

ภาคผนวก จ

ใบรับรองการสอบเทียบเครื่องมือ



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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	9-Oct-25	9-Oct-26	12
Water Lab	Dissolved Oxygen (on site)	DO Meter	BKK_LG0079	24-Jun-25	24-Jun-26	12
Water Lab	Oil & Grease	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26	12
Water Lab	Oil & Grease	Water Bath	BKK_EN0439	9-Oct-25	9-Oct-26	12
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26	12
Water Lab	Total Suspended Solids	Oven	BKK_EN0425	6-Oct-25	6-Oct-26	12
Water Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26	12
Water Lab	Total Dissolved Solids 180°C	Oven	BKK_EN0425	6-Oct-25	6-Oct-26	12
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_EN0422	3-Sep-25	3-Sep-26	12
Water Lab	COD	Hot Block	BKK_EN0222	9-Apr-25	9-Apr-26	12
Water Lab	COD	Spectrophotometer	BKK_EN0356	8-Oct-25	8-Oct-26	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 :

REVIEW BY

*Jinda K*

APPROVED BY

*Siriluk P*

NEXT CAL DATE

17/10/25

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 Lerngagrakul

Approved by :

*Saithip*

Approved Signatory

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

Issue Date : 21 October 2024

**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.



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	24I1022	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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## Certificate of Calibration

Cert.No.: 25CH1162

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 : 08 October 2025  
Calibration Date : 09 October 2025  
Reference : 2510-0271DSC-1  
Submitted by :

Ambient Temperature :  $(25 \pm 2.5) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 15) \%$   
Calibration Procedure : In - house method :  
- CP-CH5 by direct measurement with certified reference material (CRM)  
- CP-CH8 by comparison with temperature standard

Calibrated by : Walalak Sirithean

Approved by :

*Saithip*

Approved Signatory

- ( ) Chakrit Waewwanjua  
( ) Ponpan Paipim  
(✓) Saithip Meangmai

Issue Date :

10 October 2025

REVIEW BY *Jinda K*  
APPROVED BY *Siriluk P*  
NEXT CAL DATE.....09/10/26

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

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**Cert.No.:** 25CH1162

**Page.:** 2 of 3

**Condition of this calibration result**

**1. Reference Standard Instrument**

<b><u>Instrument</u></b>	<b><u>Serial No.</u></b>	<b><u>ID No.</u></b>	<b><u>Cert. No.</u></b>	<b><u>Due Date</u></b>
1) Ref. Standard Thermometer	4982054	110RC044	25I708	03 July 2026

- This measurement result is traceable to SI through Technology Promotion Association (Thailand - Japan)

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

<b><u>Buffer Solution</u></b>	<b><u>Manufacturer</u></b>	<b><u>Lot No.</u></b>	<b><u>Exp. date</u></b>
pH 4.007	CPA chem	1114384	12 June 2027
pH 6.965	CPA chem	1066667	18 Jan 2026
pH 10.010	CPA chem	1135355	16 Aug 2026

**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)**

<b>Unit Under Calibration</b>	<b>Standard pH Buffer Solution</b>	<b>Actual pH Reading</b>	<b>Actual mV Reading (mV)</b>	<b>Uncertainty of pH Measurement (±)</b>	<b>Coverage factor <i>k</i></b>
pH Electrode S/N.: 252063043080	4.007	3.996	176.6	0.0046	2.00
	6.965	6.974	1.1	0.0084	2.00
	10.010	9.996	-176.9	0.0070	2.00

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



Cert.No.: 25CH1162

Page.: 3 of 3

### Calibration Results

#### Function : Temperature Measurement

#### **( \* ) Without adjustment**

This equipment was connected with Temperature Probe;

- Model : PHC281  
- Serial No. : 252063043080

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	25.001	25.0	-0.001	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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TEL. 0-2717-3000 FAX. 0-2719-9484

## Certificate of Testing

Cert.No.: 25TW128

Page.: 1 of 2

**Equipment :** DO Meter  
**Manufacturer :** Mettler Toledo  
**Model :** Seven2Go S9  
**Serial No. :** C315969633  
**ID No. :** BKK\_LG0079  
**Received Date :** 23 June 2025  
**Test Date :** 24 June 2025  
**Reference :** 2506-0741DSC-7  
**Submitted by :**

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

**Laboratory Condition :** Temperature (  $25 \pm 5$  ) °C  
Humidity (  $50 \pm 20$  ) %  
**Test Procedure :** In - house method : CP-CH9  
by Comparison Technique with Azide Modification Method

**Tested by :** Walalak Sirithean

**Approved by :**

*Saithip*

Approved Signatory

- ( ) Chakrit Waewwanjua  
( ) Ponpan Paipim  
(✓) Saithip Meangmai

**Issue Date :** 25 June 2025

REVIEW BY	<i>Chayathon P.</i>
APPROVED BY	<i>Narakorn P.</i>
NEXT CAL DATE	24/06/26



Cert.No.: 25TW128

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.: 976209

<b>Titration Method (Azide Modification Method) (mg/L)</b>	<b>DO Meter Reading (mg/L)</b>	<b>Standard Deviation (mg/L)</b>
8.20	8.20	0.0045

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

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## Certificate of Calibration

Cert. No.: 25LM109

Page.: 1 of 2

**Equipment :** DO Meter with Sensor

**Manufacturer :** Mettler Toledo

**Model :** Seven2Go S9

**Serial No. :** C315969633

**ID No. :** BKK\_LG0079

**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 :** 23 June 2025

**Calibrated Date :** 24 June 2025

**Ambient Temperature :** ( 26 ± 10 ) °C

**Relative Humidity :** ( 50 ± 30 ) %

**AC Line Voltage :** ( 220 ± 22 ) V

**Calibrated by :** Warakorn Lerngagtrakul

**Approved by :**

*Kunchit*

Approved Signatory

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

**Issue Date :**

27 June 2025

**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 :** 2506-0741DSC-8

**Cert. No.:** 25LM109  
**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 measurement result is traceable to the International System of Unit maintained through :

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

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

**Function :** Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 976209

<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	80	20.003	20.1	0.097	0.16	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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Accredited by

NSC-TISI-TIS 17025

Calibration 0426



## Calibration certificate

Calibration Certificate No. 25BCI0265

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MSE224S-100-DU	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.
Serial   QM Ident. no.	27405555   BKK_EN0003	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand)Co., Ltd.  104 Phatthanakarn 40,Phattanakarn Rd.,Khwaeng Phatthanakarn ,Khet Suan Luang,Bangkok 10250	<div>REVIEW BY <i>Linda K</i></div> <div>APPROVED BY <i>Siriluk P</i></div> <div>NEXT CAL DATE.....17/07/26</div>
Order no.	265054	
Number of pages	4	
Date of calibration	17 Jul 2025	

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TISI-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date of issue	17 Jul 2025	Approval of the Calibration Certificate	Person in charge
		Mr. Chonchai Inthana	Chonchai Inthana

Calibration object

Single range instrument

Model	MSE224S-100-DU
Serial Number	27405555
QM Ident. no   Inventory no.	BKK_EN0003   ---
Maximum capacity (Max. load)	220.0000 g
Measured up to	220.0000 g
Scale interval	0.0001 g

Place of calibration

Address	According to page 1
Department   Cost center	ENVI Department   ---
Building   Floor	---   1st Floor.
Room	Laboratory Room.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET Calibration Guide No. 18, Version 4.0 (11/2015) - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	Testo 174(Traceable to Si unit through ENTECH)	11 Nov 2025
Test weight set OIML R111 E2	Certificate No.M2308197S ,E2(Traceable to SI unit through TCS)	23 Aug 2025



Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	17 Jul 2025
Temperature at place of calibration   Temp. diff. <i>T</i> <sub>weights</sub> - <i>T</i> <sub>place</sub>	22.5 °C   0.7 K
Measuring conditions	The installation site is suitable. The device is level. Balance was loaded up to Max before test.
Comments	Humidity 58.0 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 10 g   200 g		
	10 g	200 g
1	10.0000 g	200.0000 g
2	10.0000 g	199.9999 g
3	10.0000 g	200.0000 g
4	10.0000 g	200.0000 g
5	10.0001 g	199.9999 g
6	10.0000 g	200.0000 g
7	10.0000 g	200.0000 g
8	10.0001 g	200.0000 g
9	10.0000 g	200.0000 g
10	10.0000 g	199.9999 g
	<i>s</i> = 0.00004 g	<i>s</i> = 0.00005 g

Eccentricity

Test load (nominal): 100 g	
Center	100.0000 g
Front left	100.0001 g
Back left	100.0000 g
Back right	100.0001 g
Front right	100.0001 g
Maximum deviation from centric loading indication $ \Delta_{ecc} _{max}$ = 0.0001 g	

Error of indication

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
<i>L</i>	<i>I</i>	<i>E</i>	<i>k</i>	<i>U</i> ( <i>E</i> )	<i>U</i> <sub>rel</sub> ( <i>E</i> )
0.0100 g	0.0100 g	0.0000 g	2.00	0.00012 g	1.2 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00013 g	0.13 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00013 g	0.013 %
2.0000 g	2.0000 g	0.0000 g	2.00	0.00013 g	0.0065 %
5.0000 g	5.0000 g	0.0000 g	2.00	0.00013 g	0.0026 %
10.0000 g	10.0000 g	0.0000 g	2.00	0.00013 g	0.0013 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00014 g	0.00068 %
50.0000 g	50.0000 g	0.0000 g	2.00	0.00015 g	0.00029 %
100.0000 g	100.0000 g	0.0000 g	2.00	0.00018 g	0.00018 %
200.0000 g	200.0000 g	0.0000 g	2.00	0.00028 g	0.00014 %
220.0000 g	220.0001 g	0.0001 g	2.00	0.00032 g	0.00015 %
Maximum error of indication		$ E _{max}$ = 0.0001 g			

*U*<sub>rel</sub>(*E*) is the quotient of *U*(*E*) and test load *L*. The uncertainty of measurement *U*(*E*) is valid only if error *E* is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.  
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

End of calibration certificate

# Uncertainty of measurement in use

Device adjusted before measurement	Yes
Temperature deviation considered	1.5 K (isoCAL active)
Temperature coefficient considered	$1 \cdot 10^{-6}/\text{K}$

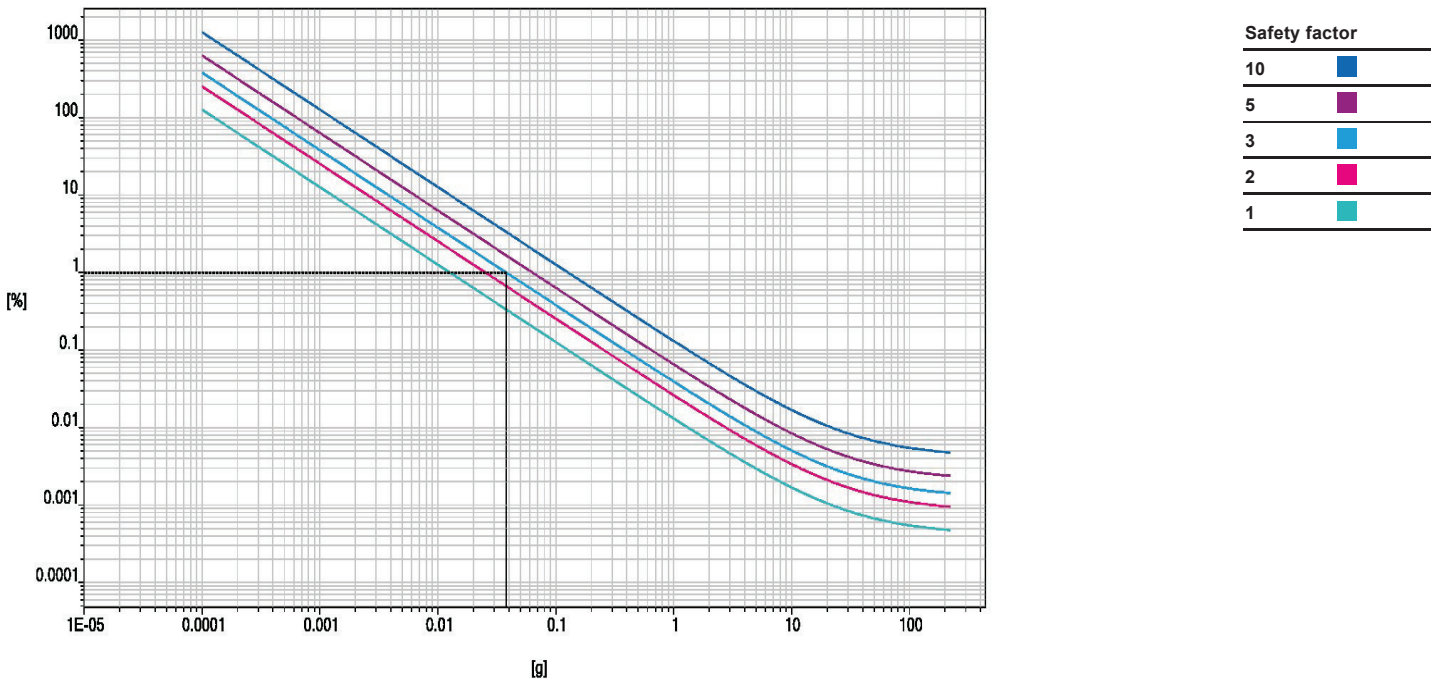
Uncertainty of the weighing result  $U_{gl}(W)$

$U_{gl}(W) = 0.00013 \text{ g} + 4.19 \cdot 10^{-6} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering of the reading  $R$  into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication $R$	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	2.2000 g	0.00014 g	0.0063 %
25 %	55.0000 g	0.00036 g	0.00066 %
50 %	110.0000 g	0.00059 g	0.00054 %
75 %	165.0000 g	0.00082 g	0.00050 %
100 %	220.0000 g	0.0011 g	0.00048 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.0380 g



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



## 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 : (  $26 \pm 10$  ) °C  
Relative Humidity : (  $50 \pm 30$  ) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

Kunchit

Approved Signatory

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

Issue Date : 30 October 2024

**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.

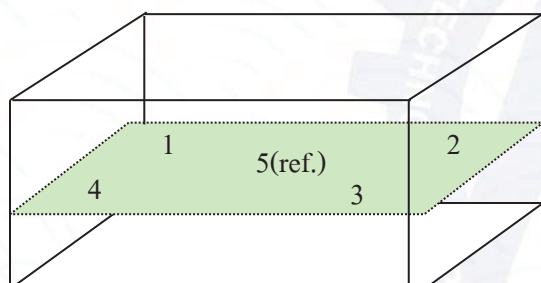
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

**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 )
<b>Beginning of Calibration</b>	25	54	222
<b>Finished of Calibration</b>	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 <b>k</b>
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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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.: 25TM528

Page : 1 of 3

Equipment : Water Bath  
Manufacturer : Memmert  
Model : WNE 29  
Serial No. : L622.0282  
ID No. : BKK\_EN0439

REVIEW BY

*Jinda K*

APPROVED BY

*Siriluk P*

NEXT CAL DATE

09/10/26

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 : 08 October 2025

Calibration Date : 09 October 2025

Ambient Temperature : ( 26 ± 10 ) °C

Relative Humidity : ( 50 ± 30 ) %

AC Line Voltage : ( 220 ± 22 ) V

Calibrated by : Kunchit Promprat

*Kunchit Promprat*

Approved by :

Approved Signatory

( ) Chakrit Waewwanjua

( ) Ponpan Paipim

(✓) Suwit Imjai

Issue Date : 28 October 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 :** Water Bath  
**Condition As-Received :** Used Item  
**Reference :** 2510-0042OC-13

**Cert. No.:** 25TM528

**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	MY58041391	25LM20	TPA	08 Feb 2026

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

3. This measurement result is traceable to the International System of Unit maintained through :

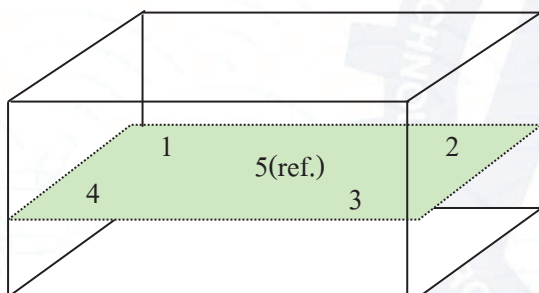
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

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

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

**Heat transfer medium used :** Water

	<u>Environmental</u>		<u>AC Voltage Supply</u> ( Volt )
	( °C )	( %R.H. )	
<b>Beginning of Calibration</b>	24	63	224
<b>Finished of Calibration</b>	24	58	224



Front

<u>Position :</u>	<u>Ref. Std. ID No.:</u>
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147



**Equipment :** Water Bath  
**Condition As-Received :** Used Item  
**Reference :** 2510-0042OC-13  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source

**Cert. No.:** 25TM528

**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	84.863	84.748	84.869	84.990	84.966	0.21

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Coverage Factor <i>k</i>
85.0	0.33	0.12	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-



# 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. T241770

Page 1 of 3

## Certificate of Calibration

Equipment : Chamber ( Oven )

Manufacturer : Memmert

Model : UF 110

Serial No. : B423.1549

Customer Code : BKK\_EN0425

ID No. : T4671A5

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanaka

Khet Suan Luang, Bangkok 10250

Customer Location : Oven Room

Date of Receipt : 22 October 2024

Calibrated By : Boonchai Suriyawong ( Site Calibration Manager )

Approved By :  / Sujjar Naknakred (Site Calibration Manager)

Date of Issue : 11 NOV 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. T241770

Page 2 of 3

## Calibration Report

**Equipment** : Chamber ( Oven )  
**Date of Calibration** : 29 October 2024  
**Environment** : Temperature : 22.4-27.7 °C  
Line Voltage : 221.7-225.9 V  
Relative Humidity : 55 - 65 %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	31-(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 1 Hour 35 Minute At 104 °C  
Fresh Air Damper ☐ Open ☒ Min ☐ Medium ☐ Max  
☐ Close  
☐ Not Available

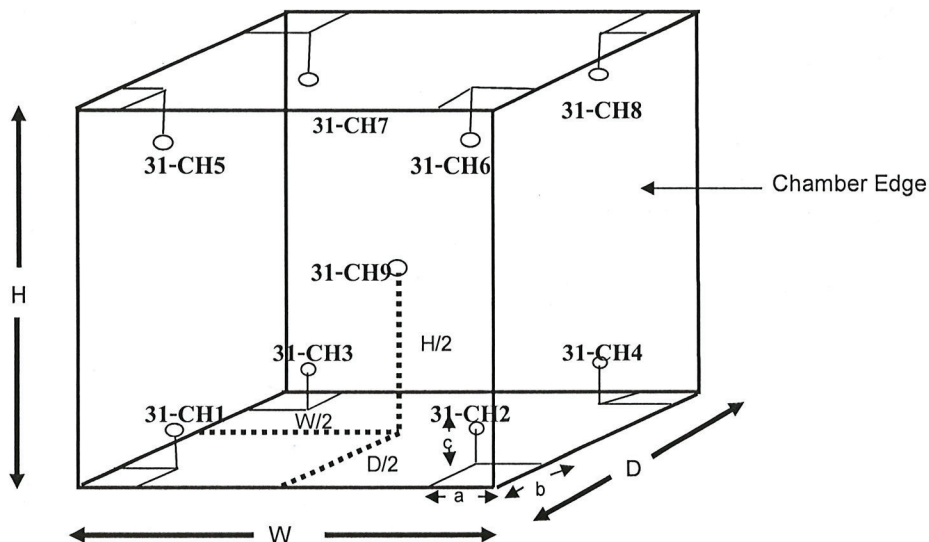
5. Adjustment :

( X ) without adjustment

( ) after adjustment

Approved By 

## Calibration Report



**Remark :**

Internal Dimensions of Chamber : W (Width) = 56 cm. , H(Height)=55 cm. and D(Depth)=41 cm.

Size of Installed Standard sensor number 31-CH1 to number 31-CH8 : a = 5 cm. , b = 5 cm. and c = 5 cm.

Size of Installed Standard sensor number 31-CH9 : W/2=56 cm./2 , H/2=55 cm./2 and D/2=41 cm./2

**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
104	104.19	104.50	103.83	104.26	104.02	104.34	103.76	104.42	103.96
180	180.39	180.40	179.84	180.15	179.27	180.23	180.36	180.68	180.73

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	104.14	0.14	0.60	0.42	2.00
180.0	179.9 , 180	180.0	180.23	0.27	0.76	0.63	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. 



**Metrology Center**  
**SCI ECO Services Company Limited**

51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Bangkok Tel : +668 9205 6851 , +669 81924 0059

Saraburi Tel : +669 8247 2360

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



Certificate No. T251785

Page 1 of 3

## Certificate of Calibration

**Equipment** : Chamber ( Oven )

**Manufacturer** : Memmert

**Model** : UF110

**Serial No.** : B423.1549

**Customer Code** : BKK\_EN0425

**ID No.** : T4671A5

**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** : 1 October 2025

**Calibrated By** : Sujjar Naknakred ( Site Calibration Manager )

**Approved By** : Don Zai Boonchai Suriyawong (Site Calibration Manager)

**Date of Issue** : 10 OCT 2025

REVIEW BY	<u>finda k</u>
APPROVED BY	<u>Siriluk P.</u>
NEXT CAL. DATE	<u>06/10/26</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.



Certificate No. T251785

Page 2 of 3

## Calibration Report

**Equipment** : Chamber ( Oven )  
**Date of Calibration** : 6 October 2025  
**Environment** : Temperature : 24.4-25.8 °C  
Line Voltage : 220.5-225.2 V  
Relative Humidity : 55 - 65 %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 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	23-(CH1-10)	T250314	6 April 2026
DATA LOGGER	34970A	T195	T250314	6 April 2026

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 14 Minute At 104 °C  
Fresh Air Damper ☒ Open ☒ Min ☐ Medium ☐ Max  
☐ Close  
☐ Not Available

5. Adjustment :

( ) without adjustment

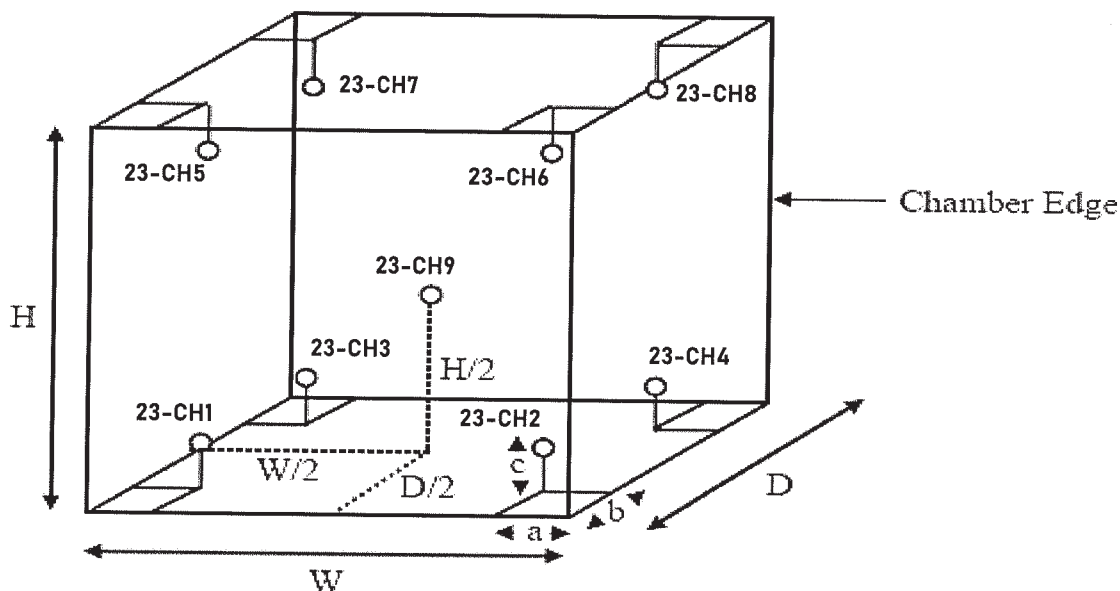
( X ) after adjustment

Approved By. Donkai

Certificate No. T251785

Page 3 of 3

## Calibration Report



**Remark :** Internal Dimensions of Chamber : W (Width) = 56 cm. , H (Height) = 48 cm. and D (Depth) = 40 cm.  
 Size of Installed Standard sensor number 23-CH1 to number 23-CH8 : a = 5 cm. ,b = 5 cm. and c = 5 cm.  
 Size of Installed Standard sensor number 23-CH9 : W/2 = 56 cm./2 , H/2 = 48 cm./2 and D/2 = 40cm./2

### Measurement Results

Average Standard Reading at each position (°C)									
Calibration Point	23-CH1	23-CH2	23-CH3	23-CH4	23-CH5	23-CH6	23-CH7	23-CH8	23-CH9
104	104.13	103.54	103.92	104.37	104.40	104.51	104.18	103.86	103.80
180	180.05	179.82	179.64	179.52	181.20	180.29	180.19	179.35	179.89

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	104.08	0.28	0.87	0.45	2.00
180.0	180.0 , 180.1	180.0	179.99	0.37	1.49	0.61	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)  
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

## 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 (  $25 \pm 5$  ) °C

Humidity (  $50 \pm 20$  ) %

Test Procedure :

In - house method : CP-CH9

by Comparison Technique with Azide Modification Method

Tested by :

Walalak Sirithean

Approved by :

Saithip

Approved Signatory

( ) Chakrit Waewwanjua

( ) Ponpan Paipim

(✓) Saithip Meangmai

Issue Date :

20 May 2025

REVIEW BY

finda K

APPROVED BY

Siriluk P

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

<b>Titration Method (Azide Modification Method)</b> (mg/L)	<b>DO Meter Reading</b> (mg/L)	<b>Standard Deviation</b> (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

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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 Lerngagtrakul

**Approved by :**

*Kunchit*

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 %.

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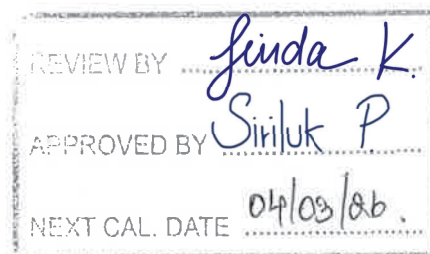
Certificate No. T250356

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** :  / 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

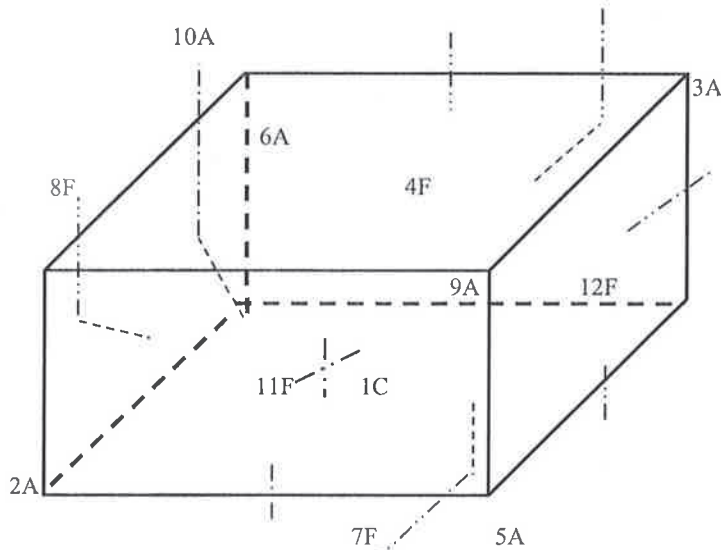
Approved By. 



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. 



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.: 24CG3401

Page.: 1 of 2

Equipment :	Burette
Capacity :	50 mL
Serial No. :	-
ID. No. :	BKK_EN0422
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 :	756 mmHg
Calibration Procedure :	ASTM E 542 - 01
Calibrated by :	Sa-ngeunkam Wongsu

REVIEW BY ..... *Jinda K.* .....

APPROVED BY ..... *Siriluk P.* .....

NEXT CAL DATE..... 03/09/25 .....

Approved by :

*Sa-ngeunkam Wongsu*  
Approved Signatory

(✓) Srisuda Khamtha  
( ) Ponpan Paipim  
( ) Unnophol Harachai

Issue Date :

3 September 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 :** 29 August 2024  
**Condition As-Received :** Used Item  
**Calibration Date :** 3 September 2024  
**Reference :** 2408-0944DSC-2

**Cert.No.:** 24CG3401  
**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	XP205	B134206712	140RC007	24MM316	TPA	15 July 2025
2) Data Logger	HL-20D	20683159	140EC012	23H2174	TPA	10 Oct 2024
3) Thermometer	-	1594592	140EC010	24I175	TPA	22 Feb 2025

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 :**

<b>Nominal capacity ( mL )</b>	<b>Reading ( mL )</b>	<b>Uncertainty ( ± mL )</b>	<b>k Factor</b>
50	49.9951	0.010	2.00

**Remark** mL = cm<sup>3</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-







## Certificate of Calibration

Cert.No.: 25CG3385

Page.: 1 of 2

Equipment :	Burette
Capacity :	50 mL
Serial No. :	-
ID. No. :	BKK_EN0422
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 :	753 mmHg
Calibration Procedure :	ASTM E 542 - 01
Calibrated by :	Srisuda Khamtha 
Approved by :	 Approved Signatory
( ) Ponpan Paipim	
(✓) Chakrit Waewwanjua	

Issue Date :

3 September 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 :** Burette  
**Received Date :** 1 September 2025  
**Condition As-Received :** Used Item  
**Calibration Date :** 3 September 2025  
**Reference :** 2509-0049DSC-1

**Cert.No.:** 25CG3385  
**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	MS204TS	C226356983	140RC010	24MM603	TPA	10 Oct 2025
2) Data Logger	HL-20D	20683159	140EC012	24H2129	TPA	15 Oct 2025
3) Digital Thermometer	HH376	230806555	140EC013	25I1740	TPA	17 Jan 2026

This measurement result 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 :**

<b>Nominal capacity ( mL )</b>	<b>Reading ( mL )</b>	<b>Uncertainty ( ± mL )</b>	<b>k Factor</b>
10	9.9941	0.0082	2.00
25	24.9804	0.0087	2.00
50	49.9819	0.010	2.00

**Remark** mL = cm<sup>3</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-



Certificate No. T250579

Page 1 of 5

**Certificate of Calibration****Equipment : HOT BLOCK****Manufacturer : Environmental Express****Model : B3000- 240****Serial No. : 2017CODW116****Customer Code : BKK\_EN0222****ID No. : T6769A4****Customer : ALS Laboratory Group (Thailand) Co.,Ltd.****104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,  
Khet Suan Luang, Bangkok 10250****Customer Location : Wet Chemistry Lab2****Date of Receipt : 2 April 2025****Calibrated By : Boonchai Suriyawong ( Site Calibration Manager )****Approved By :  / Sujjar Naknakred (Site Calibration Manager)****Date of Issue : 21 APR 2025**

REVIEW BY	<i>Jinda K</i>
APPROVED BY	<i>Siriluk P</i>
NEXT CAL. DATE	09/04/26

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. T250579

Page 2 of 5

## Calibration Report

Equipment : HOT BLOCK  
Date of Calibration : 9 April 2025  
Environment : Temperature : 22.8-22.9 °C  
Line Voltage : 222.1-225.1 V  
Relative Humidity : 55 - 65 %RH

### Condition of this results of calibration :

1. This equipment was calibrated by insert 20 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	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 - Hour 40 Minute At 150 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

5. Adjustment :

( X ) without adjustment

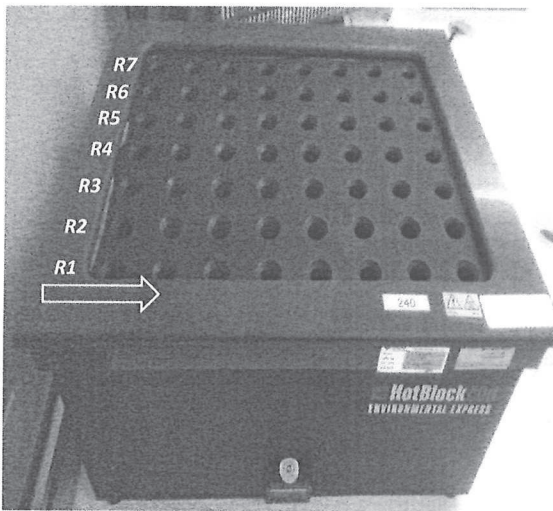
( ) after adjustment

Approved By. 

Certificate No T250579

Page 3 of 5

## Calibration Report



Row	Hole							
R7	H49	H50	H51	H52	H53	H54	H55	H56
R6	H41	H42	H43	H44	H45	H46	H47	H48
R5	H33	H34	H35	H36	H37	H38	H39	H40
R4	H25	H26	H27	H28	H29	H30	H31	H32
R3	H17	H18	H19	H20	H21	H22	H23	H24
R2	H9	H10	H11	H12	H13	H14	H15	H16
R1	H1	H2	H3	H4	H5	H6	H7	H8

H: STANDARD THERMOCOUPLE TYPE T

H1	=	TN91	H9	=	TN99	H17	=	TN107	H25	=	TN95	H33	=	TN103	H41	=	TN91	H49	=	TN99
H2	=	TN92	H10	=	TN100	H18	=	TN108	H26	=	TN96	H34	=	TN104	H42	=	TN92	H50	=	TN100
H3	=	TN93	H11	=	TN101	H19	=	TN109	H27	=	TN97	H35	=	TN105	H43	=	TN93	H51	=	TN101
H4	=	TN94	H12	=	TN102	H20	=	TN110	H28	=	TN98	H36	=	TN106	H44	=	TN94	H52	=	TN102
H5	=	TN95	H13	=	TN103	H21	=	TN91	H29	=	TN99	H37	=	TN107	H45	=	TN95	H53	=	TN103
H6	=	TN96	H14	=	TN104	H22	=	TN92	H30	=	TN100	H38	=	TN108	H46	=	TN96	H54	=	TN104
H7	=	TN97	H15	=	TN105	H23	=	TN93	H31	=	TN101	H39	=	TN109	H47	=	TN97	H55	=	TN105
H8	=	TN98	H16	=	TN106	H24	=	TN94	H32	=	TN102	H40	=	TN110	H48	=	TN98	H56	=	TN106

Approved By.





Certificate No. T250579

Page 4 of 5

## Calibration Report

### Measurement Results

			Average Standard Reading at each position ( ° C )									
Calibration Point			TN91	TN92	TN93	TN94	TN95	TN96	TN97	TN98	TN99	TN100
Point	Setting	Max	150.48	150.03	149.42	150.76	149.50	150.44	149.78	149.96	150.02	150.35
150	150.2	Min	150.30	149.86	149.23	150.57	149.29	150.24	149.62	149.75	150.20	150.20
		Average	<i>150.40</i>	<i>149.94</i>	<i>149.34</i>	<i>150.67</i>	<i>149.40</i>	<i>150.34</i>	<i>149.71</i>	<i>149.86</i>	<i>149.95</i>	<i>150.29</i>
			<b>TN101</b>	<b>TN102</b>	<b>TN103</b>	<b>TN104</b>	<b>TN105</b>	<b>TN106</b>	<b>TN107</b>	<b>TN108</b>	<b>TN109</b>	<b>TN110</b>
	Max	150.08	150.18	150.18	150.56	150.01	149.33	149.76	150.52	150.65	150.02	
	Min	149.94	150.03	150.16	150.37	149.80	149.09	149.64	150.40	150.50	149.83	
	Average	<i>150.03</i>	<i>150.11</i>	<i>150.25</i>	<i>150.48</i>	<i>149.91</i>	<i>149.20</i>	<i>149.70</i>	<i>150.46</i>	<i>150.58</i>	<i>149.92</i>	
			<b>TN91</b>	<b>TN92</b>	<b>TN93</b>	<b>TN94</b>	<b>TN95</b>	<b>TN106</b>	<b>TN97</b>	<b>TN98</b>	<b>TN99</b>	<b>TN100</b>
	Max	149.41	149.87	149.17	149.78	149.61	150.30	149.32	150.32	150.02	150.22	
	Min	149.31	149.74	149.00	149.63	149.50	150.18	149.18	150.23	149.89	150.12	
	Average	<i>149.35</i>	<i>149.79</i>	<i>149.10</i>	<i>149.72</i>	<i>149.56</i>	<i>150.23</i>	<i>149.27</i>	<i>150.28</i>	<i>149.97</i>	<i>150.17</i>	
			<b>TN101</b>	<b>TN102</b>	<b>TN103</b>	<b>TN104</b>	<b>TN105</b>	<b>TN106</b>	<b>TN107</b>	<b>TN108</b>	<b>TN109</b>	<b>TN110</b>
	Max	149.63	149.57	150.11	149.69	149.91	149.55	149.59	150.27	<b>150.06</b>	<b>149.53</b>	
	Min	149.52	149.45	149.98	149.60	149.76	149.41	149.44	150.18	<b>149.95</b>	<b>149.42</b>	
	Average	<i>149.58</i>	<i>149.51</i>	<i>150.06</i>	<i>149.64</i>	<i>149.85</i>	<i>149.49</i>	<i>149.53</i>	<i>150.22</i>	<i>150.00</i>	<i>149.49</i>	
			<b>TN91</b>	<b>TN92</b>	<b>TN93</b>	<b>TN94</b>	<b>TN95</b>	<b>TN96</b>	<b>TN97</b>	<b>TN98</b>	<b>TN99</b>	<b>TN100</b>
	Max	149.36	149.62	149.48	150.45	149.58	150.12	149.10	149.91	<b>149.66</b>	<b>150.15</b>	
	Min	149.18	149.45	149.34	150.33	149.52	150.06	149.01	149.87	<b>149.49</b>	<b>150.04</b>	
	Average	<i>149.29</i>	<i>149.54</i>	<i>149.41</i>	<i>150.39</i>	<i>149.56</i>	<i>150.09</i>	<i>149.06</i>	<i>149.89</i>	<i>149.60</i>	<i>150.11</i>	
			<b>TN101</b>	<b>TN102</b>	<b>TN103</b>	<b>TN104</b>	<b>TN105</b>	<b>TN106</b>				
	Max	149.71	149.73	150.63	148.58	149.83	149.13					
	Min	149.59	149.66	150.53	148.46	149.79	149.07					
	Average	<i>149.65</i>	<i>149.70</i>	<i>150.59</i>	<i>149.75</i>	<i>149.17</i>	<i>149.10</i>					

Approved By.





Certificate No. T250579

Page 5 of 5

## Calibration Report

### Measurement Results

HOT BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability ( $\pm$ °C)	Uncertainty ( $\pm$ °C)
	Min , Max	Average		
150.2	150.2 , 150.3	150.2	0.20	0.82

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 % .

End of Certificate

 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



## Certificate of Calibration

Cert.No.: 24CHO568

Page.: 1 of 3

Equipment :	Spectrophotometer
Manufacturer :	HACH
Model :	DR3900
Serial No. :	2021559
ID No. :	BKK_EN0356
Condition As-Received:	Used Item
Received Date :	29 October 2024
Calibration Date :	29 October 2024
Reference :	2410-07820C-1
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand
Calibration Place :	Wet Chemistry Lab 2
Ambient Temperature :	( 21.8 to 21.5 ) °C (On-Site)
Relative Humidity :	( 58.2 to 59.3 ) % (On-Site)
Calibration Procedure :	In - house method : CP-OCH4 based on ASTM E 275-08
Calibrated by :	Warakorn Lerngagtrakul 
Approved by :	 Approved Signatory
( ) Unnopphol Harachai	
( ) Ponpan Paipim	
(✓) Saithip Meangmai	
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%

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. :** 24CHO568

**Page :** 2 of 3

**Condition of calibration result**

**1. Reference Standard Material :**

<b><u>Material</u></b>	<b><u>Serial No.</u></b>	<b><u>Certificate No.</u></b>	<b><u>Due date</u></b>
1. Absorbance Standard set	44487	122584	31 May 2026
2. Wavelength Standard set	36730	118120	15 Jan 2026
3. Wavelength Standard set	36730	118121	15 Jan 2026

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 through :

- Starna Scientific Ltd.

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

**Calibration Results : without adjustment**

**Wavelength Accuracy**

<b>Certified Values of Reference Material ( nm )</b>	<b>UUC Reading ( nm )</b>	<b>Uncertainty of Measurement ( ± nm )</b>	<b>Coverage Factor <i>k</i></b>
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
747.61	748	0.59	2.00
807.04	808	0.72	2.05





Cert. No. : 24CHO568

Page : 3 of 3

**Calibration Results : without adjustment**

**Photometric Accuracy**

Wavelength (nm)	Certified Values of Reference Material ( Abs )	UUC Reading ( Abs )	Uncertainty of Measurement ( $\pm$ Abs )	Coverage Factor <i>k</i>
420.0	Zero	0.000	0.0028	2.00
	0.5750	0.575	0.0028	2.00
	0.7156	0.713	0.0028	2.00
	1.0176	1.015	0.0028	2.00
440.0	Zero	0.000	0.0028	2.00
	0.5598	0.560	0.0028	2.00
	0.7037	0.701	0.0028	2.00
	1.0013	0.998	0.0028	2.00
465.0	Zero	0.000	0.0028	2.00
	0.5222	0.524	0.0028	2.00
	0.6646	0.665	0.0028	2.00
	0.9444	0.945	0.0028	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5234	0.525	0.0029	2.00
	0.7007	0.701	0.0028	2.00
	0.9992	1.000	0.0028	2.00
590.0	Zero	0.000	0.0028	2.00
	0.5573	0.558	0.0029	2.00
	0.7760	0.774	0.0028	2.00
	1.1104	1.108	0.0028	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5648	0.566	0.0029	2.00
	0.7654	0.765	0.0028	2.00
	1.0961	1.096	0.0028	2.00

**Remark**

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- \* : Not NSC-ONSC Accredited
- UUC = Unit Under Calibration

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



## Certificate of Calibration

Cert.No.: 25CHO537

Page.: 1 of 3

**Equipment :** Spectrophotometer  
**Manufacturer :** HACH  
**Model :** DR3900  
**Serial No. :** 2021559  
**ID No. :** BKK\_EN0356  
**Condition As-Received:** Used Item  
**Received Date :** 08 October 2025  
**Calibration Date :** 08 October 2025  
**Reference :** 2510-0042OC-11  
**Submitted by :** ALS Laboratory Group (Thailand) Co.,Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand  
**Calibration Place :** Wet Chemistry Lab 2  
**Ambient Temperature :** ( 21.9 to 21.9 ) °C (On-Site)  
**Relative Humidity :** ( 62 to 65 ) % (On-Site)  
**Calibration Procedure :** In - house method :  
CP-OCH4 based on ASTM E 275-08  
**Calibrated by :** Uthen Kankawi  
**Approved by :**   
( ) Chakrit Waewwanjua  
( ) Ponpan Paipim  
(✓) Saithip Meangmai  
**Issue Date :** 9 October 2025

REVIEW BY 

APPROVED BY 

NEXT CAL DATE... 08/10/26

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. : 25CHO537

Page : 2 of 3

**Condition of calibration result**

1. Reference Standard Material :

<u>Material</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1. Absorbance Standard set	44487	122584	31 May 2026
2. Wavelength Standard set	36730	118120	15 Jan 2026
3. Wavelength Standard set	36730	118121	15 Jan 2026

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 through :

- Starna Scientific Ltd.

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

**Calibration Results : without adjustment**

**Wavelength Accuracy**

<b>Certified Values of Reference Material ( nm )</b>	<b>UUC Reading ( nm )</b>	<b>Uncertainty of Measurement ( <math>\pm</math> nm )</b>	<b>Coverage Factor <i>k</i></b>
418.40	418	0.59	2.00
479.88	480	0.59	2.00
513.75	513	0.59	2.00
537.00	536	0.59	2.00
638.00	638	0.59	2.00
747.61	748	0.59	2.00
807.04	807	0.59	2.00





Cert. No. : 25CHO537

Page : 3 of 3

**Calibration Results : without adjustment**

**Photometric Accuracy**

Wavelength (nm)	Certified Values of Reference Material ( Abs )	UUC Reading ( Abs )	Uncertainty of Measurement ( $\pm$ Abs )	Coverage Factor <i>k</i>
420.0	Zero	0.000	0.0028	2.00
	0.5750	0.573	0.0028	2.00
	0.7156	0.713	0.0028	2.00
	1.0176	1.014	0.0028	2.00
440.0	Zero	0.000	0.0028	2.00
	0.5598	0.557	0.0028	2.00
	0.7037	0.700	0.0028	2.00
	1.0013	0.997	0.0028	2.00
465.0	Zero	0.000	0.0028	2.00
	0.5222	0.522	0.0028	2.00
	0.6646	0.664	0.0028	2.00
	0.9444	0.945	0.0028	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5234	0.523	0.0028	2.00
	0.7007	0.700	0.0028	2.00
	0.9992	0.999	0.0028	2.00
590.0	Zero	0.000	0.0028	2.00
	0.5573	0.556	0.0028	2.00
	0.7760	0.773	0.0028	2.00
	1.1104	1.108	0.0028	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5648	0.565	0.0028	2.00
	0.7654	0.765	0.0028	2.00
	1.0961	1.096	0.0028	2.00

**Remark**

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



Agilent Technologies (Thailand) Limited  
U CHU LIANG BLDG. 22/F UNIT A,D  
968 RAMA 4 ROAD, SILOM, BANGRAK  
Bangkok 10500 Thailand

Tel: +662 637 6363  
Fax: +662 632 4334  
Email: [ccc-smt@agilent.com](mailto:ccc-smt@agilent.com)  
Website: [www.agilent.com/chem](http://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](mailto: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**

<b>Customer Purchase Order Number:</b>	<b>Customer Number:</b> 70371013
<b>Service Request:</b>	<b>Service Request Date:</b>
<b>Service Order:</b> 6006676060	<b>Service Confirmation:</b> 6905905441

REVIEW BY <i>Tattaporn C.</i>
APPROVED BY <i>Samtra N.</i>
NEXT CAL. DATE <i>31/4/2026</i>

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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:**

<b>Problem Description:</b> *WU-EQQ-IM-7900-5001253655		
<b>Service Provided:</b> 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.		
<b>Service Overview Code:</b> Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
<b>Reported Hours:</b> 7.0	<b>Travel Hours:</b> 2.0	
<b>Customer Field Service Representative Name:</b> Panthep Kurasathain	<b>Customer Field Service Representative Signature:</b> 	<b>Date:</b> 08 Oct 2024
<b>Customer Name:</b> Supakwan Mak	<b>Customer Signature:</b> 	<b>Date:</b> 08 Oct 2024
<b>Additional Comments:</b>		

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

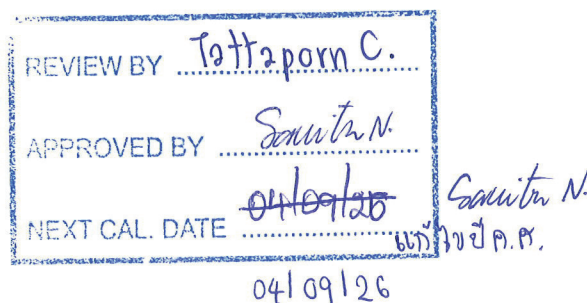
**Customer Location** : Acid Digestion Lab

**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.



# Metrological Center

SCI ECO Services Company Limited

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

Website : www.scieco.co.th

E-Mail : calibrate@scg.co.th

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 :

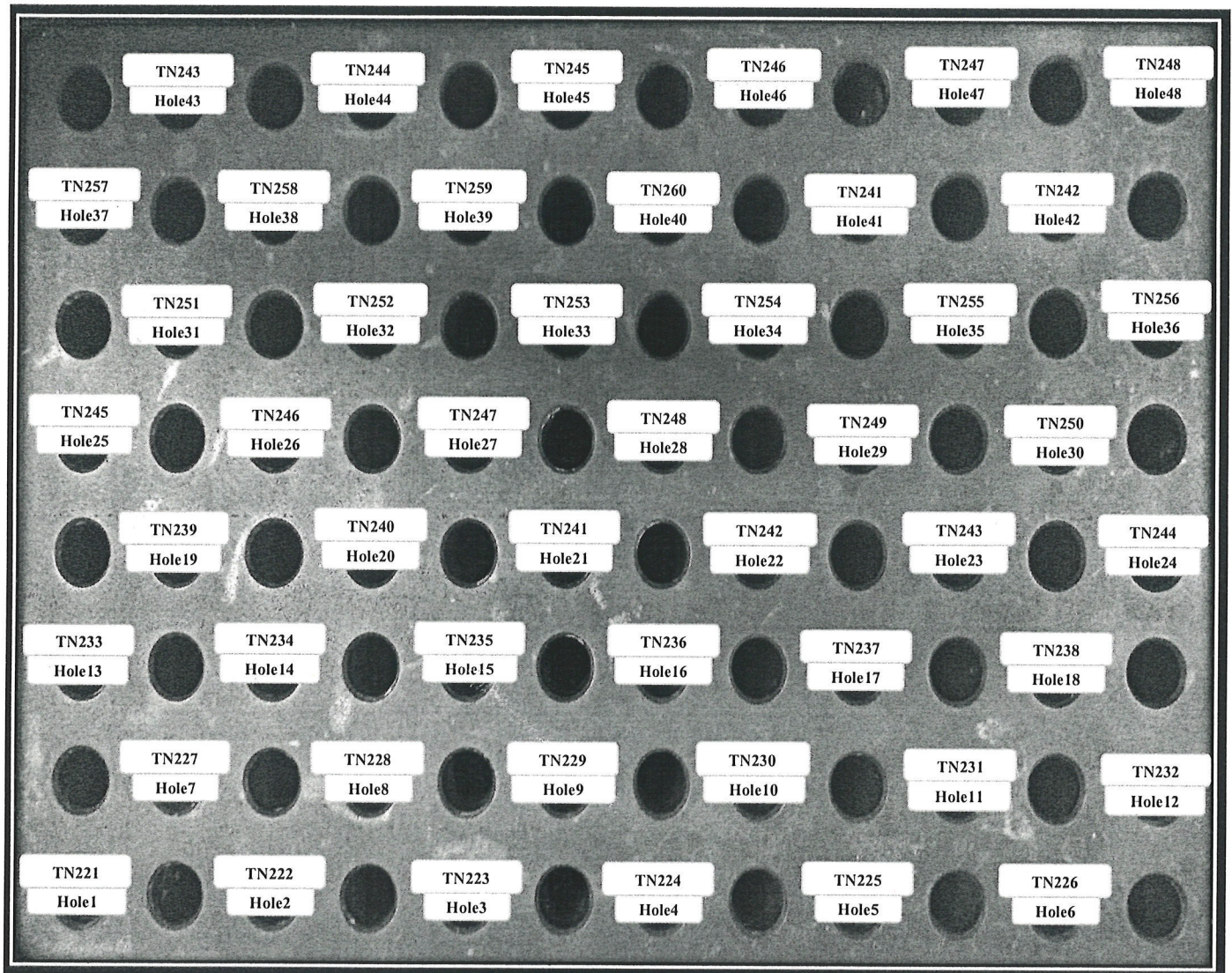
( ) without adjustment

( X ) after adjustment

Approved By. Pon Lert



## Calibration Report



### FRONT CONTROL

Approved By. Don Zai



Certificate No. T250355

Page 4 of 6

## 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.



Certificate No. T250355

Page 5 of 6

## Calibration Report

### Measurement Results

Calibration Point		Average Standard Reading at each position ( ° C )					
<b>R1 Hole1-Hole6</b>		<b>TN221</b>	<b>TN222</b>	<b>TN223</b>	<b>TN224</b>	<b>TN225</b>	<b>TN226</b>
<b>CAL POINT</b>	Max	104.48	104.40	104.60	105.27	105.24	105.19
<b>105</b>	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
<b>R2 Hole7-Hole12</b>		<b>TN227</b>	<b>TN228</b>	<b>TN229</b>	<b>TN230</b>	<b>TN231</b>	<b>TN232</b>
	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
<b>R3 Hole13-Hole18</b>		<b>TN233</b>	<b>TN234</b>	<b>TN235</b>	<b>TN236</b>	<b>TN237</b>	<b>TN238</b>
	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
<b>R4 Hole19-Hole24</b>		<b>TN239</b>	<b>TN240</b>	<b>TN241</b>	<b>TN242</b>	<b>TN243</b>	<b>TN244</b>
	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
<b>R5 Hole25-Hole30</b>		<b>TN245</b>	<b>TN246</b>	<b>TN247</b>	<b>TN248</b>	<b>TN249</b>	<b>TN250</b>
	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
<b>R6 Hole31-Hole36</b>		<b>TN251</b>	<b>TN252</b>	<b>TN253</b>	<b>TN254</b>	<b>TN255</b>	<b>TN256</b>
	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
<b>R7 Hole37-Hole42</b>		<b>TN257</b>	<b>TN258</b>	<b>TN259</b>	<b>TN260</b>	<b>TN241</b>	<b>TN242</b>
	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
<b>R8 Hole43-Hole48</b>		<b>TN243</b>	<b>TN244</b>	<b>TN245</b>	<b>TN246</b>	<b>TN247</b>	<b>TN248</b>
	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. \_\_\_\_\_





## 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. 

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

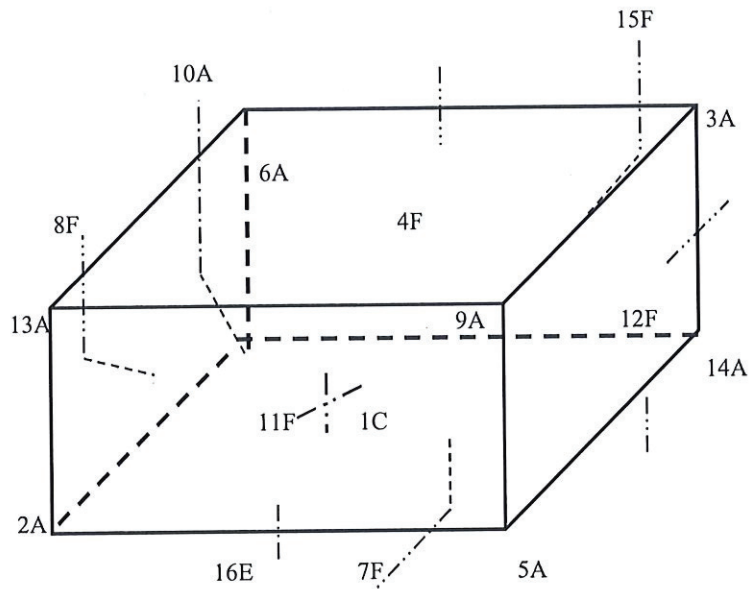
Approved By. Bum Sri



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. 