

ภาคผนวก ฉ

ใบรับรองการสอบเทียบเครื่องมือ



right solutions.
right partner.

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	pH at 25 °C	pH meter	BKK_EN0342	17-Oct-24	17-Oct-25	12
Water Lab	Oil & Grease	Electronic Top-Loading Balance	BKK_EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Oil & Grease	Water Bath	BKK_EN0439	29-Oct-24	29-Oct-25	12
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BKK_EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Total Suspended Solids	Oven	BKK_EN0273	14-May-24	14-Nov-25	18
Water Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	BKK_EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Total Dissolved Solids 180°C	Oven	BKK_EN0273	14-May-24	14-Nov-25	18
Water Lab	BOD	DO Meter	BKK_EN0017	20-May-25	20-Nov-26	18
Water Lab	BOD	Incubator	BKK_EN0304	4-Mar-25	4-Mar-26	12
Water Lab	BOD	Burette	BKK_EN0171	27-Feb-24	27-Aug-25	18
Water Lab	COD	Hot Block	BKK_EN0370	2-Jan-25	2-Jan-26	12
Water Lab	COD	Spectrophotometer	BKK_EN0018	13-Sep-24	13-Sep-25	12
Water Lab	Lead	ICP-MS	BKK_EL0043	4-Oct-24	3-Apr-26	18
Water Lab	Lead	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Lead	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18



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



Certificate of Calibration

Cert.No.: 24CH1295

Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Hach
Model : HQ411d
Serial No. : 200100031163
ID No. : BKK_EN0342
Condition As-Received: Used Item
Received Date : 16 October 2024
Calibration Date : 17 October 2024
Reference : 2410-0548DSC-5
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
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lernagatrakul

Approved by :

Approved Signatory

() Unnopphol Harachai
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 21 October 2024

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.: 24CH1295

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1)Ref. Standard Thermometer	2188080	130RC044	2411022	16 Sep 2025

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :The measurement results are traceable to SI through Hach Lenge GmbH Ltd.
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00
: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	1034203	27 Sep 2026
pH 6.999	Hach Lenge GmbH	C03145	28 Feb 2026
pH 10.010	CPA chem	1034205	27 Sep 2025

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

Calibration Results

Function : pH Measurement

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

<u>Unit Under Calibration</u>	<u>Standard pH Buffer Solution</u>	<u>Actual pH Reading</u>	<u>Actual mV Reading (mV)</u>	<u>Uncertainty of pH Measurement (±)</u>	<u>Coverage factor k</u>
pH Electrode S/N.: 230473042902	4.008	4.028	174.6	0.0044	2.00
	6.999	7.014	1.4	0.0084	2.05
	10.010	10.018	-172.8	0.0066	2.00

Remark - Can not connect the BNC because the plug does not match with the socket.



Cert.No.: 24CH1295

Page.: 3 of 3

Calibration Results

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : PHC281

- Serial No. : 230473042902

Dimension of probe

- Length : 103 mm.

- Diameter : 12 mm.

- Immersion Depth : 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor <i>k</i>
25.0	25.002	25.0	-0.002	0.13	2.00

Remark : UUC* = Unit Under Calibration

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

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Sartorius (Thailand) Co., Ltd.

129 Rama 9 Road, Huaykwang, Bangkok 10310

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



NSC-TISI-TIS 17025

CALIBRATION 0426

SARTORIUS

REVIEW BY

APPROVED BY

NEXT CAL DATE.....02/08/25

Certificate

of Calibration

Model Number : MSE224S-100-DU

Description : Analytical Balance

Serial Number : 0027405555

ID No. : BKK_EN0003

Manufacturer : Sartorius

Certificate No. : 24BCI0270

Issued Date : Monday, August 05, 2024

Reference No. : 240942

Page No. : 1 of 2

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

104 Phatthanakan 40,Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250.

Calibrated Place : Lab Room

Calibrated By : Mr.Chonchai Inthana

Calibration Date : Friday, August 02, 2024

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

Ambients Conditions:

Temperature : 23.0 °C ± 5.0 °C

Humidity : 55.0 % RH ± 10.0 % RH

Pressure : ±

Reasons for calibration

☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ MaintenanceEquipment Condition: ☒ Good Operate ☐ Fair**Measurement Method****UKAS Publication Ref :Lab 14**

The measurement uncertainty stated is the 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	TCS	M23081975	23-Aug-2025
Testo 174 H	Thermo-Hygrometer , Testo 174H	ENTECH	H/T 661303,H661140	12-Nov-2024

This certificate relate and apply this equipment only.

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

Mr.chonchai Intrhaha(Technical Manager)

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T
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M
P

Sartorius (Thailand) Co., Ltd.

129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310

Tel: +66 2643 8361-6 Fax: +66 2643-8367, e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate of Calibration

Model Number : MSE224S-100-DU

Description : Analytical Balance

Serial Number : 0027405555

ID No. : BKK_EN0003

Manufacturer : Sartorius

Certificate No. : 24BCI0270

Issued Date : Monday, August 05, 2024

Reference No. : 240942

Page No. : 2 of 2

Calibration Results : Without Adjustment

Repeatability

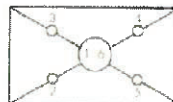
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.

Nominal Value : (Low Load)	20.0000	200.0000
20 g	20.0000	199.9999
Tolerance	20.0001	200.0000
0.0001 g	20.0000	200.0000
	20.0000	200.0000
Nominal Value : (High Load)	20.0000	200.0000
200 g	20.0001	200.0001
Tolerance	20.0000	200.0000
0.0001 g	20.0000	199.9999
	20.0000	200.0000
Standard Deviation	0.00004	0.00006

Eccentricity (Off-center loading error)

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

Nominal value : 100 g
Tolerance 0.0004 g



Difference

1	-
2	0.0000
3	0.0000
4	0.0000
5	0.0001
6	-

Linearity

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

Tolerance 0.0002 g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00015
0.1	0.1000	0.1000	0.0000	0.00015
1	1.0000	1.0000	0.0000	0.00015
2	2.0000	2.0000	0.0000	0.00015
5	5.0000	5.0000	0.0000	0.00015
10	10.0000	10.0000	0.0000	0.00015
20	20.0000	20.0000	0.0000	0.00015
50	50.0000	50.0001	0.0001	0.00016
100	100.0000	100.0001	0.0001	0.00019
200	200.0000	200.0000	0.0000	0.00029

End of Report.



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Certificate of Calibration

Cert. No.: 24TM1618

Page : 1 of 3

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE29
Serial No. : L622.0282
ID No. : BKK_EN0439

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

Location : Organic Preparation Lab

Received Order : 29 October 2024
Calibration Date : 29 October 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

Approved Signatory

() Ponpan Paipim
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 30 October 2024

REVIEW BY

APPROVED BY

NEXT CAL DATE..... 29/10/25

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 : Water Bath
Condition As-Received : Used Item
Reference : 2410-0782OC-4

Cert. No.: 24TM1618

Page : 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Data Acquisition	MY57013711	24LM115	TPA	13 Jul 2025

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.

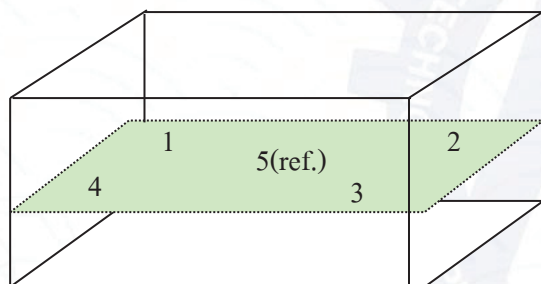
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	<u>Environmental</u>		<u>AC Voltage Supply</u>
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	25	54	222
Finished of Calibration	25	57	226



Front

<u>Position :</u>	<u>Ref. Std. ID No.:</u>
1	4803988-001
2	4803988-002
3	4803988-003
4	4803988-004
5(ref.)	4803988-005



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2410-0782OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 24TM1618
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			Position					
			1	2	3	4	5 (ref.)	
85.0	85.0	85.0	85.133	85.212	85.150	84.983	85.096	0.22

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor <i>k</i>
85.0	0.21	0.13	2

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

Uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

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

UUC* : Unit Under Calibration

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

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

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Certificate No. T240904

Page 1 of 3

Certificate of Calibration**Equipment** : Chamber (Oven)**Manufacturer** : Memmert**Model** : UF 450**Serial No.** : B717.0531**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 : Laboratory (Oven Room)**Date of Receipt** : 08 May 2024**Calibrated By** : Preecha Phisassutthikul (Temperature Calibration Manager)**Approved By** :  / Nuafun Sungchum (Metrology Manager)**Date of Issue** : 23 MAY 2024

REVIEW BY
APPROVED BY
NEXT CAL. DATE	14/11/25

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 Metrology.

Certificate No. T240904

Page 2 of 3

Calibration Report

Equipment : Chamber (Oven)
Date of Calibration : 14 May 2024
Environment : Temperature : 26.5-28.1 °C
Line Voltage : 226.7-229.8 V
Relative Humidity : 51 - 57 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors 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	21-(CH1-10)	T231955	17 November 2024
DATA LOGGER	34970A	T121	T231955	17 November 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 30 Minute At 104 °C

Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

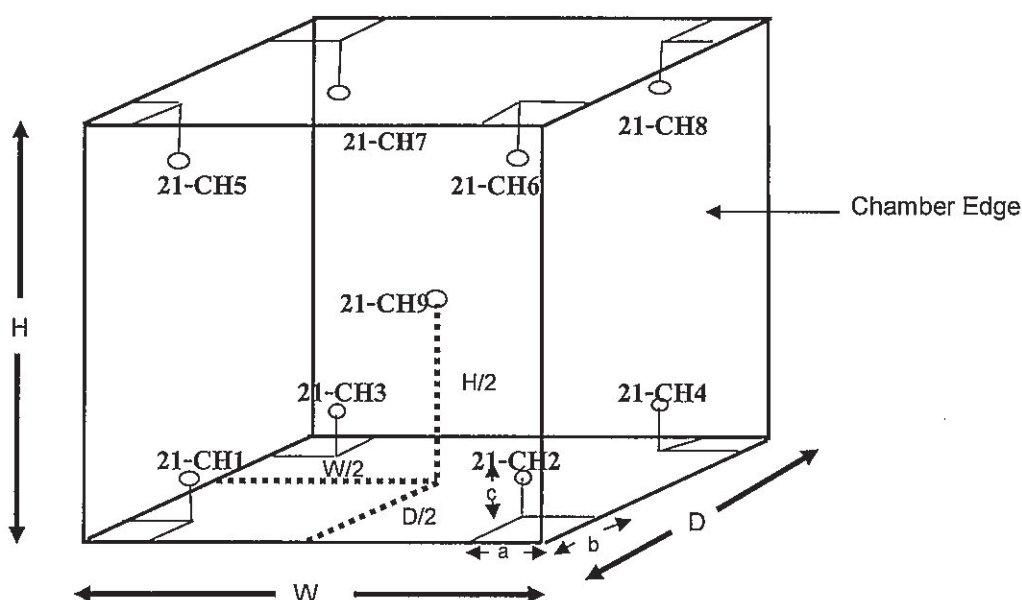
5. Adjustment :

(X) without adjustment

'() after adjustment

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 21-CH1 to number 21-CH8 : a = 5 cm. , b = 5 cm. and c = 5 cm.
 Size of Installed Standard sensor number 21-CH9 : W/2=104 cm./2 , H/2=72 cm./2 and D/2=60 cm./2

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)								
	21-CH1	21-CH2	21-CH3	21-CH4	21-CH5	21-CH6	21-CH7	21-CH8	21-CH9
104	103.4	105.0	103.7	103.6	103.3	104.6	103.3	104.0	103.9
180	179.5	181.1	179.2	179.5	179.0	181.3	179.8	179.9	180.2

Chamber (Oven)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
	Min , Max	Average					
104.0	103.9 , 104	104.0	103.85	0.14	1.27	0.44	2.00
180.0	179.9 , 180.1	180.0	179.94	0.39	2.29	0.76	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 % .

End of Certificate

Approved By. _____





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250



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

Cert.No.: 23TW243

Page.: 1 of 2

Certificate of Testing

Equipment :	DO Meter
Manufacturer :	YSI
Model :	5000-230V
Serial No. :	09J101147
ID No. :	BKK_EN0017
Received Date :	15 November 2023
Test Date :	16 November 2023
Reference :	2311-0505DSC-4
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 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 :	 Approved Signatory
(✓) Saithip Meangmai () Warakorn Lerngagtrakul () Ponpan Paipim	
Issue Date :	17 November 2023

REVIEW BY ...	
APPROVED BY ...	
NEXT CAL. DATE	16/05/25



Cert.No.: 23TW243

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

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

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Burette	-	130BU10	23CG1172	22 Mar 2025
2) Balance	1124013382	140RC006	23MM18	20 Feb 2024

2. Standard Material :-

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

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 16K100498

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.18	8.18	0.0055

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

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Cert. No.: 23LM192

Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor

Manufacturer : YSI

Model : 5000-230V

Serial No. : 09J101147

ID No. : BKK_EN0017

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

Location : TPA Chemistry Calibration Laboratory

Received Order : 15 November 2023


Calibrated Date : 16 November 2023

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Kunchit Promprat

Approved by : 
Approved Signatory

() Pornthippa Tameyakul
() Ponpan Paipim
(✓) Suwit Imjai

Issue Date : 17 November 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 0060730



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2311-0505DSC-10

Cert. No.: 23LM192

Page.: 2 of 2

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Digital Thermometer	3240076	231305	TPA	15 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.

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

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 16K100498

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (± °C)	<u>Coverage Factor</u> <i>k</i>
20.0	60	19.997	19.93	-0.067	0.15	2.00

UUC* : Unit Under Calibration

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

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Certificate of Testing

Cert.No.: 25TW101

Page.: 1 of 2

Equipment :

DO Meter

Manufacturer :

YSI

Model :

5000-230V

Serial No. :

09J101147

ID No. :

BKK_EN0017

Received Date :

19 May 2025

Test Date :

20 May 2025

Reference :

2505-0593DSC-1

Submitted by :

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

Approved Signatory

() Chakrit Waewwanjua

() Ponpan Paipim

(✓) Saithip Meangmai

Issue Date :

20 May 2025

REVIEW BY

APPROVED BY

NEXT CAL DATE.....20/11/26



Cert.No.: 25TW101

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

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

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1. Burette	-	130BU10	25CG1126	18 Mar 2027
2. Balance	14233821	110RC001	24MM131	04 July 2025

2. Standard Material :-

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 16K100498

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.21	0.0090

This report was certified only for the instrument we tested. It is allowable to use for study
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-



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



Certificate of Calibration

Cert. No.: 25LM83

Page.: 1 of 2

Equipment : DO Meter with Sensor

Manufacturer : YSI

Model : 5000-230V

Serial No. : 09J101147

ID No. : BKK_EN0017

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

Location : TPA On Site Calibration Laboratory

Received Order : 19 May 2025

Calibrated Date : 20 May 2025

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Warakorn Lerngatrakul

Approved by :

Approved Signatory

- () Chakrit Waewwanjua
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date :

26 May 2025

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 : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2505-0593DSC-2

Cert. No.: 25LM83
Page.: 2 of 2

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Digital Thermometer	2188080	2411022	TPA	17 Sep 2025

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 : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 16K100498

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (± °C)	<u>Coverage Factor</u> <i>k</i>
20.00	60	20.003	19.92	-0.083	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-



Metrology

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. T250356

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Incubator)

Manufacturer : Memmert

Model : ICP 750

Serial No. : F819.0021

Customer Code : BKK_EN0304

ID No. : T9572A4

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

104 Phatthanakan 40, Phatthanakan Rd.,

Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250

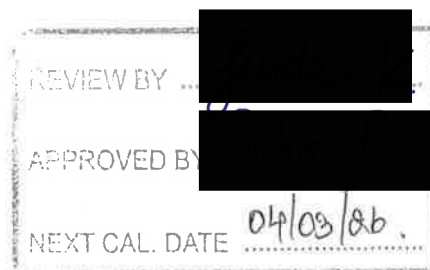
Customer Location : Wet Chemistry Lab 2

Date of Receipt : 26 February 2025

Calibrated By : Atiphong Rongrat (Technician)

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

Date of Issue : 17 MAR 2025



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 Metrology.

Certificate No. T250356

Page 2 of 4

Calibration Report

Equipment : Chamber (Incubator)
Date of Calibration : 4 March 2025
Environment : Temperature : 24.5-24.7 °C
Line Voltage : 221.4-224.7 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 12 resistance thermometer detectors 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 2019) 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	31-(CH1-10)	T240399	16 March 2025
RTD	100 ohm	32-(CH1-10)	T240399	16 March 2025
DATA LOGGER	34970A	T193	T240399	16 March 2025

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 2 Hour 10 Minute At 20 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment

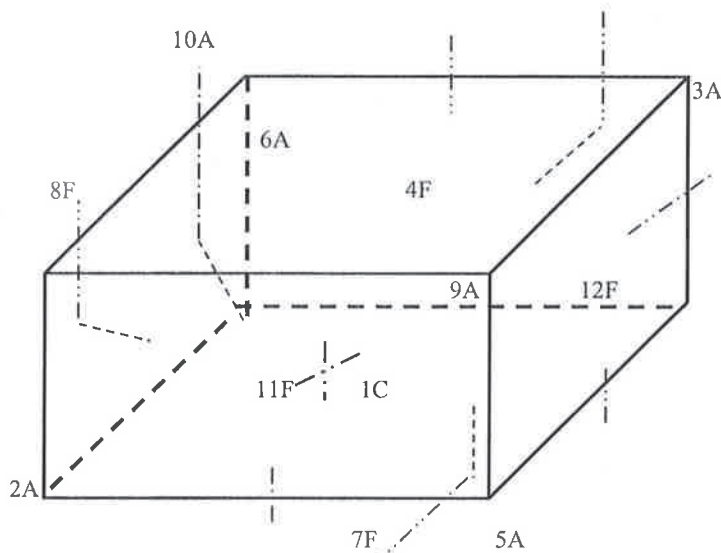
() after adjustment

Approved By. 

Certificate No. T250356

Page 3 of 4

Calibration Report



C = Centre , F = Centre of Face , A = Corner , E = Centre of Edge

1C	=	31-CH1
2A	=	31-CH2
3A	=	31-CH3
4F	=	31-CH4
5A	=	31-CH5
6A	=	31-CH6
7F	=	31-CH7
8F	=	31-CH8
9A	=	31-CH9
10A	=	31-CH10
11F	=	32-CH1
12F	=	32-CH2

Approved By. _____

Certificate No. T250356

Page 4 of 4

Calibration Report

Measurement Results :

Calibration Point	Average Standard Reading at each position (°C)											
	31-CH1	31-CH2	31-CH3	31-CH4	31-CH5	31-CH6	31-CH7	31-CH8	31-CH9	31-CH10	32-CH1	32-CH2
20	20.02	20.42	19.96	20.23	19.83	19.44	19.71	20.01	20.06	20.04	20.13	19.98

Chamber (Incubator)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
	Min , Max	Average					
20.0	-	20.0	19.99	0.10	0.43	0.38	2.02

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 % .

End of Certificate

Approved By. _____





Certificate of Calibration

Cert.No.: 24CG952

Page.: 1 of 2

Equipment : Burette
Capacity : 50 mL
Serial No. : -
ID. No. : BKK_EN0171
Manufacturer : Witeg
Made in : Germany
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Ambient Temperature : (20 ± 2.5) °C
Relative Humidity : (50 ± 10) %
Barometric Pressure : 760 mmHg
Calibration Procedure : ASTM E 542 - 01

Calibrated by : Natcha Chayingcheiw

Approved by :

Approved Signatory

- () Unnopphol Harachai
(✓) Srisuda Khamtha
() Sa-ngeunkam Wongsas

Issue Date :

27 February 2024

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 : Burette
Received Date : 23 February 2024
Condition As-Received : New Item
Calibration Date : 27 February 2024
Reference : 2402-0757DSC-1

Cert.No.: 24CG952
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID. No.</u>	<u>Certificate No.</u>	<u>Traceability</u>	<u>Due date</u>
1) Balance	XP205DR	1126143764	140RC004	23MM538	TPA	15 Sep 2024
2) Thermo-Hygrograph	THDX-CE	00016540	140EC001	23H1275	TPA	09 June 2024
3) Thermometer	-	0834181	140EC005	23I948	TPA	10 Aug 2024

This certification is traceable to SI Unit

2. The certificate is valid only to the item calibrated on date and place of calibration.
3. True value is converted to true volume at the standard temperature of 20 °C

Calibration result :

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
50	50.0032	0.010	2.00

Remark mL = cm³

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-

Certificate No. T242116**Page 1 of 4****Certificate of Calibration**

Equipment : Hot Block

Manufacturer : Environmental Express

Model : B3000-240

Serial No. : 2021CODW148

Customer Code : BKK_EN0370


ID No. : T2940A5

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


Customer Location : Wet Chemistry Lab 2

Date of Receipt : 25 December 2024

Calibrated By : Atiphong Rongrat (Technician)

Approved By :  / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 27 JAN 2025

REVIEW BY	
APPROVED BY	
NEXT CAL. DATE	02/01/26

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. T242116

Page 2 of 4

Calibration Report

Equipment : Hot Block
Date of Calibration : 2 January 2025
Environment : Temperature : 20.1-23.4 °C
Line Voltage : 222.1-227.3 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 29 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20.

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
TC	TYPE T	TN241-TN250	T240401	16 March 2025
TC	TYPE T	TN251-TN260	T240401	16 March 2025
TC	TYPE T	TN221-TN230	T240712	19 April 2025
TC	TYPE T	TN231-TN240	T240712	19 April 2025
DATA LOGGER	34970A	T193	T240401	16 March 2025

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 2 Hour 30 Minute At 150 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

() without adjustment

(X) after adjustment

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

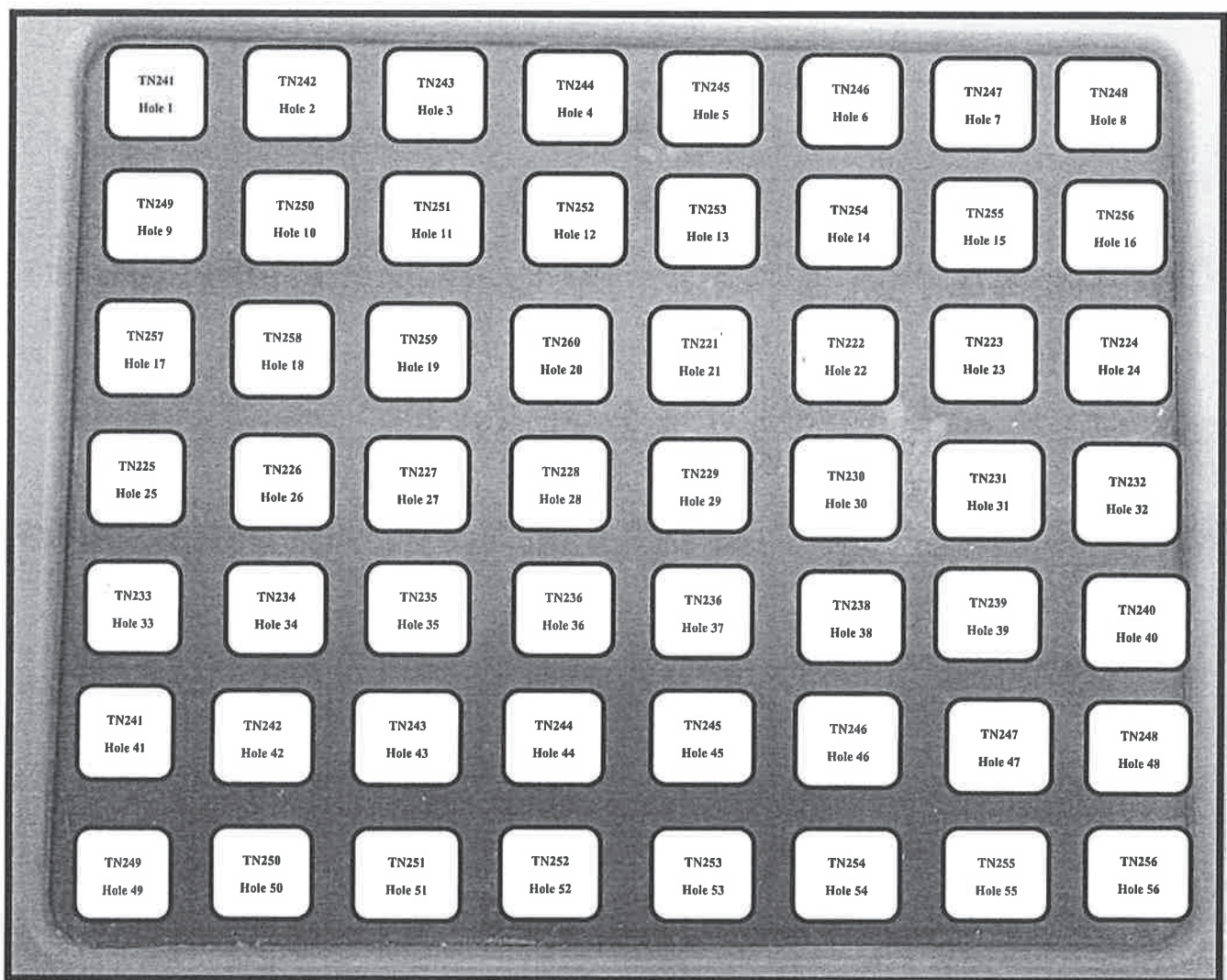
Website : www.scieco.co.th

E-Mail : calibrate@scg.co.th

Certificate No. T242116

Pa 3 of 4

Calibration Report



FRONT CONTROL

Approved By. 

Calibration Report

Measurement Results

		Average Standard Reading at each position (°C)									
		TN241 Hole 1	TN242 Hole 2	TN243 Hole 3	TN244 Hole 4	TN245 Hole 5	TN246 Hole 6	TN247 Hole 7	TN248 Hole 8	TN249 Hole 9	TN250 Hole 10
CAL POINT	Max	149.78	150.72	150.64	150.94	150.79	151.11	149.77	150.20	150.18	150.28
	Min	149.57	150.52	150.47	150.79	150.65	150.99	149.59	150.06	150.03	150.15
	Average	150.15	150.71	150.71	150.58	150.40	150.52	150.76	150.57	150.49	150.21
		TN251 Hole 11	TN252 Hole 12	TN253 Hole 13	TN254 Hole 14	TN255 Hole 15	TN256 Hole 16	TN257 Hole 17	TN258 Hole 18	TN259 Hole 19	TN260 Hole 20
150	Max	150.32	150.22	150.60	150.51	150.87	150.45	150.37	149.49	150.18	150.33
	Min	150.19	150.04	150.46	150.40	150.74	150.30	150.26	149.33	150.03	150.18
	Average	150.25	150.13	150.53	150.46	150.80	150.37	150.31	149.41	150.11	150.26
		TN221 Hole 21	TN222 Hole 22	TN223 Hole 23	TN224 Hole 24	TN225 Hole 25	TN226 Hole 26	TN227 Hole 27	TN228 Hole 28	TN229 Hole 29	TN230 Hole 30
	Max	150.49	150.86	149.10	149.64	149.11	149.69	149.75	149.82	150.16	150.34
	Min	150.24	150.63	148.90	149.43	148.94	149.54	149.61	149.69	150.07	150.24
	Average	150.36	150.74	149.00	149.53	149.03	149.62	149.68	149.76	150.11	150.29
		TN231 Hole 31	TN232 Hole 32	TN233 Hole 33	TN234 Hole 34	TN235 Hole 35	TN236 Hole 36	TN236 Hole 37	TN238 Hole 38	TN239 Hole 39	TN240 Hole 40
	Max	149.03	149.54	149.50	149.49	150.85	150.73	150.02	149.84	150.12	150.09
	Min	148.93	149.43	149.36	150.72	150.72	150.62	149.94	149.78	150.01	149.98
	Average	148.98	149.49	149.43	150.10	150.78	150.67	149.98	149.81	150.06	150.03
		TN241 Hole 41	TN242 Hole 42	TN243 Hole 43	TN244 Hole 44	TN245 Hole 45	TN246 Hole 46	TN247 Hole 47	TN248 Hole 48	TN249 Hole 49	TN250 Hole 50
	Max	150.86	150.14	150.35	150.97	151.03	151.09	149.81	150.16	149.49	149.51
	Min	150.80	150.00	150.19	150.81	150.85	150.96	149.69	150.02	149.35	149.35
	Average	150.83	150.07	150.27	150.89	150.94	151.02	149.75	150.09	149.42	149.43
		TN251 Hole 51	TN252 Hole 52	TN253 Hole 53	TN254 Hole 54	TN255 Hole 55	TN256 Hole 56				
	Max	149.71	150.32	150.59	149.42	149.87	149.40				
	Min	149.56	150.17	150.49	149.31	149.74	149.29				
	Average	149.64	150.25	150.54	149.37	149.81	149.35				

Hot Block			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (± °C)	Uncertainty (± °C)
	Min , Max	Average		
148.0	147.9 , 148.1	148.0	0.13	0.84

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. [Signature]

Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-374/24
Equipment UV/Vis Spectrophotometer
Model UV-1800
Manufacturer Shimadzu
Serial No. A11454908533 CD
ID No. BKK_EN0018
Date of receipt 13 September 2024
Date of calibration 13 September 2024
Date of issue 13 SEP 2024

REVIEW BY	[Redacted]
APPROVED BY	[Redacted]
NEXT CAL DATE	13/09/2025

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

Address 104 Soi Phattanakan 40, Phattanakan Road, Phattanakan, Suan Luang, Bangkok 10250

Temperature (25.3 - 26.7) °C (On site)
Humidity (50.4 - 55.9) %RH (On site)

Equipment condition Good Operation

Calibration Location Organic Preparation Lab

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01

Traceability Wavelength Accuracy is traceable to certificate No. 106372 and 106371
Photometric Accuracy is traceable to certificate No. 106364 and 111398
Stray Light is traceable to certificate No. 106377
The above certificate are traceable to SI unit through Sarna Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr.Wanchana Janloey

Approved by



Mr.Sonthi Temboonsakdi
Service Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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Certificate of Calibration

Certificate No.

BSCC-UV-374/24

Number of Page(s)

2 of 3

Calibration Results:

1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (\pm nm)
241.70	241.55	-0.15	0.18
334.02	333.85	-0.17	0.18
418.53	418.57	0.04	0.18
572.99	572.97	-0.02	0.18
879.41	879.17	-0.24	0.18

2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (\pm A)
235	0.0000	0.0000	0.0000	0.0075
	0.7171	0.7169	-0.0002	0.0075
257	0.0000	0.0000	0.0000	0.0075
	0.8354	0.8345	-0.0009	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2786	0.2781	-0.0005	0.0075
350	0.0000	0.0000	0.0000	0.0075
	0.6199	0.6194	-0.0005	0.0075

*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced
except in full, without written approval of the Bara Scientific Co., Ltd.

Certificate of Calibration

Certificate No. **BSCC-UV-374/24**

Number of Page(s)

3 of 3

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ($\pm A$)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5761	0.5765	0.0004	0.0042
	0.7119	0.7105	-0.0014	0.0042
	1.0189	1.0174	-0.0015	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5610	0.5613	0.0003	0.0042
	0.7001	0.6984	-0.0017	0.0042
	1.0026	1.0011	-0.0015	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5235	0.5232	-0.0003	0.0042
	0.6614	0.6598	-0.0016	0.0042
	0.9456	0.9444	-0.0012	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5249	0.5245	-0.0004	0.0042
	0.6975	0.6956	-0.0019	0.0042
	1.0009	0.9994	-0.0015	0.0042
590.0	0.0000	0.0000	0.0000	0.0042
	0.5590	0.5586	-0.0004	0.0042
	0.7725	0.7708	-0.0017	0.0042
	1.1125	1.1114	-0.0011	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5666	0.5666	0.0000	0.0042
	0.7620	0.7604	-0.0016	0.0042
	1.0982	1.0971	-0.0011	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)		
	Wavelength (nm)	Transmission (%T)	Absorbance (A)
200.85 \pm 0.11nm	199.58	0.9520	2.0217

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

*****End of Certificate*****

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.



Agilent Technologies (Thailand) Limited
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Bangkok 10500 Thailand

Tel. +662 637 6363
Fax: +662 632 4334
Email: ccc-smt@agilent.com
Website: www.agilent.com/chem

Customer Contact:

ALS Laboratory Group (Thailand) Co
Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd
Khwaeng Phatthanakan Khet Suan

TAX ID : 0105540004859

chanattagarn.imchom@alsglobal.com
227158760

Invoice To:

ALS Laboratory Group (Thailand) Co
Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd
Khwaeng Phatthanakan Khet Suan

Delivery Site:

ALS Laboratory Group (Thailand) Co
Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd
Khwaeng Phatthanakan Khet Suan

Location:

Room
Bldg
Lab
Dept

SERVICE REPORT

Customer Purchase Order Number:	Customer Number: 70371013
Service Request:	Service Request Date:
Service Order: 6006676060	Service Confirmation: 6905905441

REVIEW BY	
APPROVED BY	
NEXT CAL. DATE	31/4/2026

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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Bangkok 10500 Thailand
Tax ID : 0105542068218

Citibank N.A. Bangkok Branch
399 Interchange 21 Building, Sukhumvit Road, Klongtoey Nau
Sub-district, Wattana District, Bangkok 10110 Thailand
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: 6905905441

Service Confirmation Date: 08.10.2024

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-IM-7900	ICPMS 7900 System			
G8410A	SPS 4 Autosampler	AU15430722	ICP MS 7900	SYS-IM-7900
G8411A	ISIS 3 for Agilent 7850/7900/8900	JP15510227	ICP MS 7900	SYS-IM-7900
G3292A	PSC 6106T Chiller	2U15A1948	ICP MS 7900	SYS-IM-7900
G8403A	Agilent 7900 ICP-MS	JP15471169	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	04.10.2024	04.10.2024
1010	5185-5850	ICP-MS Checkout Solutions	1.00	Agreement Entitlement - 100 % covered		

Additional Information:

Service Confirmation Number: 6905905441

Service Confirmation Date: 08.10.2024

Service Information:

Problem Description: *WU-EQQ-IM-7900-5001253655		
Service Provided: Perform OQ Hardware. Test CDS logon, auto sampler, Auto tune, BG and 20 Min stability. I calibrate the instrument No BKK_EL0043 test all pass.		
Service Overview Code: Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
Reported Hours: 7.0	Travel Hours: 2.0	
Customer Field Service Representative Name: Panthep Kurasathain	Customer Field Service Representative Signature: 	Date: 08 Oct 2024
Customer Name: Supakwan Mak	Customer Signature: 	Date: 08 Oct 2024
Additional Comments:		



Metrological Center

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E-Mail : calibrate@scg.co.th

Certificate No. T250355

Page 1 of 6

Certificate of Calibration

Equipment : HEATING BLOCK

Manufacturer : Environmental Express

Model : SC 196

Serial No. : 6974CECW3285

Customer Code : BKK_EL0054

ID No. : T5306A3

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

Customer Location : Acid Digestion Lab

Date of Receipt : 26 February 2025

Calibrated By : Atiphong Rongrat (Technician)

Approved By :  / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 17 MAR 2025



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.



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Certificate No. T250355

Page 2 of 6

Calibration Report

Equipment : HEATING BLOCK
Date of Calibration : 4 March 2025
Environment : Temperature : 24.4-24.9 °C
Line Voltage : 221.6-226.3 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20.

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
TC	TYPE T	TN221-TN230	T240712	19 April 2025
TC	TYPE T	TN231-TN240	T240712	19 April 2025
TC	TYPE T	TN241-TN250	T240401	16 March 2025
TC	TYPE T	TN251-TN260	T240401	16 March 2025
DATA LOGGER	34970A	T193	T240401	16 March 2025

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 2 Hour 40 Minute At 95 °C

Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

() without adjustment

(X) after adjustment

Approved By. _____



Metrological Center

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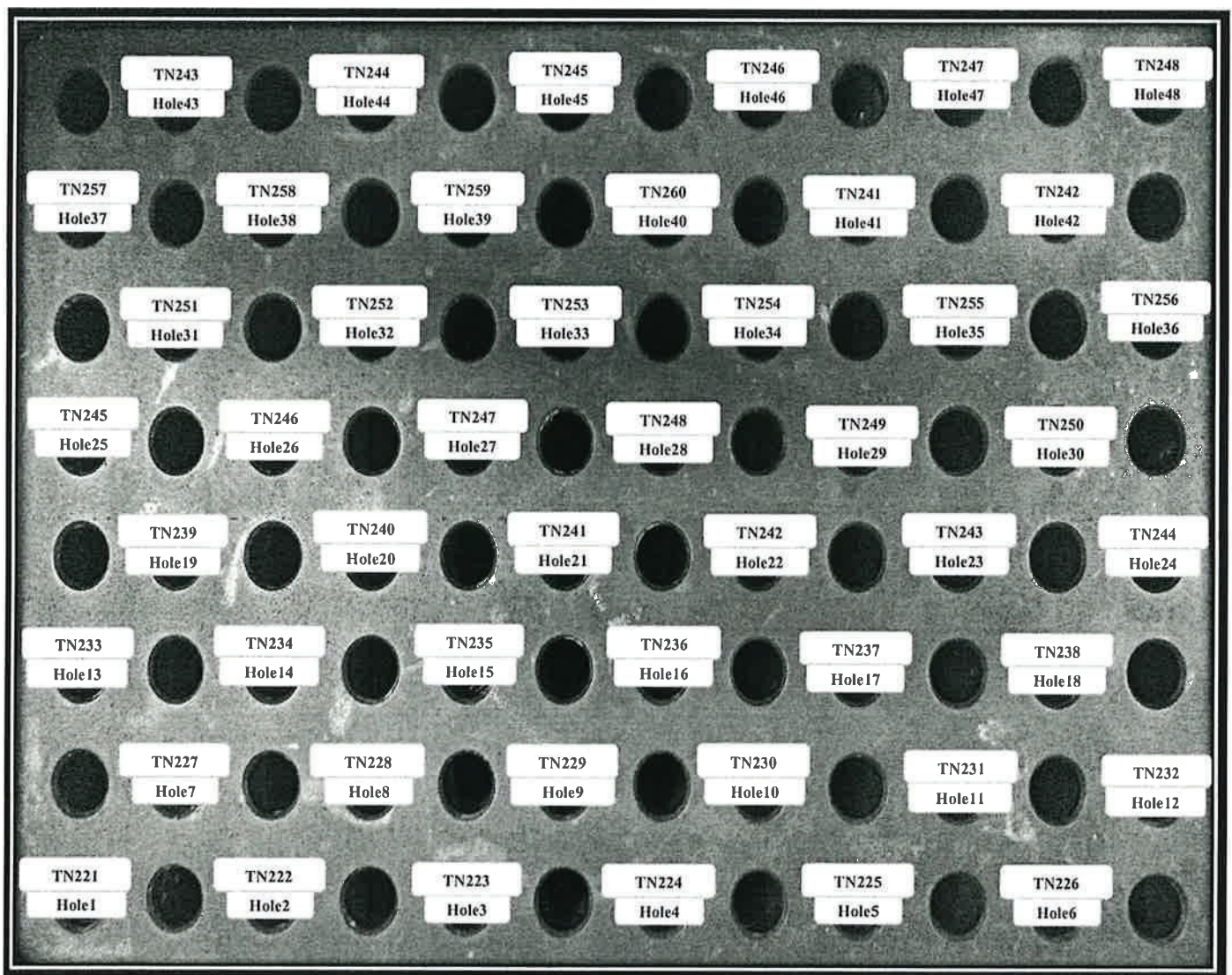
Website : www.scieco.co.th

E-Mail : calibrate@scg.co.th

Certificate No. T250355

Page 3 of 6

Calibration Report



FRONT CONTROL

Approved By. _____



Calibration Report

Measurement Results

Calibration Point		Average Standard Reading at each position (°C)					
R1 Hole1-Hole6		TN221	TN222	TN223	TN224	TN225	TN226
CAL POINT	Max	94.85	95.37	95.03	95.25	95.52	94.75
95	Min	94.17	94.66	94.38	94.63	94.87	94.12
	Average	94.51	95.02	94.70	94.94	95.20	94.43
R2 Hole7-Hole12		TN227	TN228	TN229	TN230	TN231	TN232
	Max	94.71	94.56	94.79	95.32	95.44	95.06
	Min	94.05	93.88	94.10	94.65	94.90	94.65
	Average	94.38	94.22	94.44	94.99	95.17	94.85
R3 Hole13-Hole18		TN233	TN234	TN235	TN236	TN237	TN238
	Max	95.26	95.43	95.40	95.71	95.41	95.06
	Min	94.54	94.64	94.71	95.10	94.86	94.42
	Average	94.90	95.03	95.06	95.41	95.13	94.74
R4 Hole19-Hole24		TN239	TN240	TN241	TN242	TN243	TN244
	Max	95.13	95.06	95.68	96.16	95.35	95.80
	Min	94.39	94.43	94.86	95.51	94.88	95.12
	Average	94.76	94.75	95.27	95.83	95.12	95.46
R5 Hole25-Hole30		TN245	TN246	TN247	TN248	TN249	TN250
	Max	94.95	95.81	95.39	95.82	95.66	95.66
	Min	94.47	95.03	94.67	94.99	94.84	94.87
	Average	94.71	95.42	95.03	95.41	95.25	95.27
R6 Hole31-Hole36		TN251	TN252	TN253	TN254	TN255	TN256
	Max	96.07	95.34	96.28	95.39	94.95	95.12
	Min	95.28	94.55	95.51	94.62	94.13	94.35
	Average	95.67	94.95	95.90	95.00	94.54	94.73
R7 Hole37-Hole42		TN257	TN258	TN259	TN260	TN241	TN242
	Max	95.15	95.63	96.11	95.09	95.34	95.51
	Min	94.38	94.88	95.32	94.28	94.54	94.72
	Average	94.76	95.25	95.71	94.69	94.94	95.11
R8 Hole43-Hole48		TN243	TN244	TN245	TN246	TN247	TN248
	Max	95.84	95.87	95.44	95.72	95.65	95.75
	Min	95.06	95.10	94.60	94.95	94.87	94.98
	Average	95.45	95.48	95.02	95.34	95.26	95.36

Approved By.

Calibration Report

Measurement Results

Calibration Point		Average Standard Reading at each position (°C)					
R1 Hole1-Hole6		TN221	TN222	TN223	TN224	TN225	TN226
CAL POINT	Max	104.48	104.40	104.60	105.27	105.24	105.19
105	Min	104.15	104.02	104.25	104.94	104.91	104.93
	Average	104.32	104.21	104.42	105.10	105.08	105.06
R2 Hole7-Hole12		TN227	TN228	TN229	TN230	TN231	TN232
	Max	105.20	105.45	105.58	105.96	105.81	106.03
	Min	104.92	105.14	105.29	105.64	105.53	105.79
	Average	105.06	105.29	105.43	105.80	105.67	105.91
R3 Hole13-Hole18		TN233	TN234	TN235	TN236	TN237	TN238
	Max	106.09	106.14	105.83	106.25	105.97	105.88
	Min	105.80	105.89	105.57	106.00	105.69	105.65
	Average	105.94	106.01	105.70	106.13	105.83	105.77
R4 Hole19-Hole24		TN239	TN240	TN241	TN242	TN243	TN244
	Max	105.87	105.75	105.30	105.07	105.22	105.66
	Min	105.62	105.52	105.13	104.90	105.05	105.49
	Average	105.74	105.63	105.21	104.98	105.14	105.57
R5 Hole25-Hole30		TN245	TN246	TN247	TN248	TN249	TN250
	Max	105.62	105.54	105.52	105.75	105.97	105.69
	Min	105.45	105.35	105.31	105.57	105.81	105.49
	Average	105.53	105.44	105.41	105.66	105.89	105.59
R6 Hole31-Hole36		TN251	TN252	TN253	TN254	TN255	TN256
	Max	106.19	106.34	106.47	105.96	105.76	105.35
	Min	106.02	106.16	106.31	105.77	105.58	105.18
	Average	106.10	106.25	106.39	105.87	105.67	105.27
R7 Hole37-Hole42		TN257	TN258	TN259	TN260	TN241	TN242
	Max	106.21	105.59	105.45	105.36	106.08	106.09
	Min	106.04	105.42	105.28	105.20	105.90	105.92
	Average	106.12	105.51	105.37	105.28	105.99	106.00
R8 Hole43-Hole48		TN243	TN244	TN245	TN246	TN247	TN248
	Max	106.54	106.33	105.78	105.38	105.42	105.69
	Min	106.38	106.16	105.60	105.20	105.25	105.52
	Average	106.46	106.25	105.69	105.29	105.33	105.61

Approved By. [Signature]



Metrological Center

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E-Mail : calibrate@scg.co.th

Certificate No. T250355

Page 6 of 6

Calibration Report

Measurement Results:

HEATING BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (\pm °C)	Uncertainty (\pm °C)
	Min , Max	Average		
102.0	-	102.0	0.43	0.83
107.0	-	107.0	0.20	0.70

* 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. _____





Metrology

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



Certificate No. T232160

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cooling Room)

Manufacturer : KOLDTECH

Model : KM 320

Serial No. : TBN-1012061/05

Customer Code : BKK_EN0167

ID No. : T2463A3

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

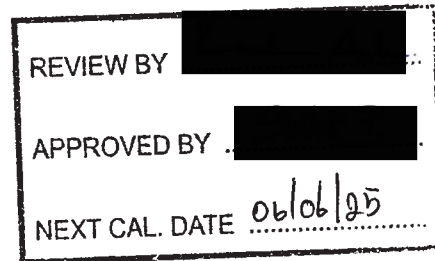
Customer Location : Laboratory

Date of Receipt : 29 November 2023

Calibrated By : Atiphong Rongrat (Technician)

Approved By :  / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 09 JAN 2024



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 Metrology.

Certificate No. T232160

Page 2 of 4

Calibration Report

Equipment : Chamber (Cooling Room)
Date of Calibration : 6 December 2023
Environment : Temperature : 23.4-24.9 °C
Line Voltage : 221.4-230.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber , the other one standard thermocouples type T 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
TC	TYPE T	TN161-TN170	T230773	10 April 2024
TC	TYPE T	TN171-TN180	T230773	10 April 2024
DATA LOGGER	34970A	T149	T230773	10 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 30 Minute At 3 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

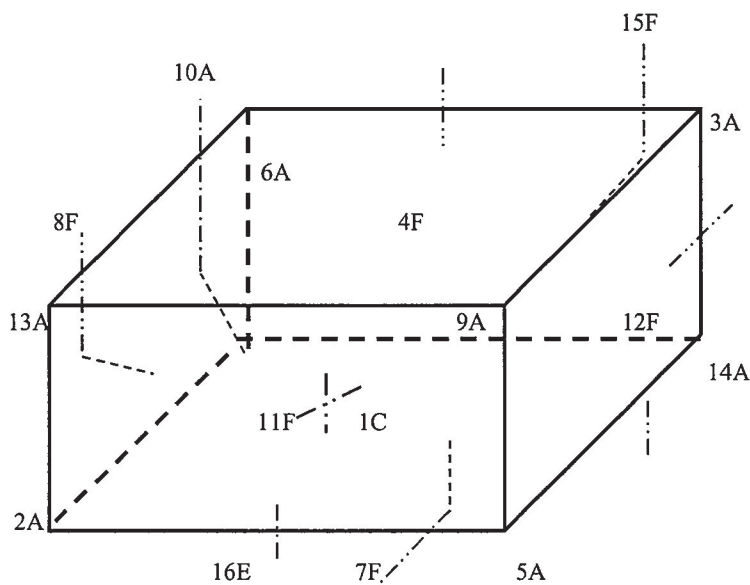
5. Adjustment :

(X) without adjustment

() after adjustment

Approved By. 

Calibration Report



C = Centre , F = Centre of Face , A = Corner , E = Centre of Edge

1C	=	TN161
2A	=	TN162
3A	=	TN163
4F	=	TN164
5A	=	TN165
6A	=	TN166
7F	=	TN167
8F	=	TN168
9A	=	TN169
10A	=	TN170
11F	=	TN171

12F	=	TN172
13A	=	TN173
14A	=	TN174
15F	=	TN175
16E	=	TN176

Approved By. _____

Certificate No. T232160

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)											
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170	TN171	TN172
3.0	2.83	3.34	2.95	3.46	3.45	3.76	3.25	3.46	3.39	3.50	3.58	3.42
	TN173	TN174	TN175	TN176								
	3.33	3.39	3.15	3.43								

Chamber (Cooling Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
	Min , Max	Average					
3.0	2.8 , 4.1	3.5	3.36	1.10	2.00	1.90	2.09

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. _____



Certificate No. T250873

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cooling Room)**Manufacturer** : KOLDTECH**Model** : KM 320**Serial No.** : TBN-1012061/05**Customer Code** : BKK_EN0167**ID No.** : T2463A3**Customer** : ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Laboratory Room**Date of Receipt** : 28 May 2025**Calibrated By** : Atiphong Rongrat (Technician)**Approved By** :  / Boonchai Suriyawong (Site Calibration Manager)**Date of Issue** : 19 JUN 2025REVIEW BY APPROVED BY 

NEXT CAL DATE.....04/12/26

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

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

Certificate No. T250873

Page 2 of 4

Calibration Report

Equipment : Chamber (Cooling Room)
Date of Calibration : 4 June 2025
Environment : Temperature : 23.4-24.9 °C
Line Voltage : 221.4-230.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber , the other one standard thermocouples type T 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
TC	TYPE T	TN91-TN100	T242036	3 December 2025
TC	TYPE T	TN101-TN110	T242036	3 December 2025
DATA LOGGER	34970A	T121	T242036	3 December 2025

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 2 Hour 20 Minute At 3 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment

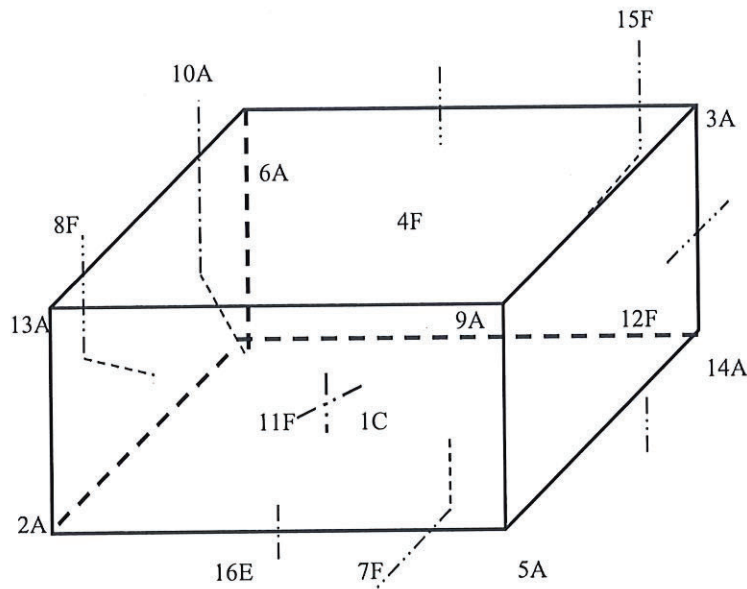
() after adjustment

Approved By. 

Certificate No. T250873

Page 3 of 4

Calibration Report



C = Centre , F = Centre of Face , A = Corner , E = Centre of Edge

1C = TN91	12F = TN102
2A = TN92	13A = TN103
3A = TN93	14A = TN104
4F = TN94	15F = TN105
5A = TN95	16E = TN106
6A = TN96	
7F = TN97	
8F = TN98	
9A = TN99	
10A = TN100	
11F = TN101	

Approved By. _____



Certificate No. T250873

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)											
	TN91	TN92	TN93	TN94	TN95	TN96	TN97	TN98	TN99	TN100	TN101	TN102
3.0	2.95	2.92	3.09	2.92	3.16	3.50	3.40	3.03	3.14	2.98	3.44	3.13
	TN103	TN104	TN105	TN106								
	3.19	3.06	3.46	2.92								

Chamber (Cooling Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
	Min , Max	Average					
3.0	2.8 , 3.9	3.4	3.14	1.20	1.30	1.90	2.04

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. _____