



บริษัท ปตท. น้ำมันและการค้าปลีก จำกัด (มหาชน)

รายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อม  
และมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม

โครงการท่าเทียบเรือและคลังน้ำมันภูเก็ต

ระหว่างเดือนกรกฎาคม-ธันวาคม พ.ศ. 2566

ภาคผนวก จ

ใบรับรองการสอบเทียบเครื่องมือ



right solutions.  
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#### รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Songkhla Lab	Cadmium	ICP-MS	SGK_CL0048	2-Aug-23	2-Feb-25	18
Songkhla Lab	Cadmium	Cold Room Water	SGK_CL0065	31-Jan-23	31-Jul-24	18
Songkhla Lab	Lead	ICP-MS	SGK_CL0048	2-Aug-23	2-Feb-25	18
Songkhla Lab	Lead	Cold Room Water	SGK_CL0065	31-Jan-23	31-Jul-24	18
Songkhla Lab	BOD	Incubator	SGK_CL0028	13-Jul-23	13-Jan-25	18
Songkhla Lab	BOD	DO/BOD Analyser	SGK_CL0073	21-Nov-22	21-May-24	18
Songkhla Lab	COD	COD Reactor	SGK_CL0085	23-Jan-23	23-Jan-24	12
Songkhla Lab	COD	Spectrophotometer	SGK_CL0038	24-Jan-23	24-Jan-24	12
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	13-Jul-23	13-Jan-25	18
Songkhla Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	SGK_CL0045	25-Jan-23	25-Jan-24	12
Songkhla Lab	Total Dissolved Solids 180°C	Oven	SGK_CL0024	28-Apr-23	28-Oct-24	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	Total Kjeldahl Nitrogen	Digestion Unit	BKK_EN0366	17-May-23	17-May-24	12
Water Lab	Total Kjeldahl Nitrogen	Discrete analyzer	BKK_EN0037	12-Jul-23	12-Jul-24	12
Water Lab	Fecal Coliform	Autoclave	BKK_ML0037	17-Jul-23	17-Jan-25	18
Water Lab	Fecal Coliform	Incubator	BKK_ML0010	17-Jul-23	17-Jan-25	18
Water Lab	Fecal Coliform	Hot Air Oven	BKK_ML0013	21-Nov-22	21-May-24	18
Water Lab	Fecal Coliform	Water Bath	BKK_ML0056	20-Apr-23	20-Apr-24	12
Water Lab	Fecal Coliform	Autoclave	BKK_ML0037	17-Jul-23	17-Jan-25	18
Water Lab	Fecal Coliform	Incubator	BKK_ML0010	17-Jul-23	17-Jan-25	18
Water Lab	Fecal Coliform	Hot Air Oven	BKK_ML0013	21-Nov-22	21-May-24	18
Water Lab	Fecal Coliform	Water Bath	BKK_ML0056	20-Apr-23	20-Apr-24	12
Water Lab	Total Solids	Electronic Top-Loading Balance	BKK_EN0002	8-Feb-23	8-Feb-24	12
Water Lab	Total Solids	Oven	BKK_EN0273	29-Nov-22	29-May-24	18
Songkhla Lab	Conductivity	Conductivity Meter	SGK_CL0032	3-May-23	3-May-24	12
Songkhla Lab	Floatable Oil & Grease	Electronic Top-Loading Balance	SGK_CL0045	25-Jan-23	25-Jan-24	12
Songkhla Lab	Floatable Oil & Grease	Oven	SGK_CL0024	28-Apr-23	28-Oct-24	18
Songkhla Lab	Floatable Oil & Grease	Water Bath	SGK_CL0035	13-Jul-23	13-Jan-25	18
Water Lab	Nitrate	Ion Chromatography	BKK_EN0069	12-Jan-23	12-Jan-24	12
Water Lab	Phosphate	Ion Chromatography	BKK_EN0069	12-Jan-23	12-Jan-24	12
Songkhla Lab	Salinity	Conductivity meter	SGK_CL0032	3-May-23	3-May-24	12
Songkhla Lab	Temperature	Infrared Thermometer	PHK_FS0006	3-Feb-23	3-Feb-24	12
Songkhla Lab	Total Alkalinity	pH meter	SGK_CL0030	28-Apr-23	28-Oct-24	18
Songkhla Lab	Turbidity	Turbidity Meter	SGK_FS0045	22-May-23	22-May-24	12
Sludge	Oil & Grease	Electronic Top-Loading Balance	BKK_EN0002	8-Feb-23	8-Feb-24	12
Sludge	Total Petroleum Hydrocarbon	Electronic Top-Loading Balance	BKK_EN0002	8-Feb-23	8-Feb-24	12
Sludge	pH aqueous phase 50% (w/v)	pH meter	BKK_EN0072	12-Sep-22	12-Mar-24	18



Agilent Technologies

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Email: ccc-smt@agilent.com  
Website: [www.agilent.com/chem](http://www.agilent.com/chem)

#### Customer Contact:

ALS Laboratory Group (Thailand) Co Ltd  
Branch Number 0002  
114/1 Moo8 Banplu Subdistric Hat Yai District  
TAX ID : 0105540004859  
kanitta.hemprasatpor@alsglobal.com  
0811721334

#### Invoice To:

ALS Laboratory Group (Thailand) Co Ltd  
Branch Number 0002  
114/1 Moo8 Banplu Subdistric Hat Yai District SONGKHLA 90250

#### Payer:

ALS Laboratory Group (Thailand) Co Ltd Head Office  
104 Phatthanakan 40 Phatthanakan Rd Khwaeng Phatthanakan Khet Suan Luang BANGKOK 10250

#### Delivery Site:

ALS Laboratory Group (Thailand) Co Ltd  
Branch Number 0002  
114/1 Moo8 Banplu Subdistric Hat Yai District

#### Location:

Room  
Bldg  
Lab  
Dept

products | applications | software | services

Agilent Technologies (Thailand) Limited. Head Office  
U Chu Liang Bldg. 22/F Unit A,D  
968 Rama 4 Road, Silom, Bangkok,  
Bangkok 10500 Thailand  
Tax ID : 0105542068218

#### SERVICE REPORT

Customer Purchase Order Number:	Customer Number: 70579367
Service Request:	Service Request Date:
Service Order: 6005939422	Service Confirmation: 6905074481

REVIEW BY Kavinda J.  
APPROVED BY Kanitta H.  
NEXT CAL. DATE 2/01/25

#### Direct Inquiries to:

Contact Name: Customer Contact Center  
Contact E-mail: ccc-smt@agilent.com  
Contact Telephone: +662 637 6363  
Contact Fax: +662 632 4334

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Acc. No: 012-4452-007,  
THB:Krung Thai Bank PCL  
Siam Square Br.416/1-2 Rama I Rd.,Pathumwan, BKK 10330 Thailand

ORIGINAL

Service Confirmation Number: 6905074481

Service Confirmation Date: 02.08.2023

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-IM-7900	ICPMS 7900 System			
G7201C	ICP-MS MassHunter SW only (excludes PC)	USH3799575	ICP MS 7900	SYS-IM-7900
G8403A	Agilent 7900 ICP-MS	JP16511669	ICP MS 7900	SYS-IM-7900
G8411A	ISIS 3 for Agilent 7850/7900/8900	JP16510379	ICP MS 7900	SYS-IM-7900

Service Items:


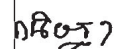
Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	EOQ	Enterprise Operational Qualification	1.00	Agreement Entitlement - 100 % covered	02.08.2023	02.08.2023
1010	5185-5850	ICP-MS Checkout Solutions	1.00	Agreement Entitlement - 100 % covered		

Additional Information:

Service Confirmation Number: 6905074481

Service Confirmation Date: 02.08.2023

Service Information:

<b>Problem Description:</b> WU-S-QQ-IM-7900-5001093854		
<b>Service Provided:</b> -Perform OQ hardware. -Test OQ of instrument ICP-MS = SGK_CL0048. All tests Passed.		
<b>Service Overview Code:</b> Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
<b>Reported Hours:</b> 9.0	<b>Travel Hours:</b> 3.0	
<b>Customer Field Service Representative Name:</b> Uthai Ngamlertsirichai	<b>Customer Field Service Representative Signature:</b> 	<b>Date:</b> 02 Aug 2023
<b>Customer Name:</b> KANITTA HEMPRASATPORN	<b>Customer Signature:</b> 	<b>Date:</b> 02 Aug 2023
<b>Additional Comments:</b>		



# 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 : 3-Feb-2023

Certificate No. : 23TH0527

CSR No. : A073/03634

Page. : 1 of 3

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

Calibration Place : Chemical Laboratory  
Instrument Name : Cold Room Water  
Manufacturer : MODULAR  
Model : N/A  
Serial No. : N/A  
ID No. : SGK\_CL0065  
Resolution : 0.1 °C  
Received Date : 31-Jan-2023  
Calibrated Date : 31-Jan-2023  
Ambient Temperature : (30 ± 10) °C  
Relative Humidity : (50 ± 30) %

REVIEW BY Ananta B.  
APPROVED BY Kampha H.  
NEXT CAL. DATE 31/07/24

### 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 :

Imron Rattanaylum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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Certificate No. : 23TH0527

CSR No. : A073/03634

Page. : 2 of 3

### Details of Calibration

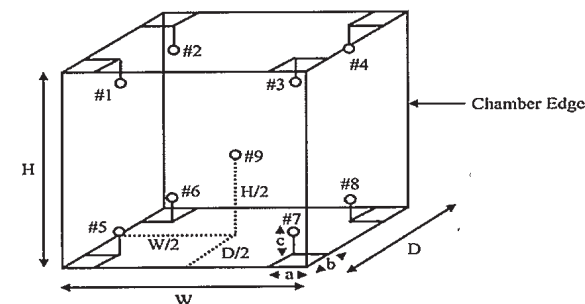
#### 1. Reference Standard Equipment Used:

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

- 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 = 5.0 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





Certificate No. : 23TH0527  
CSR No. : A073/03634  
Page. : 3 of 3

#### Result of Calibration :

#### 2. Temperature Measurement Accuracy Test

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

Cal point ( °C )	Measured Standard Temperature At Spread Locations ( °C )														
	#1	#2	#3	#4	#5	#6	#7	#8	#9	Ref.10	#11	#12	#13	#14	#15
4	3.18	3.39	3.54	3.77	3.99	3.86	3.85	3.92	4.02	3.86	3.78	3.84	3.85	4.09	3.91

The uncertainty of measurement was  $\pm$  0.38 °C

#### 3. Performance Result

The performance of the Cold Room Water are reported as shown below

Cal point ( °C )	UUC Setting ( °C )	UUC Reading ( °C )	Temperature Stability ( $\pm$ °C )	Temperature Uniformity ( °C )	Overall Variation ( °C )
4	4.0	4.0	1.23	0.50	0.84

- 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 : 16-Jul-2023

Certificate No. : 23TH3096

CSR No. : A095/04743

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 : Incubator  
Manufacturer : Memmert  
Model : ICP750  
Serial No. : F816.0063  
ID No. : SGK\_CL0028  
Resolution : 0.1 °C  
Received Date : 13-Jul-2023  
Calibrated Date : 13-Jul-2023  
Ambient Temperature : (30  $\pm$  10) °C  
Relative Humidity : (50  $\pm$  30) %

REVIEW BY ..... Anonla B. ....  
APPROVED BY ..... Kamtha H. ....  
NEXT CAL. DATE 13/01/25

#### 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%

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Certificate No. : 23TH3096  
CSR No. : A095/04743  
Page. : 2 of 3

#### Details of Calibration

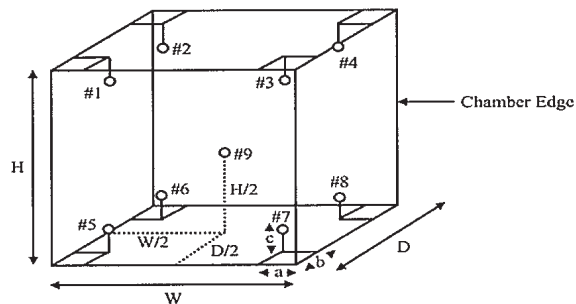
##### 1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data Acquisition/Switch Unit	34970A	MY58009813	23SDAT004	23-May-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. 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



Certificate No. : 23TH3096  
CSR No. : A095/04743  
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	
20	20.10	20.04	20.03	19.97	20.08	20.23	20.10	19.94	20.07	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 )
20	20.0	20.0	0.14	0.17	0.32

- 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.: 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 Lernagtrakul

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.



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

Cert. No.: 22LM162  
Page.: 2 of 2

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:-

Instrument	Model	Serial No.	Cert. No.	Due Date
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

Calibration Point ( °C )	Immersion Depth ( mm )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty ( ± °C )	Coverage Factor k
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 %.

-o0o-



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 FAX. 0-2719-9484

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 Lernagatrakul  
Issue Date : 22 November 2022

B 0300950



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).

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

#### 2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
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

-o0o-

Malee

a 1136621



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

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

Cert. No.: 23TM74/1

Page.: 1 of 3

## Certificate of Calibration

This Certificate was issued to replace to the Certificate No.23TM74

Equipment : COD Reactor

Manufacturer : Hach

Model : DRB 200

Serial No. : 21120C1313

ID No. : SGK\_CL0085

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Songkhla Branch  
114/1 Moo 8, Kanjanavanij Rd.,  
Banphru, Hatyai,  
Songkhla 90250, Thailand

Location : Chemistry Room

Received Order : 23 January 2023

Calibration Date : 23 - 24 January 2023

Ambient Temperature : ( 26 ± 10 ) °C

Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Kunchit Promprat

Approved by :

*Malee*  
Approved Signatory

( ) Pornthippa Tameyakul

(✓) Malee Butkruea

( ) Suwit Imjai

Issue Date : 2 March 2023

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

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approval of the head of Calibration and Testing Equipment Services.



Equipment : COD Reactor

Condition As-Received : Used Item

Reference : 2301-0661OC-4

Procedure Used :-

As agreed with customer the calibration was perform using in-house calibration method according to directed 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	34972A	MY44073381	22LM78/1	12 May 2023

2. This certification is traceable to the SI unit.

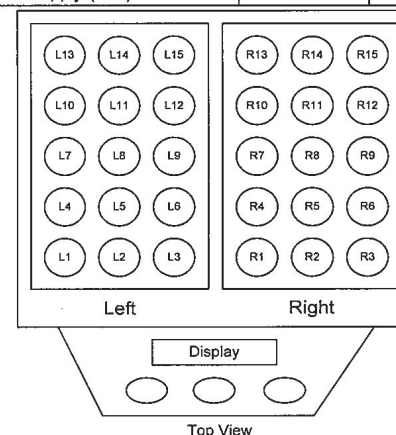
3. This result of calibration was found accurate as shown on date and place of calibration only.

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

Function of UUC\* : Temperature Source

Heat transfer medium used : Alumina Calcined

Environment during calibration		
	Beginning	Finished
Temp.(°C)	28	28
REL.Humi.(%)	58	55
AC Supply (Volt)	225	225



Left		Right	
Position	ID No. of Sensor	Position	ID No. of Sensor
L1	20-01TC-01	R1	20-01TC-01
L2	20-01TC-02	R2	20-01TC-02
L3	20-01TC-03	R3	20-01TC-03
L4	20-01TC-04	R4	20-01TC-04
L5	20-01TC-05	R5	20-01TC-05
L6	20-01TC-06	R6	20-01TC-06
L7	20-01TC-07	R7	20-01TC-07
L8	20-01TC-08	R8	20-01TC-08
L9	20-01TC-09	R9	20-01TC-09
L10	20-01TC-10	R10	20-01TC-10
L11	20-01TC-01	R11	20-01TC-01
L12	20-01TC-02	R12	20-01TC-02
L13	20-01TC-03	R13	20-01TC-03
L14	20-01TC-04	R14	20-01TC-04
L15	20-01TC-05	R15	20-01TC-05

*Malee*

A 0010625

a 1149780



Equipment : COD Reactor  
 Condition As-Received : Used Item  
 Reference : 2301-0661OC-4  
 Result of Calibration :- ( \* ) Without Adjustment  
 Function of UUC\* : Temperature Source

Cert. No.: 23TM74/1  
 Page: 3 of 3

Calibration Point 150 °C

UUC* Setting ( °C )	UUC* Reading ( °C )	Measured Temperature ( °C )						Temperature stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>	
		Position									
		<i>Left</i>			<i>Right</i>						
150	150	L13	L14	L15	R13	R14	R15	Left	0.59	2	
		148.290	148.623	148.360	149.812	150.003	149.566				
		L10	L11	L12	R10	R11	R12				
		148.929	148.812	149.120	150.357	149.814	149.593				
152	152	L7	L8	L9	R7	R8	R9	Right			0.10
		149.534	149.895	150.362	151.629	151.699	151.581				
		L4	L5	L6	R4	R5	R6				
		149.999	149.972	149.971	151.721	151.690	151.682				
		L1	L2	L3	R1	R2	R3				
		149.639	149.855	149.415	151.444	151.419	150.728				

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.

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 %.

-o0o-

Malu.

a 1149779



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
 TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23CHO30  
 Page: 1 of 3

## Certificate of Calibration

Equipment : Spectrophotometer  
 Manufacturer : HACH  
 Model : DR 3900  
 Serial No. : 1687645  
 ID No. : SGK\_CL0038  
 Condition As-Received: Used Item  
 Received Date : 23 January 2023  
 Calibration Date : 24 January 2023  
 Reference : 2301-0661OC-1  
 Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Songkhla Branch.  
 114/1 Moo 8 , Kanjanavanij Rd.,  
 Banphru , Hatyai ,  
 Songkhla 90250 , Thailand

REVIEW BY Ananta B.  
 APPROVED BY Kanitta H.  
 NEXT CAL. DATE 24/01/24

Calibration Place : Chemistry Room  
 Ambient Temperature : ( 28.3 - 27.3 ) °C (On-Site)  
 Relative Humidity : ( 49.6 - 49.9 ) % (On-Site)  
 Calibration Procedure : In - house method :  
 CP-OCH4 based on ASTM E 275-01

Calibrated by : Kunchit Promprat

Approved by : Malu.  
 Approved Signatory

( ✓ ) Malee Butkruea  
 ( ) Saithip Meangmai  
 ( ) Warakorn Lernagatrakul

Issue Date : 7 February 2023  
 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 0050506





Cert. No. : 23CHO30

Page : 2 of 3

**Condition of calibration result**

## 1. Reference Standard Material :

Material	Serial No.	Certificate No.	Due date
1. Absorbance Standard set	32593	100581	30 Mar 2024
2. Wavelength Standard set	29829	94776	02 Sep 2023
3. Wavelength Standard set	29829	94777	02 Sep 2023

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

3. This certificate is traceable to the International System of Unit maintained at :

- National Physical Laboratory (NPL), The United Kingdom of Great Britain and Northern Ireland
- National Institute of Standards and Technology (NIST), The United States of America

4. Spectral BandWidth : 5 nm  
Scan Speed : - nm/min

**Calibration Results : without adjustment****Wavelength Accuracy**

Certified Values of Reference Material ( nm )	UUC Reading ( nm )	Uncertainty of Measurement ( ± nm )	Coverage Factor k
418.40	418	0.59	2.00
479.88	480	0.59	2.00
513.75	514	0.59	2.00
537.00	536	0.59	2.00
638.00	638	0.59	2.00
684.70	685	0.59	2.00
747.61	748	0.59	2.00
807.04	807	0.59	2.00

Malu.

a 1146846



Cert. No. : 23CHO30

Page : 3 of 3

**Calibration Results : without adjustment****Photometric Accuracy**

Wavelength (nm)	Certified Values of Reference Material ( Abs )	UUC Reading ( Abs )	Uncertainty of Measurement ( ±Abs )	Coverage Factor k
420.0	Zero	0.000	0.0028	2.00
	0.5701	0.568	0.0029	2.00
	0.7147	0.712	0.0030	2.00
	1.0031	0.999	0.0030	2.00
440.0	Zero	0.000	0.0028	2.00
	0.5552	0.553	0.0029	2.00
	0.7031	0.700	0.0030	2.00
	0.9867	0.981	0.0029	2.00
465.0	Zero	0.000	0.0028	2.00
	0.5178	0.517	0.0030	2.00
	0.6642	0.663	0.0029	2.00
	0.9312	0.930	0.0030	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5195	0.517	0.0030	2.00
	0.7007	0.698	0.0029	2.00
	0.9833	0.979	0.0028	2.00
590.0	Zero	0.000	0.0028	2.00
	0.5537	0.550	0.0030	2.00
	0.7763	0.771	0.0029	2.00
	1.0912	1.083	0.0028	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5615	0.558	0.0029	2.00
	0.7659	0.762	0.0030	2.00
	1.0763	1.070	0.0028	2.00

**Remark**

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer

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 %.

-o-o-

Malu.

a 1146845



# 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.seal-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 Kanitta 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.



SCaL

### 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 ...

Certificate No. : 23CH0203

CSR No. : A088/04367

Page. : 2 of 2





**SARTORIUS**

# Certificate of Calibration

REVIEW BY Ananta B.  
APPROVED BY Kanitta H.  
NEXT CAL. DATE 25/11/24

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. : 1 of 2

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

Calibrated Place : Balance Room.

Calibrated By : Mr. Chonchai Inthana Calibration Procedure No. : This calibration was conducted by  
Using in-house calibration procedure number (WI-003)  
Based on UKAS LAB 14 : 2019

Metrological data : Ambients Conditions:  
Capacity : 220 g Readability : 0.0001 g Temperature : 22.4 °C ± 3.0 °C  
Humidity : 65.0 % RH ± 5.0 % RH  
Pressure :                      ±                     

## Reasons for calibration

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

## Measurement Method UKAS Publication Ref : Lab 14

The measurement uncertainty stated is the expended 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.

*Chonchai Inthana*

Mr.Chonchai Inthana(Technical Manager)



**SARTORIUS**

# 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

<b>Repeatability</b>  <i>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.</i>			<b>Eccentricity (Off-center loading error)</b>  <i>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).</i>		
Nominal Value : (Low Load)	20.0000	200.0000	Nominal value :	50	g
20 g	20.0001	200.0000	Tolerance	0.0004	g
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			

## 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.



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.  
NEXT CAL. DATE 28/11/2024

### 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 : Southern Calibration Service Co., Ltd.,

Calibrated by : Ibrorhim Saleemin

Approved by :

Imron Rattanaylum / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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Certificate No. : 23TH1728

CSR No. : A088/04367

Page : 2 of 3

### Details of Calibration

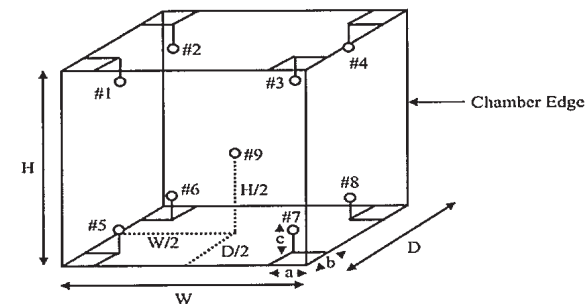
#### 1. Reference Standard Equipment Used:

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



Certificate No. : 23TH1728

CSR No. : A088/04367

Page. : 3 of 3

**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, Songkla 90250 Thailand

Tel : 08 1599 0417 Fax : 0 7480 5133 Email : s.calibration@gmail.com www.scal-lab.com

NSC-TIS-17025  
CALIBRATION 0294**CALIBRATION CERTIFICATE**

Issued Date : 16-Jul-2023

Certificate No. : 23TH3097

CSR No. : A095/04743

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 : Chemical Laboratory  
Instrument Name : Water Bath  
Manufacturer : Memmert  
Model : WNE29  
Serial No. : L616.0538  
ID No. : SGK\_CL0035  
Resolution : 0.1 °C  
Received Date : 13-Jul-2023  
Calibrated Date : 13-Jul-2023  
Ambient Temperature : (30 ± 10) °C  
Relative Humidity : (50 ± 30) %

REVIEW BY Ananta B.  
APPROVED BY Kanitha B.  
NEXT CAL. DATE 13/01/25

**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 :

- 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%**

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Certificate No. : 23TH3097

CSR No. : A095/04743

Page. : 2 of 3

#### Details of Calibration

##### 1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data Acquisition/Switch Unit	34970A	MY58009813	23SDAT004	23-May-2024

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

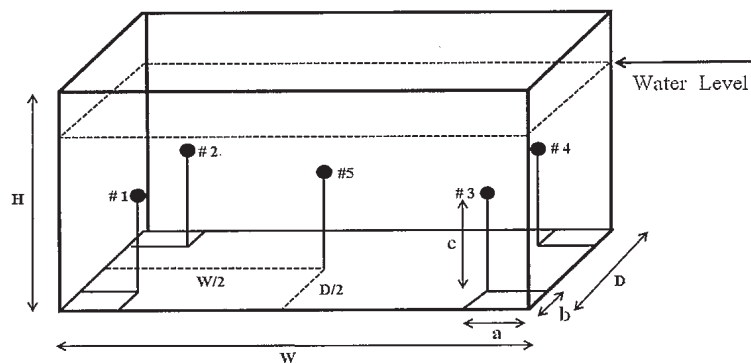
and carry no implication regarding the longterm stability of instrument.

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. 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. : 23TH3097

CSR No. : A095/04743

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	79.17	79.47	79.43	79.25	79.38	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	80.0	80.0	0.24	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 ...



## Metrological Center

SCI ECO Services Company Limited

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

Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T230902

Page 1 of 5

### Certificate of Calibration

Equipment : Digestion Unit

Manufacturer : SCP Science

Model : DigiPRER HT

Serial No. : HTC1120480658

Customer Code : BKK\_EN0366

ID No. : T2635A5

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Wet Chemistry Lab 1

Date of Receipt : 10 May 2023

Calibrated By : Sujjar Naknakred ( Site Calibration Manager )

Approved By : [Signature] / Boonchai Suriyawong ( Site Calibration Manager )

Date of Issue : 29 MAY 2023

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.



## Metrological Center

SCI ECO Services Company Limited

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

Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T230902

Page 2 of 5

### Calibration Report

Equipment : Digestion Unit

Date of Calibration : 17 May 2023

Environment : Temperature : 23.9 - 26.3 °C

Line Voltage : 221.8 - 225.9 V

Relative Humidity : 55 - 65 %RH

#### Condition of this results of calibration :

1. This equipment was calibrated by insert four standard thermocouples type S into its chamber , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T10.

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	Type S	M20A1-(CH17-CH20)	T230547	18 April 2024
DATA LOGGER	34970A	T149	T230547	18 April 2024

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 54 Minute At 380 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

5. Adjustment :

( X ) without adjustment

( ) after adjustment

Approved By [Signature]





# Metrological Center

SCI ECO Services Company Limited

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

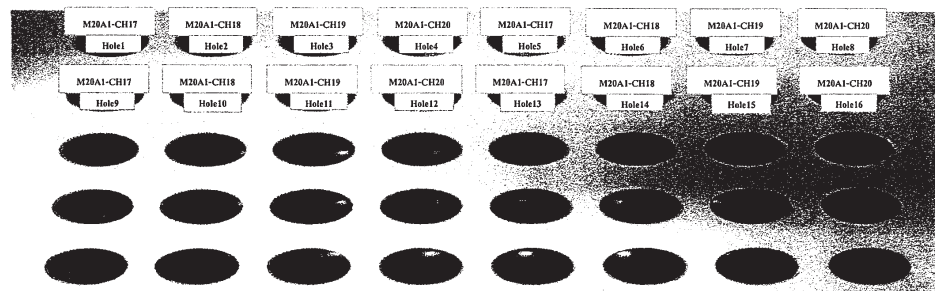
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T230902

Page 3 of 5

## Calibration Report



FRONT

### Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
°C	°C	°C	Reading	Hole1	Hole2	Hole3	Hole4	Hole5	Hole6	Hole7	Hole8
				M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20	M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20
380.0	380.0	379.4 - 380.7	Max °C	377.3	379.0	379.2	380.2	377.5	379.5	380.7	380.1
			Min °C	376.8	378.6	378.9	379.9	377.0	379.0	380.2	379.6
			Average °C	377.0	378.8	379.1	380.0	377.3	379.2	380.4	379.9
			Stability ± °C	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
°C	°C	°C	Reading	Hole9	Hole10	Hole11	Hole12	Hole13	Hole14	Hole15	Hole16
				M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20	M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20
380.0	380.0	379.4 - 380.7	Max °C	377.1	378.9	379.7	379.9	379.3	379.6	379.5	377.4
			Min °C	376.7	378.5	379.3	379.5	378.9	379.1	379.0	377.0
			Average °C	376.9	378.7	379.5	379.7	379.1	379.4	379.3	377.2
			Stability ± °C	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2

Approved By.



# Metrological Center

SCI ECO Services Company Limited

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

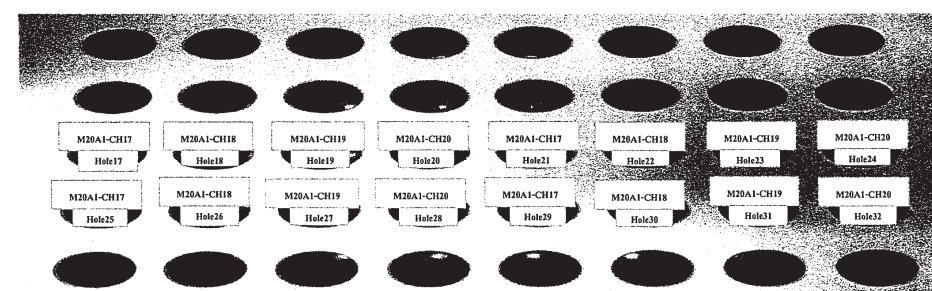
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T230902

Page 4 of 5

## Calibration Report



FRONT

### Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
°C	°C	°C	Reading	Hole17	Hole18	Hole19	Hole20	Hole21	Hole22	Hole23	Hole24
				M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20	M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20
380.0	380.0	379.4 - 380.7	Max °C	378.4	380.1	380.1	380.0	379.1	379.8	379.6	377.8
			Min °C	377.8	379.6	379.7	379.3	378.6	379.2	379.2	377.3
			Average °C	378.1	379.9	379.9	379.7	378.9	379.5	379.4	377.5
			Stability ± °C	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
°C	°C	°C	Reading	Hole25	Hole26	Hole27	Hole28	Hole29	Hole30	Hole31	Hole32
				M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20	M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20
380.0	380.0	379.4 - 380.7	Max °C	377.9	379.4	380.1	380.1	379.3	379.6	378.9	377.3
			Min °C	377.4	378.9	379.7	379.7	378.8	378.9	378.4	376.7
			Average °C	377.7	379.2	379.9	379.9	379.0	379.3	378.6	377.0
			Stability ± °C	0.3	0.3	0.2	0.2	0.3	0.4	0.3	0.3

Approved By.



# Metrological Center

SCI ECO Services Company Limited

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

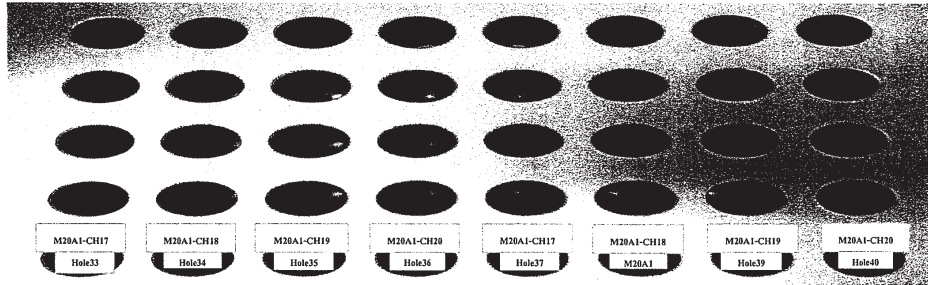
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T230902

Page 5 of 5

## Calibration Report



FRONT

### Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	Hole33	Hole34	Hole35	Hole36	Hole37	Hole38	Hole39	Hole40
				M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20	M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20
380.0	380.0	379.4 - 380.7	Max °C	377.7	378.0	378.3	379.0	378.2	378.5	377.3	377.4
			Min °C	377.3	377.6	377.9	378.6	377.7	378.1	376.9	377.0
			Average °C	377.5	377.8	378.1	378.8	378.0	378.3	377.1	377.2
			Stability ± °C	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

The expanded uncertainty of temperature measurement was  $\pm 1.85$  °C

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=2 , providing a level of confidence of approximately 95 % .

Approved By.

*[Signature]*



บริษัท ดับเบิล เอส ไดแอกโนสติกส์ จำกัด  
DOUBLE S DIAGNOSTICS CO., LTD.

4 ซอยอุดมสุข 14 แขวงบางนา เขตบางนา กรุงเทพมหานคร 10260 โทรศัพท์: (02) 747-7009 โทรสาร: (02) 747-7008  
4 Soi Udomsak 14, Bangna, Bangkok 10260 Tel. (02) 747-7009 Fax: (02) 747-7008

Maintenance Plan YEAR : 2023

เดือน	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
รวม							ck					

### Periodical maintenance check list for Konelab

	6M	12M	Note!
1.Diluent-wash tubing change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.ISE tubing change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	none
3.Syringe check/change		<input checked="" type="checkbox"/>	
4.Dispensing check/ change		<input checked="" type="checkbox"/>	
5.Waste tubing change when necessary		<input checked="" type="checkbox"/>	
6.Lamp check/change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
7.Mixer paddle/paddle change(not Konelab20)		<input checked="" type="checkbox"/>	
8.ISE needles check/change		<input checked="" type="checkbox"/>	none
9.Pump tubing check/ change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
10.Broken/worn out part check /change		<input checked="" type="checkbox"/>	
11.Peristaltic pump check /cleaning/ lubrication	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
12.Heating check		<input checked="" type="checkbox"/>	
13.Cooling check		<input checked="" type="checkbox"/>	
14.Dispenser mechanic check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
15.Cuvette transfer mechanic check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
16.Dispenser movement check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
17.Sample/reagent register check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
18.Dispensing tubing tightness check	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
19.Photometer and optics cleaning/check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
20.Workstation PC cleaning if necessary	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
21.Mechanic cleaning/lubrication	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
22.Instrument cleaning if necessary	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
23.Complete analyzer testing with waterblank/QC or sample	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
24.Test parameters/Adjustment/config. Save to USB key	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
25.UPS Test	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Place: ALS LAB Instrument: 890 AquaChem  
Date/Time: 12/7/66 Serial no: 20981  
Service done by: 51756 Install date: 12/2/66  
Signature of customer: 8111 Date/Time: 12/2/66

Laboratory  
Analyzer User

7/12/2023 21:21

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Performed 7/12/2023  
Lot W166

=====

ACCEPTANCE CRITERIA

=====

	Result	Limit	Warning
Temperature (?C)	37.7	37.0 +/- 1.0	
Dispensing ratio	16.4	14.8 - 17.2	
CV%	1.17	<1.7	
Photometric noise			
Max SD L340_2 (mA)	0.19	<2.0	
Max SD L340_4 (mA)	1.06	<3.0	
Linearity of photometer			
Slope	1.0188	0.94 - 1.06	
Curvature	0.0035	+/- 0.02	
Max bias from linear fit (mA)	3.2	<15.0	
Max delta %	-2.0	+/- 6.0	
Linearity of sample dispensing			
Proport. volume XDISP2 (?l)	2.06	1.96 - 2.16	
Proport. volume XDISP4 (?l)	4.13	3.85 - 4.40	
XDISP2 CV%	0.58	<2.0	
XDISP4 CV%	0.70	<2.0	
XDISP10 CV%	0.59	<2.0	
Needle 0 ?l volume			
Average (A)	0.009	<0.050	
Standard deviation (A)	0.002	<0.005	
Volume (?l)	0.06	<0.32	

=====

OTHER INFORMATION

=====

Dispensing ratio	Photom., noise: SD (mA)
Posit Result (A)	Posit L340_2 L340_4
1 0.1592	1 0.07 0.64
2 0.1624	2 0.09 1.06
3 0.1631	3 0.14 0.50
4 0.1631	4 0.13 0.53
5 0.1625	5 0.19 0.38
6 0.1650	6 0.02 0.64

Laboratory  
Analyzer User

7/12/2023 21:21

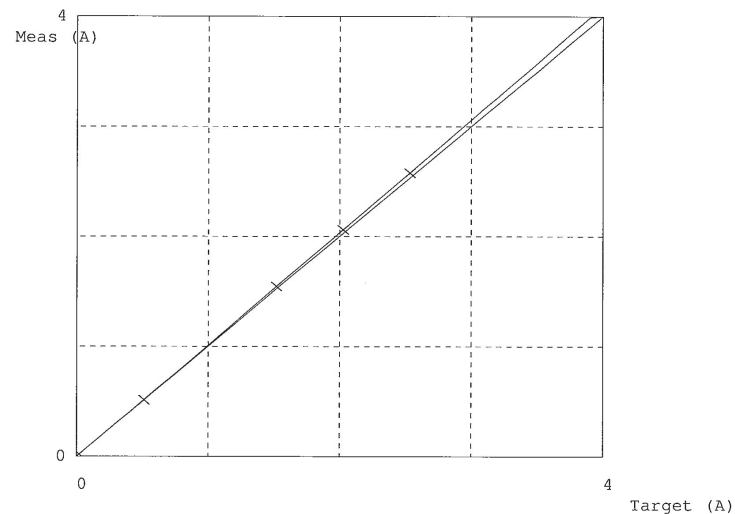
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Linearity of sample dispensing

Test	Absorbance (A)
XDISP2	0.311
XDISP4	0.616
XDISP10	1.478

Linearity of photometer

L340_	Target (A)	Meas (A)	Delta (A)	Delta %
1	0.001	0.005	-0.004	-394.7
2	0.512	0.519	-0.007	-1.5
3	1.523	1.550	-0.027	-1.8
4	2.027	2.066	-0.039	-1.9
5	2.532	2.582	-0.050	-2.0







TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
53/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM1103  
Page : 1 of 3

## Certificate of Calibration

Equipment : Autoclave  
Manufacturer : Sanyo  
Model : MLS-3781  
Serial No. : 830167  
ID No. : BKK\_ML0037

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 : 17 July 2023  
Calibration Date : 17 July 2023  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Preecha Hlahib

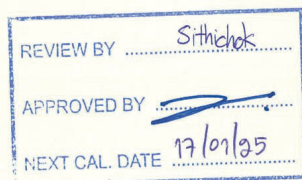
Approved by :

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

Issue Date : 24 July 2023

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.



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2307-0285OC-3  
Procedure Used :-

Cert. No.: 23TM1103  
Page : 2 of 3

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:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY57013823	23LM66	TPA	25 Mar 2024

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 )

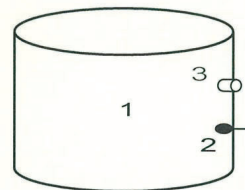
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

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.

Remark : TPA : Technology Promotion Association ( Thailand - Japan )

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source



	Environmental		
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	22	53	220
Finished of Calibration	22	54	220

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	22-17TC-01
2 =	Temperature sensor	23-17TC-02
3 =	Exhaust port	19-17TC-03

[Signature]



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2307-02850C-3  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 23TM1103  
Page : 3 of 3

Operating parameter Set : Temperature = 121 °C  
Sterilization period = 15 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	120.877	0.39	0.12	1.0	2
		2	120.870				
		3	120.866				

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 %.

-o0o-

*Signature*

a 1159504



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM1146  
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, Phatthakan Rd.,  
Khwawng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand  
Location : Incubation & Micrological Reading  
Received Order : 17 July 2023  
Calibration Date : 17 July 2023  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
Calibrated by : Man Pattanapongpaiboon

Approved by : *Malee*  
Approved Signatory  
( ) Pornthippa Tameyakul  
( / ) Malee Butkruea  
( ) Suwit Imjai

Issue Date : 24 July 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 0056489





Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2307-0285OC-1

Cert. No.: 23TM1146  
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	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY49001451	23LM27	TPA	25 Feb 2024

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

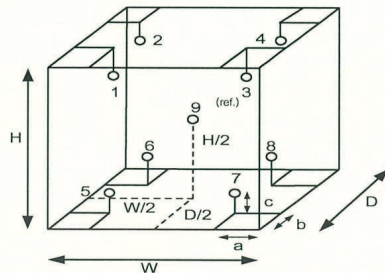
3. This certification is traceable to the International System of Unit.

**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Close



**Probe Installation Details :**

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

**Dimension of Chamber :**

D = 0.50 m  
W = 0.75 m  
H = 1.2 m  
Capacity = 0.45 m<sup>3</sup>

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	24	24
REL.Humid. ( % )	54	56
AC Supply ( Volt )	221	223

Position :	Ref. Std. ID No.:
1	19RTD-2/1
2	19RTD-2/2
3	19RTD-2/3
4	19RTD-2/4
5	19RTD-2/5
6	19RTD-2/6
7	19RTD-2/7
8	19RTD-2/8
9 (ref.)	19RTD-2/9

Malu.

a 1172189



Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2307-0285OC-1  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

Cert. No.: 23TM1146  
Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor k
35.0	35.0	35.0	0.055	0.30	0.44	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	34.888	34.933	34.815	34.813	35.064	35.019	35.156	35.141	35.087	0.30

**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 %.

-o0o-

Malu.

a 1172188



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.: 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 :   
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

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

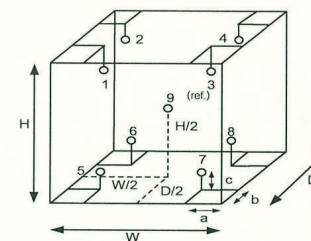
2. This certificate is valid only to the item calibrated on date and place of calibration.

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



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 m<sup>3</sup>

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

a 1138049





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 k
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 %.

-oOo-

*Malee*

a 1138053



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
 TEL. 0-2717-3000-29 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

Approved by : *Malee*  
 Approved Signatory

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

Issue Date : 24 April 2023

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 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:-

Instrument	Model	Serial No.	Cert. No.	Due Date
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.

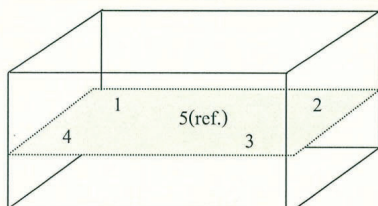
3. This certification is traceable to the International System of Unit.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Heat transfer medium used :** Water

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



Front

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

Maka



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

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

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

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 k
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 %.

-o0o-

Maka





**SARTORIUS**

# Certificate of Calibration

Model Number : MSE224S-100-DU Certificate No. : 23BCI0072  
Description : Analytical Balance Issued Date : Monday, February 13, 2023  
Serial Number : 26207042 Reference No. : 203245  
ID No. : BKK\_EN0002  
Manufacturer : Sartorius Page No. : 1 of 2

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

Calibrated Place : Balance Room

Calibrated By : Mr. Chonchai Inthana  
Calibration Date : Wednesday, February 08, 2023  
Calibration Procedure No. : This calibration was conducted by  
Using in-house calibration procedure number (WI-003)  
Based on UKAS LAB 14 : 2019

Metrological data :  
Capacity : 220 g Readability : 0.0001 g  
Reasons for calibration  
☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ Maintenance  
Ambients Conditions:  
Temperature : 23.2 °C ± 5.0 °C  
Humidity : 60.0 % RH ± 10.0 % RH  
Pressure :                      ±                       
Equipment Condition: ☒ Good Operate ☐ Fair

## Measurement Method UKAS Publication Ref :Lab 14

The measurement uncertainty stated is the expended 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 form list of Sartorius Metrological Specifications.

## Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2,YCS011-522-00	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.



**SARTORIUS**

# Certificate of Calibration

Model Number : MSE224S-100-DU Certificate No. : 23BCI0072  
Description : Analytical Balance Issued Date : Monday, February 13, 2023  
Serial Number : 26207042 Reference No. : 203245  
ID No. : BKK\_EN0002  
Manufacturer : Sartorius Page No. : 2 of 2

## Calibration Results : Without Adjustment

Repeatability			Eccentricity (Off-center loading error)	
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.			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 : (Low Load)	20.0000	200.0000	Nominal value :	50 g
20 g	20.0000	199.9999	Tolerance	0.0004 g
Tolerance	20.0000	200.0000		
0.0001 g	20.0000	199.9999		
	20.0001	200.0000		
	20.0000	200.0000		
Nominal Value : (High Load)	20.0000	199.9999		
200 g	20.0000	199.9999		
Tolerance	20.0000	200.0000		
0.0001 g	20.0000	199.9999		
	20.0001	199.9999		
	20.0000	199.9999		
Standard Deviation	0.00004	0.00005		

## 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	Conventional Mass Value	Displayed Value	Deviation	Uncertainty
(g)	(g)	(g)	(g)	(g)
0.01	0.0100	0.0100	0.0000	0.00014
0.1	0.1000	0.1000	0.0000	0.00014
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	199.9999	-0.0001	0.00030

End of Report.



# 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.com



Certificate No. T222502

Page 1 of 4

## Certificate of Calibration

Equipment : Chamber ( Oven )

Manufacturer : Memmert

Model : UF 450

Serial No. : B7170531

Customer Code : BKK\_EN0273

ID No. : T8042A4

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Oven Room

Date of Receipt : 23 November 2022

Calibrated By : Sujjar Naknakred ( Site Calibration Manager )

Approved By : Buonchai /Buonchai Suriyawong (Site Calibration Manager)

Date of Issue : 09 DEC 2022

REVIEW BY	<u>Sinluk P.</u>
APPROVED BY	<u>KL AL</u>
NEXT CAL. DATE	<u>29/05/24</u>

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.

FM-L14I18/31-08-64



# Metrological Center

SCI ECO Services Company Limited

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



Certificate No. T222502

Page 2 of 4

## Calibration Report

Equipment : Chamber ( Oven )

Date of Calibration : 29 November 2022

Environment : Temperature : 29.1-29.6 °C

Line Voltage : 221.3-223.2 V

Relative Humidity : 55 - 65 %RH

### Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors and nine standard thermocouples type T into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001) and AS2853-1986 ). 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	27-(CH1-10)	T210004	30 December 2022
TC	TYPE T	TN261-TN270	T210010	30 December 2022
DATA LOGGER	34970A	T149	T210004	30 December 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 49 Minute At 104 °C

Fresh Air Damper ☒ Open ☐ Min ☐ Medium ☒ Max

☐ Close

☐ Not Available

### 5. Adjustment :

( ) without adjustment

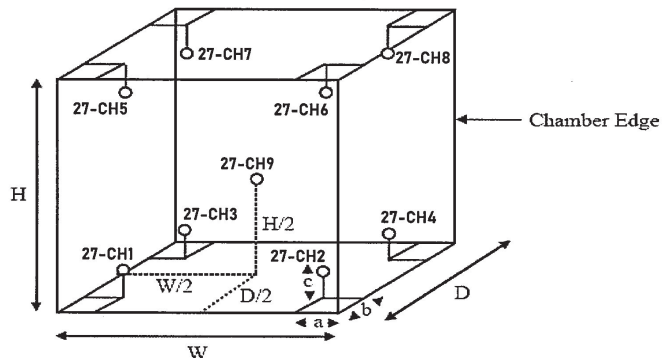
( X ) after adjustment

Approved By: Buonchai

FM-L15 I17/15-05-63



## Calibration Report



### Remark :

Internal Dimensions of Chamber : W (Width) = 104 cm. , H (Height) = 72 cm. and D (Depth) = 60 cm.  
Size of Installed Standard sensor number 27-CH1 to number 27-CH8 : a = 5 cm. ,b = 5 cm. and c = 5 cm.  
Size of Installed Standard sensor number 27-CH9 : W/2 = 104 cm./2 , H/2 = 72 cm./2 and D/2 = 60cm./2

### Measurement Results

Calibration Point	Average Standard Reading at each position (°C)								
	27-CH1	27-CH2	27-CH3	27-CH4	27-CH5	27-CH6	27-CH7	27-CH8	27-CH9
104	104.07	103.60	103.45	104.02	104.47	103.57	104.59	103.78	104.18

Chamber ( Oven )			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min , Max	Average					
104.0	-	104.0	103.97	0.07	0.70	0.42	2.00

\* The quoted uncertainty exclude "uniformity"

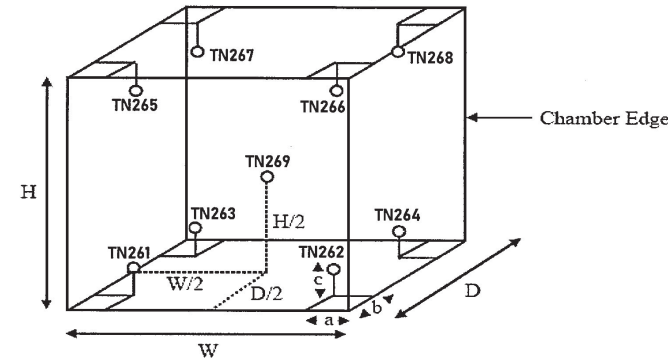
The calibration result apply only the above calibrated item.

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. \_\_\_\_\_

## Calibration Report



### Remark :

Internal Dimensions of Chamber : W (Width) = 104 cm. , H (Height) = 72 cm. and D (Depth) = 60 cm.  
Size of Installed Standard sensor number TN261 to number TN268 : a = 5 cm. ,b = 5 cm. and c = 5 cm.  
Size of Installed Standard sensor number TN269 : W/2 = 104 cm./2 , H/2 = 72 cm./2 and D/2 = 60cm./2

### Measurement Results

Calibration Point	Average Standard Reading at each position (°C)								
	TN261	TN262	TN263	TN264	TN265	TN266	TN267	TN268	TN269
180	179.14	179.17	179.65	179.26	180.41	179.64	181.18	180.99	180.36

Chamber ( Oven )			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min , Max	Average					
180.0	-	180.0	179.98	0.38	1.78	1.10	2.00

\* 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. \_\_\_\_\_



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23CH553  
Page.: 1 of 2

## Certificate of Calibration

Equipment : Conductivity Meter  
Manufacturer : Mettler Toledo  
Model : SevenCompact S230  
Serial No. : B608134488  
ID No. : SGK\_CL0032  
Condition As-Received: Used Item  
Received Date : 28 April 2023  
Calibration Date : 03 May 2023  
Reference : 2304-0804DSC-2  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. Songkhla Branch.  
114/1 Moo 8, Kanjanavanij Rd., Banphru,  
Hatyai, 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)

Calibrated by : Warakorn Lerngagtrakul

Approved by :

*Malee*

Approved Signatory

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

Issue Date : 16 May 2023

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.



Cert.No.: 23CH553

Page.: 2 of 2

### Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	1963878	130RC095	2211140	12 Sep 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

Conductivity Solution	Manufacturer	Lot No.	Exp. date
84.000 $\mu$ S/cm	CPA Chem	823326	20 June 2023
1413.0 $\mu$ S/cm	CPA Chem	826595	09 July 2023

- Control Conductivity calibration solution temperature by Water bath (25 $\pm$ 0.1) °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  $\mu$ 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
84.000 $\mu$ S/cm	91.0 $\mu$ S/cm	88.4 $\mu$ S/cm	0.62 $\mu$ S/cm	2.00
1413.0 $\mu$ S/cm	1490 $\mu$ S/cm	1414 $\mu$ S/cm	9.2 $\mu$ S/cm	2.00

### Remark

- UUC\* = Unit Under Calibration

- Adjustment Cell constant = 0.101842 cm<sup>-1</sup>

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 %.

-o0o-

A 0054235

a 1161556



REVIEW BY Autcharawan S.  
 APPROVED BY Sarat M.  
 NEXT CAL. DATE 12 Jan 24

## Certificate of Calibration

ICS-2100: Anion (ID#659)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co., Ltd.

ICS-2100 S/N: 15010977

AS-HV S/N: 5450A36659

For

ALS Laboratory Group (Thailand) Co., Ltd.



Operator Signature: Nutdanai

Date: Jan 12, 2023

(Mr. Nutdanai Laekhwan)

Application Chemist



CENTRAL LABORATORY (THAILAND) CO., LTD.

## CERTIFICATE of CALIBRATION

Certificate No.: 23-TMP-0553

Pages 1 of 2

REVIEW BY Nongkorn P.  
 APPROVED BY Nongkorn P.  
 NEXT CAL. DATE 03/02/24

Equipment : Infrared Thermometer  
 Model : 62 MAX+  
 Serial No : 48556914MV  
 ID No : PHK\_FS0006  
 Manufacturer : FLUKE  
 Customer name : ALS Laboratory Group (Thailand) Co., Ltd.  
 Customer address : 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250, Thailand

Received No : CAHO23/00223-001

Received Date : 27 Jan 23

Calibration Date : 3 Feb 23

Location : In Lab Calibration

### Condition of calibration results :

1. This calibration method was calibrated by comparison unit under test into stabilize calibration bath and comparison with Standard platinum resistance probe
2. This certificate is traceable to The International system of Units maintained at  
- The National Institute of Metrology (Thailand) NIMT.
3. This Temperature Scale is based on ITS-90
4. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of approximately 95% the uncertainty evaluation has been carried out in accordance with UKAS M3003 requirements.
5. This calibration certificate may not be reproduced other than in full except with the permission of CLT Calibration Laboratory
6. This result of calibration was found accurate as shown on date and place of calibration only.

### Environment Condition :

Room Temperature : 24 to 26 °C  
 Room Humidity : 50 to 58 %RH

Condition of Calibration : Good

Description : Calibration Result without Adjustment

### Reference Standard Instrument :

Instrument	Standard ID	Reference No.	Due Date	Traceability
Standard Readout Based Unit	SRO-35-CC	-	-	-
Standard Readout PRT module	SRO-22-CC	22-TMP-0888	28 Mar 23	CLT(22-TMP-0888)
IPRT Probe	IPT-19-CC	22-TMP-0889	28 Mar 23	CLT(22-TMP-0889)

Calibrated by : Visan

Issued date : 6 Feb 23

Approved by :

Dachdamrong Songchom

Dachdamrong Songchom

Central Laboratory (Thailand) Co., Ltd.

Head Office & Bangkok Branch : 50 Phaholyothin Road, Ladyao, Jatujak, Bangkok 10900 Thailand

Tel : (662) 940 6881-3, (662) 940 5993 Ext. 214, 217, 262, 263 Fax : (662) 579 4877

http : //www.centralabthai.com E-mail : clt.calibration@gmail.com



CENTRAL LABORATORY (THAILAND) CO., LTD.

# REPORT of CALIBRATION

CERTIFICATE CALIBRATION

Certificate No.:23-TMP-0553

Pages 2 of 2

Results of Calibration :

Without Adjustment

Resolution : 0.1 °C

Emissivity : 0.95

Distance : 150 mm.

Calibration Point (°C)	Average of Standard Reading (°C)	UUC Reading (°C)	Correction Value (°C)	Uncertainty (± °C)
-20.00	-20.0063	-20.8	0.7937	0.36
3.00	2.9998	2.8	0.1998	0.36
6.00	6.0006	5.8	0.2006	0.36

\* Remark : UUC is Unit under calibration.

The Certification Values with marked are not covered by TLAS Accreditation

~ End of Report ~

Approved by :

Dachdamrong Songchom



## Internal Calibration

Equipment : Turbidity Meter

Manufacture : HACH

ID No. : SGK\_FS0045

Model : 2100Q/QIS

Calibrate Date : May22,2023

Serial No. : 19010C073443

REVIEW BY	Somsak J.
APPROVED BY	Kanitta H.
NEXT CAL. DATE	22/5/24

Calibration Point	1st (NTU)	2nd (NTU)	3rd (NTU)	AVG (NTU)	Specifications	Evaluate
Standard 20 NTU	20.1	20.0	20.0	20.0	19 to 21 NTU	Pass
Standard 100 NTU	101.0	101.0	101.0	101.0	95 to 105 NTU	Pass
Standard 800 NTU	799.0	800.0	800.1	799.7	760 to 840 NTU	Pass

Calibrated by

Somsak J.

( Scientist 2 )

Approved by :

Kanitta H.

( Section head )

CENTRAL LAB THAI  
GATEWAY TO GLOBAL QUALITY



pc 17/02/23

HACH COMPANY



An ISO 9001 Certified Company

P.O.Box 389  
Loveland, CO 80539  
(970) 669-3050

**Certificate of Analysis**

This is a Component of 2659405-TH lot A2307

Page 1

COMMODITY: STABLCAL|sup|TS|sup0 FORMAZIN STANDARD 20 NTU  
COMMODITY NUMBER: 2684801 MANUFACTURE DATE: DATE OF ANALYSIS:  
LOT NUMBER: A2304 11/14/2022 11/18/2022

TEST	SPECIFICATIONS	RESULTS
Turbidity	19 to 21 NTU	20.3 NTU

The expiration date is Feb 2024

Formazin and StablCal® solutions provided by Hach are not NIST traceable because the NIST 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*

Scott Als  
Analytical Services Chemist

pc 17/02/23

HACH COMPANY



An ISO 9001 Certified Company

P.O.Box 389  
Loveland, CO 80539  
(970) 669-3050

**Certificate of Analysis**

This is a Component of 2659405-TH lot A2307

Page 1

COMMODITY: STABLCAL|sup|TS|sup0 FORMAZIN STANDARD 100 NTU  
COMMODITY NUMBER: 2684901 MANUFACTURE DATE: DATE OF ANALYSIS:  
LOT NUMBER: A2299 11/10/2022 11/17/2022

TEST	SPECIFICATIONS	RESULTS
Turbidity	95 to 105 NTU	102.0 NTU

The expiration date is Feb 2024

Formazin and StablCal® solutions provided by Hach are not NIST traceable because the NIST 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*

Scott Als  
Analytical Services Chemist

PC 17/02/2

HACH COMPANY



An ISO 9001 Certified Company

P.O.Box 389  
Loveland, CO 80539  
(970) 669-3050

### Certificate of Analysis

This is a Component of 2659405-TH lot A2307

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COMMODITY: STABLCAL|sup|TS|sup0 FORMAZIN STANDARD 800 NTU  
COMMODITY NUMBER: 2660501 MANUFACTURE DATE: 11/29/2022 DATE OF ANALYSIS: 12/5/2022  
LOT NUMBER: A2318

TEST	SPECIFICATIONS	RESULTS
Turbidity	760 to 840 NTU	817.0 NTU

The expiration date is Feb 2024

Formazin and StablCal® solutions provided by Hach are not NIST traceable because the NIST 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*

Scott Als  
Analytical Services Chemist



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.: 22CH1222

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### Certificate of Calibration

Equipment : pH Meter  
Manufacturer : Mettler Toledo  
Model : Seven Compact S220  
Serial No. : B520948426  
ID No. : BKK\_EN0072  
Condition As-Received: Used Item  
Received Date : 09 September 2022  
Calibration Date : 12 September 2022  
Reference : 2209-0312DSC-1  
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)

REVIEW BY	<i>Griluk P.</i>
APPROVED BY	<i>KL AL</i>
NEXT CAL. DATE	<i>12/03/24</i>

Calibrated by : Warakorn Lernagatrakul

Approved by :

*Malee*

Approved Signatory

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

Issue Date : 15 September 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.



Cert. No.: 22CH1222

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**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	22E2769	24 Aug 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 : 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	823320	20 June 2024
pH 6.985	CPA chem	794122	14 Feb 2023
pH 10.008	CPA chem	823323	20 June 2023

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.: B520948426	4.000	177.48	177.4	4.000	0.058	2.00
	7.000	0.00	0.0	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

**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 ( ± )	Coverage factor k
pH Electrode S/N.:PCE-86-EX1001	4.008	3.999	153.9	0.0055	2.09
	6.985	7.017	-13.7	0.0084	2.00
	10.008	9.996	-179.0	0.0078	2.06

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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