016

CSR No. : A047/02339

Page. : 1 of 2

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Karnchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

Calibration Place : Microbiological Laboratory

Instrument Name : pH meter

Manufacturer : Sartorius

Model : Basic pH Meter PB-10

Serial No. : C70160695

ID No. : SGK_ML0016

Electrode No. : N/A

Received Date : 5-Jan-2023

Calibrated Date : 5-Jan-2023

Ambient Temperature : $(25 \pm 3) ^\circ\text{C}$

Relative Humidity : $(55 \pm 15) \%$

REVIEW BY	Nattawat P.
APPROVED BY	Kanitta H.
NEXT CAL. DATE	05-Jul-24 Nattawat P.

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.008 based on direct measurement by using certified reference Material (CRM)

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- HACH : HACH LANGE GmbH
- WK : WK Electric Co., Ltd.

Calibrated by : Jessadagon Lemhud

Approved by :

Kanyarat Chaipet / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Standard Solution	4.005	C02950	1733	22-Apr-2024
Standard Solution	7.000	C03001	1783	23-Sep-2024
Standard Solution	10.013	C02953	1735	29-Apr-2024
Temperature/Electrical Calibrator	MC2-TE	14987	WK2106-299-223	5-Jun-2024

2. The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration : (✓) Without Adjustment () After Adjustment

1. Electrical Measurement

Applied Voltage (mV)	pH meter Reading (mV)	Correction (mV)	Uncertainty (± mV)
177.48	177.4	0.08	0.17
0.00	0.0	0.00	0.13
-177.48	-177.4	-0.08	0.17

2. Sample Test Measurement

Standard Buffer Solutions (pH)	pH meter Reading (pH)	Correction (pH)	Uncertainty (± pH)
4.004	4.02	-0.016	0.011
7.000	7.01	-0.010	0.013
10.013	10.02	-0.007	0.036

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

... End ...



Southern Calibration Service Co., Ltd.

669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkhla 90250 Thailand

Tel: 081 599 0417 Fax: 074 805 133 Email: s.calibration@gmail.com www.scal-lab.com



CALIBRATION CERTIFICATE

Issued Date : 9-Aug-2021

Certificate No. : 21WB064

CSR No. : A047/2346

Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8 Karnchanawanich Rd. T.Ban Phru,
A. Hat Yai, Songkhla 90250 TH

Calibration Place : Microbiological Laboratory

Instrument Name : Water Bath

Manufacturer : Memmert

Model : WPE45

Serial No. : L716.0558

ID No. : SGK_ML0021

Resolution : 0.1 °C

Received Date : 6-Aug-2021

Calibrated Date : 6-Aug-2021

Ambient Temperature : (30 ± 10) °C

Relative Humidity : (50 ± 30) %

REVIEW BY	Nattawat P.
APPROVED BY	Kanitha H.
NEXT CAL. DATE	4/02/2023

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.014 based on ASTM E 715 : 1980 (reapproved 2001)

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- Q Reborn : Quality Reborn Co.,Ltd.

Calibrated by : Ibrorhim Saleemin

Approved by :

Sakeereen Heemhad / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of Southern Calibration Service Co., Ltd.

Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data logger With Sensor	34970A	MY44064411	QR21-0314	9-Feb-2022

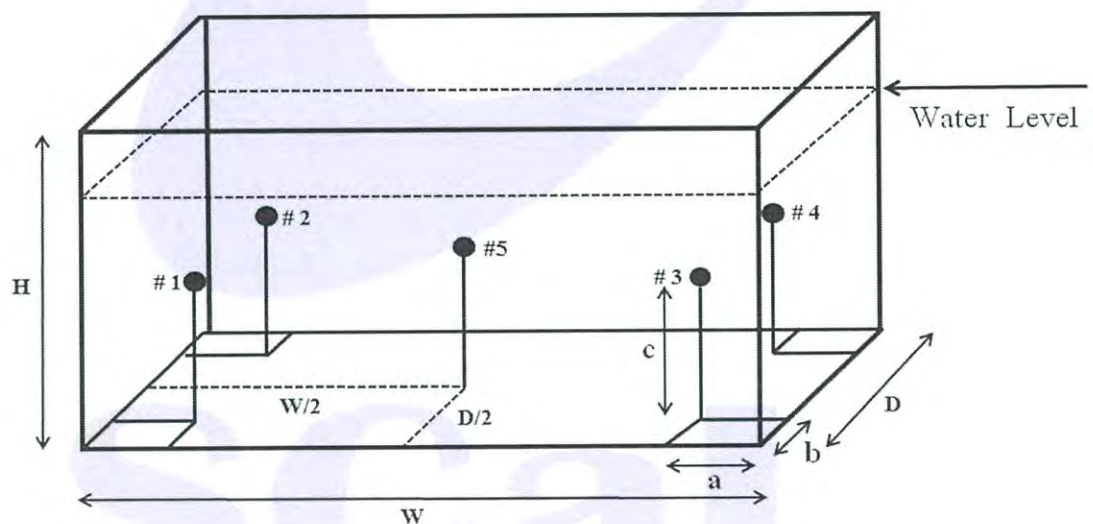
- The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.
- This certificate is not certified any commercial transaction
- Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration :

(✓) Without Adjustment

() After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details

$a = 5$ cm
 $b = 5$ cm
 $c = 5$ cm

Dimension of the chamber

$W = 45$ cm
 $H = 30$ cm
 $D = 35$ cm

Result of Calibration .:**2. Temperature Measurement Accuracy Test**

The measurement results of the Water Bath and associates are reported in the manner as shown below

Cal point (°C)	Measured Standard Temperature At Spread Locations (°C)					Uncertainty (± °C)
	#1	#2	#3	#4	Ref.5	
44.5	44.49	44.55	44.48	44.51	44.47	0.14

3. Performance Result

The performance of the Water Bath are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (± °C)	Temperature Uniformity (°C)	Overall Variation (°C)
44.5	44.6	44.6	0.20	0.24	0.24

- UUC = Unit Under Calibration

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

... End ...

SCaL



Certificate of Calibration

Represent to Certificate of Calibration ,PTC/07/22071

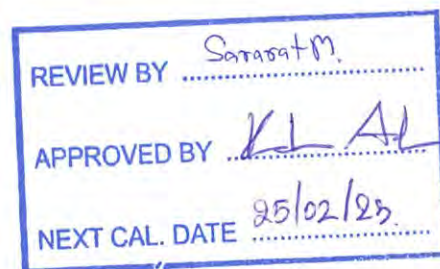
Certificate No.:	PTC/07/22071	Page:	1 of 2
Equipment:	Digital Balance	Condition:	Normal
Manufacturer:	Sartorius	Serial No:	26207042
Model:	MSE224-100-DU	ID No:	BKK_EN0002
Type of Balance:	Single interval		



Customer: ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakarn 40 Phatthanakarn Rd.,
khwaeng Phatthanakarn, Khet Suan Luang, Bangkok 10250.

Environment Condition: Temperature 21.5 °C $\pm$ 0.7 °C
Humidity 61.8 %RH $\pm$ 4.7 %RH
Air density 1.19 kg/m³

Calibration Place: ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakarn 40 Phatthanakarn Rd.,
khwaeng Phatthanakarn, Khet Suan Luang, Bangkok 10250.



The Method used: In house method, PTC-WI-07, base on Euramet cg. 18

Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co.,Ltd.
, NSC-ONSC Accreditation No.: Calibration 0189

Date Received: February 25, 2022

Calibration Date: February 25, 2022

Issued Date: March 01, 2022

Calibration By: Mr. Rungroje Metakul



PENTA CALIBRATION CO.,LTD

(Mr.Kriangsak Kalasri)

Reviewed by

Approved By :

(Mr. Keattisak Kerdtto)

Laboratory Manager

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 recognised 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). The effect that the results relate only to the items calibrated.

This calibration certificate shall not be reproduced except in full only, without written approval from penta calibration co., ltd



Represent to Certificate of Calibration ,PTC/07/22071

Certificate No.: PTC/07/22071

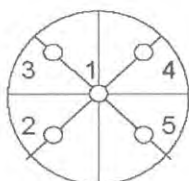
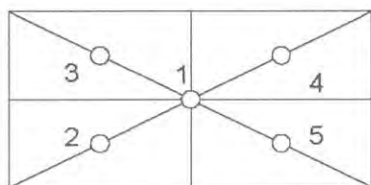
Page: 2 of 2

Measurement Results:

Without Adjustment :

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3 ,1/2 or of Maximum capacity



Eccentricity test 100 (g)

Position (g)				
1	2	3	4	5
0.0000	-0.0002	-0.0001	0.0001	-0.0001
Maximum deviation:				0.0002

Repeatability Test : Weight to be $1/2 \leq L_1 \leq$ Maximum capacity

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

Nominal test value (g)	Standard Deviation
200	0.00005

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

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.00000	0.0000	0.0000	0.00016	2.52
0.1	0.10000	0.1000	0.0000	0.00017	2.20
0.5	0.50000	0.5000	0.0000	0.00016	2.28
1	1.00001	1.0000	0.0000	0.00016	2.28
2	2.00001	2.0000	0.0000	0.00016	2.28
5	5.00001	5.0000	0.0000	0.00016	2.28
10	10.00002	10.0000	0.0000	0.00016	2.28
20	20.00002	20.0000	0.0000	0.00016	2.23
50	50.00001	50.0000	0.0000	0.00017	2.15
100	100.00002	99.9999	0.0001	0.00020	2.06
120	120.00004	120.0000	0.0000	0.00023	2.03
150	150.00003	150.0000	0.0000	0.00026	2.00
200	200.00003	199.9999	0.0001	0.00030	2.00

Note: Weight of adjust - (g)

The End of Certificate



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100

Bangkok Tel : +668 9205 6851 , +669 8247 2360

Website : www.scieco.co.th

E-Mail : calibrate@scg.co.th



Certificate No. T220139

Page 1 of 3

Certificate of Calibration

Equipment : Liquid Bath (Water)

Manufacturer : MEMMERT

Model : WNB29

Serial No. : L611.0135

Customer Code : BKK_EN0148

ID No. : T6455A4

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

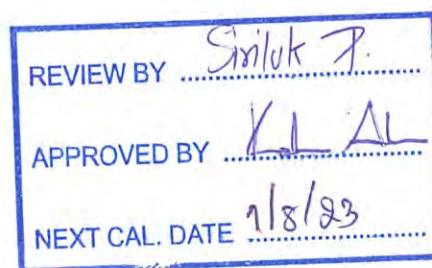
Customer Location : ORGANIC PREPARATION LAB

Date of Receipt : 26 January 2022

Calibrated By : Watcharapon Sangtong (Technician)

Approved By :  / Sujjar Naknakred (Site Calibration Manager)

Date of Issue : 08 FEB 2022



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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

Certificate No. T220139

Page 2 of 3

Calibration Report

Equipment : Liquid Bath (Water)
Date of Calibration : 31 January 2022
Environment : Temperature : 22.4-23.9 °C
Line Voltage : 221.4-225.4 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert five resistance thermometer detectors into its water bath , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T36 (based on ASTM E715-80 (Reapproved 2001)).

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 OHM	M34 (CH1-CH5)	T210115	2 February 2022
DATA LOGGER	34970A	T47	T210115	2 February 2022

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

Time Constant 1 Hour - Minute At 60 °C

5. Adjustment :

(X) without adjustment

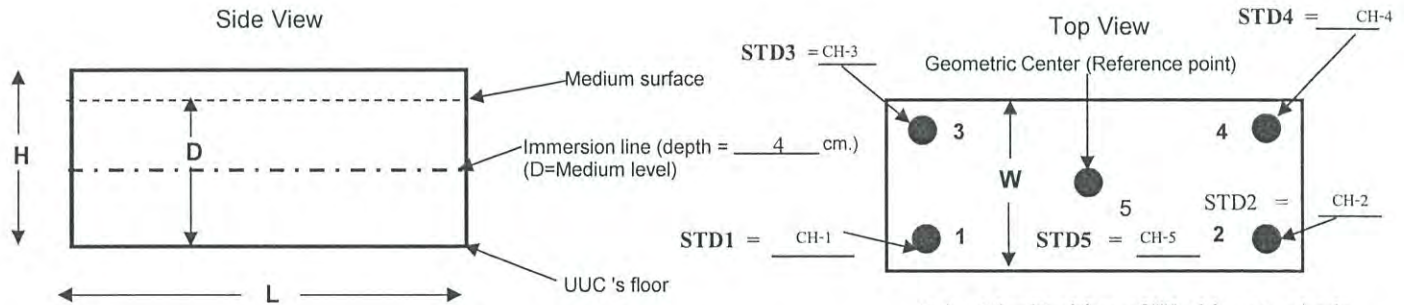
() after adjustment

Approved By. 

Certificate No. T220139

Page 3 of 3

Calibration Report



- D = Medium level : 8 cm.
 - UUC's medium : Water
 - Working standards are located at 2.5 cm. away from each corner and walls.
- Working space dimension : 62 × 41 × 14 (W×L×H)

Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)				
	CH-1	CH-2	CH-3	CH-4	CH-5
60	59.95	60.04	60.12	60.01	59.89
85	85.17	84.89	85.34	84.78	84.93
95	93.46	93.14	93.81	93.05	93.28

Liquid Bath (Water)			Temperature Distribution			
Setting (°C)	Reading (°C)		Stability (± °C)	Uniformity (± °C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
	Min , Max	Average				
61.0	60.9 , 61	61.0	0.10	0.19	0.25	2.00
86.0	85.9 , 86.1	86.0	0.12	0.39	0.32	2.06
95.0	94.8 , 95.1	94.9	0.14	0.51	0.38	2.11

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By. 



Southern Calibration Service Co., Ltd.

669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com



CALIBRATION CERTIFICATE

Issued Date : 1-May-2023

Certificate No. : 23CH0203

CSR No. : A088/04367

Page. : 1 of 2

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Karnchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

Calibration Place : Chemical Laboratory

Instrument Name : pH meter

Manufacturer : Mettler Toledo

Model : S220

Serial No. : B625631849

ID No. : SGK_CL0030

Electrode No. : 1204613

Received Date : 28-Apr-2023

Calibrated Date : 28-Apr-2023

Ambient Temperature : (25 ± 3) °C

Relative Humidity : (55 ± 15) %

REVIEW BY	Ananta B.
APPROVED BY	Kamrta H.
NEXT CAL. DATE	28 / 10 / 2024

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.008 based on direct measurement by using certified reference Material (CRM)

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- HACH : HACH LANGE GmbH

- SCAL : Sounthern Calibration Service Co., Ltd.,

- WK : WK Electric Co., Ltd.

Calibrated by : Alisara Ma

Approved by :

Imron Rattanaylum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of Southern Calibration Service Co., Ltd.

**Details of Calibration****1. Reference Standard Equipment Used:**

Equipment	Model	Serial No.	Cert. no.	Due Date
Standard Solution	4.005	C02994	1777	5-Sep-2024
Standard Solution	7.000	C03007	1787	17-Oct-2024
Standard Solution	10.012	C02953	1735	29-Apr-2024
Temperature/Electrical Calibrator	MC2-TE	14987	WK2106-299-223	5-Jun-2024
Digital Thermometer With Sensor	DP-77	I.360896	22SDTH005	8-Aug-2023

2. The results reported in this certificate refer to the condition of the instrument on the date of calibration

and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration :**1. Electrical Measurement**

Applied Voltage (mV)	pH meter Reading		Correction (mV)	Uncertainty (± mV)
	(mV)	(pH)		
177.48	177.5	3.70	-0.02	0.17
0.00	0.0	6.70	0.00	0.13
-177.48	-177.4	9.80	-0.08	0.17

2. Before Sample Test Measurement

Standard Buffer Solutions (pH)	pH meter Reading		Correction (pH)	Uncertainty (± pH)
	(pH)	(mV)		
4.005	3.97	159.2	0.035	0.0090
6.999	6.98	-15.4	0.019	0.013
10.012	9.95	-188.0	0.062	0.036

3. After Sample Test Measurement

Standard Buffer Solutions (pH)	pH meter Reading		Correction (pH)	Uncertainty (± pH)
	(pH)	(mV)		
4.005	3.97	158.9	0.035	0.0090
6.999	7.01	-17.5	-0.011	0.013
10.012	9.98	-187.6	0.032	0.036

4. Temperature Measurement

Cal Point (°C)	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
25	25.032	25.1	-0.068	0.11

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

... End ...



Southern Calibration Service Co., Ltd.

669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkla 90250 Thailand
Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com



CALIBRATION CERTIFICATE

Issued Date : 1-May-2023

Certificate No. : 23TH1728

CSR No. : A088/04367

Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8, Karnchanawanich Rd. Tambon, Ban Phru,
Amphoe Hat Yai, Songkhla, 90250

Calibration Place : Chemical Laboratory

Instrument Name : Hot Air Oven

Manufacturer : Memmert

Model : UF110

Serial No. : B416.3387

ID No. : SGK_CL0024

Resolution : 0.1 °C

Received Date : 28-Apr-2023

Calibrated Date : 28-Apr-2023

Ambient Temperature : (30 ± 10) °C

Relative Humidity : (50 ± 30) %

REVIEW BY	 Ananta B.
APPROVED BY	 Kanitta H. 10
NEXT CAL. DATE	 28/11/2024 10

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.012 based on GLA - 20

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- SCaL : Sounthern Calibration Service Co., Ltd.,

Calibrated by : Ibrorhim Saleemin

Approved by :

Imron Rattanaylum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of Southern Calibration Service Co., Ltd.

Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data Acquisition/Switch Unit	34970A	MY58009813	22SDAT004	24-May-2023

2. The results reported in this certificate refer to the condition of the instrument on the date of calibration

and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

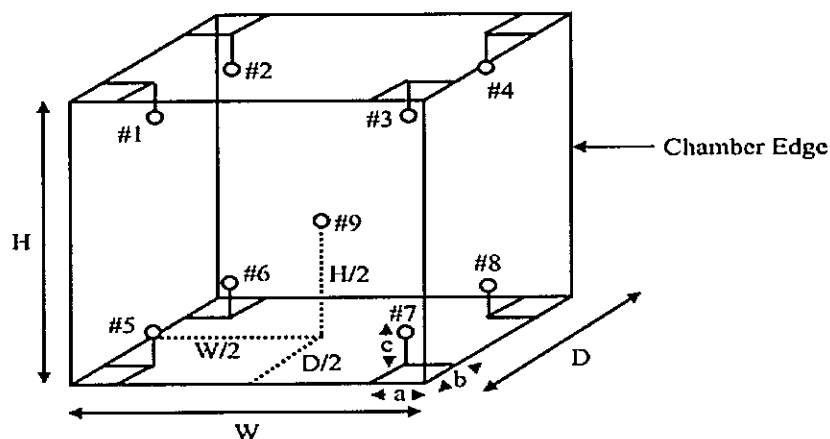
4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration :

(☒) Without Adjustment

(☐) After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details

a = 5.0 cm

b = 5.0 cm

c = 5.0 cm

Dimension of the chamber

W = 40.0 cm

H = 40.0 cm

D = 33.0 cm

Result of Calibration :

2. Temperature Measurement Accuracy Test

The measurement results of the Hot Air Oven and associates are reported in the manner as shown below

Cal point (°C)	Measured Standard Temperature At Spread Locations (°C)									Uncertainty (± °C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	
40	40.48	40.28	40.28	39.91	40.17	40.09	39.93	40.27	39.89	0.36
70	70.36	70.23	70.58	69.74	69.99	69.92	69.86	70.13	70.04	0.36
103	103.19	103.12	103.46	103.37	103.10	103.54	103.43	103.06	103.40	0.36
104	104.31	104.23	104.62	103.77	104.12	104.06	103.90	104.20	104.56	0.36
105	105.07	105.03	105.48	105.27	105.12	105.01	105.01	105.00	104.96	0.36
180	180.31	180.00	180.00	180.07	180.18	180.05	180.01	180.10	180.24	0.41

3. Performance Result

The performance of the Hot Air Oven are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (± °C)	Temperature Uniformity (°C)	Overall Variation (°C)
40	40.0	40.0	0.20	0.70	0.72
70	70.0	70.0	0.20	0.60	0.94
103	103.0	103.0	0.20	0.43	0.54
104	104.0	104.0	0.10	0.79	0.88
105	105.0	105.0	0.10	0.59	0.69
180	180.0	180.0	0.10	0.38	0.38

- UUC = Unit Under Calibration

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

... End ...



Southern Calibration Service Co., Ltd.

669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkhla 90250 Thailand

Tel: 081 599 0417 Fax: 074 805 133 Email: s.calibration@gmail.com www.scal-lab.com



CALIBRATION CERTIFICATE

Issued Date : 8-Feb-2022

Certificate No. : 22WB004

CSR No. : A0223/01123

Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8 Karnchanawanich Rd. T.Ban Phru,
A. Hat Yai, Songkhla 90250 TH

Calibration Place : Chemical Laboratory
Instrument Name : Water Bath
Manufacturer : Memmert
Model : WNE29
Serial No. : L616.0538
ID No. : SGK_CL0035
Resolution : 0.1 °C
Received Date : 5-Feb-2022
Calibrated Date : 5-Feb-2022
Ambient Temperature : (30 ± 10) °C
Relative Humidity : (50 ± 30) %

REVIEW BY	Ananta B.
APPROVED BY	Kanitta H.
NEXT CAL. DATE	6/02/2023

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.W1.014 based on ASTM E 715 : 1980 (reapproved 2001)

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- Q Reborn : Quality Reborn Co.,Ltd.

Calibrated by : Imron Rattanaylum

Approved by :

Sakeereen Heemhad / Technical Manager

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Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data logger With Sensor	34970A	MY44064411	QR21-0314	9-Feb-2022

2. The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

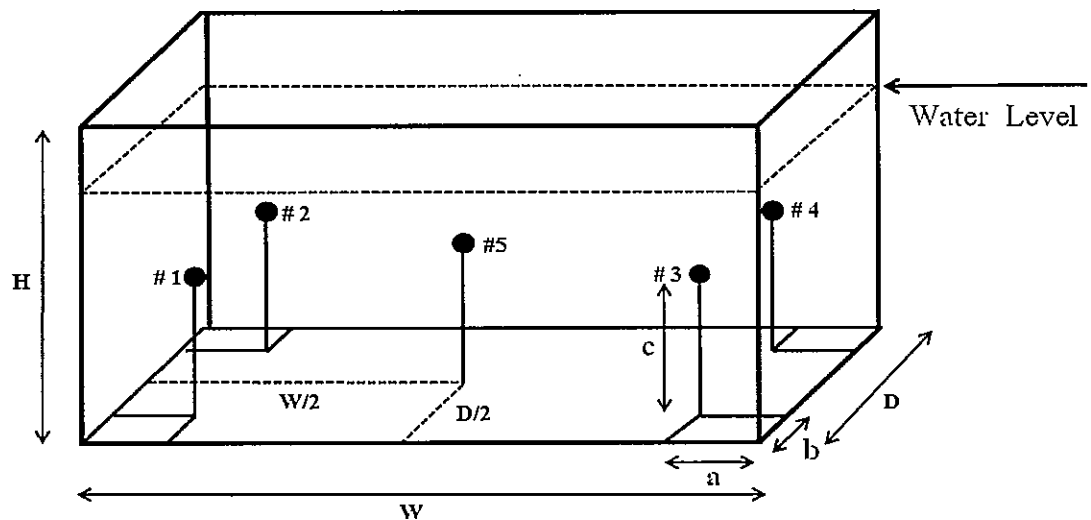
4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration :

(✓) Without Adjustment

() After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details

$a = 5$ cm
 $b = 5$ cm
 $c = 5$ cm

Dimension of the chamber

$W = 45$ cm
 $H = 30$ cm
 $D = 35$ cm



Certificate No. : 22WB004

CSR No. : A0223/01123

Page. : 3 of 3

Result of Calibration :

2. Temperature Measurement Accuracy Test

The measurement results of the Water Bath and associates are reported in the manner as shown below

Cal point (°C)	Measured Standard Temperature At Spread Locations (°C)					Uncertainty (± °C)
	#1	#2	#3	#4	Ref.5	
80	79.95	80.07	79.95	79.99	80.03	0.14

3. Performance Result

The performance of the Water Bath are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (± °C)	Temperature Uniformity (°C)	Overall Variation (°C)
80	81.0	81.0	0.10	0.19	0.19

- UUC = Unit Under Calibration

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

... End ...



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM676

Page.: 1 of 3

Certificate of Calibration

Equipment : Autoclave

Manufacturer : TOMY

Model : SX-700

Serial No. : 48134190

ID No. : BKK_ML0041

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Location : Media Preparation Room

Received Order : 20 May 2022

Calibration Date : 20 May 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :

Approved Signatory

() Pornthippa Tameyakul

() Malee Butkruea

(✓) Suwit Imjai

Issue Date : 24 May 2022

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0041435



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2205-0404OC-2

Cert. No.: 22TM676

Page.: 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Data Acquisition	34972A	MY57013823	22LM24	26 Feb 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**

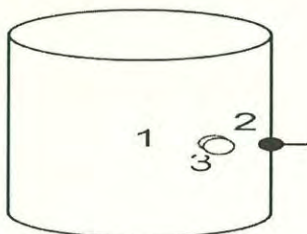
(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)

It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	55	220
Finished of Calibration	26	57	221

<u>Position</u>	<u>Description</u>	<u>Ref. Std. ID No.:</u>
1 =	Center of chamber	19-17TC-11
2 =	Temperature sensor	19-17TC-12
3 =	Exhaust port	19-17TC-13

Signature



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2205-0404OC-2

Cert. No.: 22TM676

Page.: 3 of 3

Result of Calibration :- (*) Without Adjustment

Operating parameter Set : Temperature = 108 °C

Sterilization period = 10 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor <i>k</i>
108	108	1	107.536	0.19	0.04	0.91	2
		2	107.542				
		3	107.471				

Operating parameter Set : Temperature = 115 °C

Sterilization period = 20 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor <i>k</i>
115	115	1	114.502	0.15	0.08	0.89	2
		2	114.582				
		3	114.539				

Operating parameter Set : Temperature = 118 °C

Sterilization period = 10 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor <i>k</i>
118	118	1	117.517	0.094	0.09	0.88	2
		2	117.616				
		3	117.530				

Result of Calibration :- (*) Without Adjustment

Operating parameter Set : Temperature = 121 °C

Sterilization period = 30 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor <i>k</i>
121	121	1	120.400	0.18	1.1	0.90	2
		2	120.511				
		3	120.465				

Average* : The average of 30 values in each position.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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Signature



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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM102

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : SHEL-LAB
Model : 1915A
Serial No. : 0200599
ID No. : BKK_ML0010
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Location : Incubation & Micrological Reading
Received Order : 21 January 2022
Calibration Date : 21 January 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krisda Malee

REVIEW BY	Sithichok T.
APPROVED BY	[Signature]
NEXT CAL. DATE	22/07/23

Approved by :

Malee

Approved Signatory

- (☒) Pornthippa Tameyakul
(☒) Malee Butkruea
(☐) Suwit Imjai

Issue Date :

3 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0037377



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2201-0616OC-1

Cert. No.: 22TM102

Page.: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013711	21LM7	16 Jun 2022

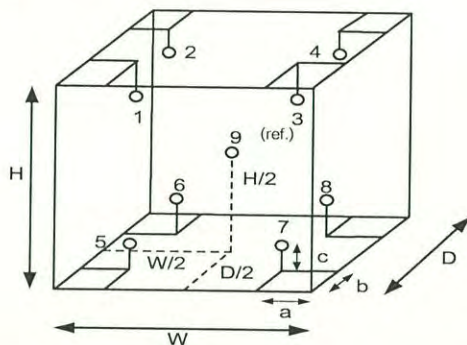
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	26	25
REL.Humid. (%)	53	54
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	18-18RTD-01
2	18-18RTD-02
3	18-18RTD-03
4	18-18RTD-04
5	18-18RTD-05
6	18-18RTD-06
7	18-18RTD-07
8	18-18RTD-08
9 (ref.)	18-18RTD-09

Probe Installation Details :

a = 10 cm
 b = 10 cm
 c = 10 cm

Dimension of Chamber :

D = 0.90 m
 W = 0.75 m
 H = 1.2 m
 Capacity = 0.81 m³

Malu .



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2201-0616OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 22TM102

Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
35.0	35.0	35.0	0.043	0.41	0.42	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
35.0	34.801	34.868	34.862	35.012	35.040	35.010	35.084	35.040	35.178

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

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.

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

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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Cert. No.: 22TM1571

Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven

Manufacturer : Binder

Model : ED 240/E2

Serial No. : 00-15533

ID No. : BKK_ML0013

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Location : Media Preparation Room

Received Order : 21 November 2022

Calibration Date : 21 November 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Krisda Malee

Approved by :

Malee

Approved Signatory

() Pornthippa Tameyakul

(✓) Malee Butkruea

() Suwit Imjai

Issue Date : 29 November 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0048150



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2211-0623OC-1

Cert. No.: 22TM1571

Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44067817	22LM121	22 Aug 2023

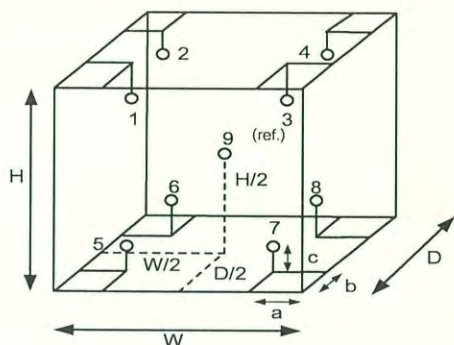
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) After Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Environment during calibration		
	Beginning	Finished
Temp. (°C)	26	26
REL.Humid. (%)	53	55
AC Supply (Volt)	219	220

Position :	Ref. Std. ID No.:
1	21-15TC-01
2	21-15TC-02
3	21-15TC-03
4	21-15TC-04
5	21-15TC-05
6	21-15TC-06
7	21-15TC-07
8	21-15TC-08
9 (ref.)	21-15TC-09

Probe Installation Details :

a = 5.0 cm
 b = 5.0 cm
 c = 5.0 cm

Dimension of Chamber :

D = 0.50 m
 W = 0.80 m
 H = 0.60 m
 Capacity = 0.24 m³

Malu.



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2211-0623OC-1
Result of Calibration :- (*) After Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 22TM1571

Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
180	180	180	0.70	1.5	2.9	1.4	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
180	179.520	180.585	178.855	179.482	178.827	179.938	179.074	180.199	180.068

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

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.

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

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM637
Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 45
Serial No. : L712.0429
ID No. : BKK_ML0056
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Location : Incubator & Microbiological Reading
Received Order : 20 April 2023
Calibration Date : 20 April 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Kunchit Promprat

REVIEW BY	Sithichok
APPROVED BY	
NEXT CAL. DATE	20/4/24

Approved by :

Malee Butkruea
Approved Signatory

- () Pornthippa Tameyakul
(/) Malee Butkruea
() Suwit Imjai

Issue Date : 24 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0053357



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2304-0253OC-1

Cert. No.: 23TM637

Page : 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Data Acquisition	34970A	MY44073381	22LM78/1	12 May 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

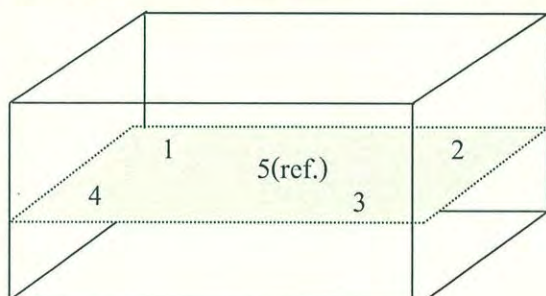
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	<u>Environmental</u>		<u>AC Voltage Supply</u>
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	25	45	223
Finished of Calibration	25	43	223



Front

<u>Position :</u>	<u>Ref. Std. S/N.:</u>
1	4803988-006
2	4803988-007
3	4804539-014
4	4804539-015
5(ref.)	4804539-016

Malu .



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2304-0253OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 23TM637

Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			Position					
			1	2	3	4	5 (ref.)	
44.5	44.5	44.5	44.492	44.463	44.475	44.510	44.491	0.15
45.0	45.0	45.0	45.005	44.962	44.979	45.016	44.986	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor <i>k</i>
44.5	0.051	0.022	2
45.0	0.080	0.026	2

Average* : The average of 30 values in each position.

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.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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Malu