



บริษัท ปตท. น้ำมันและการค้าปลีก จำกัด (มหาชน)

รายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อม
และมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม

โครงการทำเทียบเรือของการปิโตรเลียมแห่งประเทศไทย คลังปิโตรเลียมบางจาก

ระหว่างเดือนมกราคม-มิถุนายน พ.ศ. 2569

ภาคผนวก จ

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	9-Oct-25	9-Oct-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 Kjeldahl Nitrogen	Digestion Unit	BKK_EN0366	2-Mar-26	2-Mar-27	12
Water Lab	Total Kjeldahl Nitrogen	Discrete analyzer	BKK_EN0438	3-Sep-25	3-Sep-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 Solids	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26	12
Water Lab	Total 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	BOD Meter	BKK_EN0017	20-May-25	20-Nov-26	18
Water Lab	BOD	Incubator	BKK_EN0305	23-Dec-25	23-Dec-26	12
Water Lab	BOD	Burette	BKK_EN0422	3-Sep-25	3-Sep-26	12
Water Lab	COD	Hot Block	BKK_EN0222	5-Mar-26	2-Mar-27	12
Water Lab	COD	Spectrophotometer	BKK_EN0356	8-Oct-25	8-Oct-26	12
Water Lab	Lead	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
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
Water Lab	Cadmium	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Cadmium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Cadmium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Temperature	Digital Thermometer With Sensor	BKK_LG0059	5-Sep-25	5-Sep-26	12
Water Lab	Total Coliform	Autoclave	BKK_ML0041	4-Mar-25	4-Sep-26	18
Water Lab	Total Coliform	Incubator	BKK_ML0231	21-Aug-25	21-Aug-26	12
Water Lab	Total Coliform	Hot Air Oven	BKK_ML0013	9-Oct-25	9-Apr-27	18
Water Lab	Fecal Coliform	Autoclave	BKK_ML0041	4-Mar-25	4-Sep-26	18
Water Lab	Fecal Coliform	Incubator	BKK_ML0231	21-Aug-25	21-Aug-26	12
Water Lab	Fecal Coliform	Hot Air Oven	BKK_ML0013	9-Oct-25	9-Apr-27	18
Water Lab	Fecal Coliform	Water Bath	BKK_ML0056	4-Feb-26	4-Feb-27	12
Water Lab	Dissolved Oxygen	Burette	BKK_EN0422	3-Sep-25	3-Sep-26	12
Water Lab	Dissolved Oxygen	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Conductivity	Conductivity meter	BKK_EN0373	30-Jun-25	30-Jun-26	12
Water Lab	Nitrate	Ion Chromatography	BKK_EN0069	24-Jun-25	24-Jun-26	12
Water Lab	Phosphate	Ion Chromatography	BKK_EN0069	24-Jun-25	24-Jun-26	12
Water Lab	Salinity	Conductivity meter	BKK_EN0373	30-Jun-25	30-Jun-26	12
Water Lab	Total Alkalinity	Burette	BKK_EN0422	3-Sep-25	3-Sep-26	12



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



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 :

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 :

Walailak Sirithean

Approved by :

Saithip
Approved Signatory

() Chakrit Waewwanjua

() Ponpan Paipim

(✓) Saithip Meangmai

Issue Date :

10 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.



Cert.No.: 25CH1162
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
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

Buffer Solution	Manufacturer	Lot No.	Exp. date
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)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode	4.007	3.996	176.6	0.0046	2.00
S/N.: 252063043080	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 k
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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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	
Order no.	265054	
Number of pages	4	
Date of calibration	17 Jul 2025	

REVIEW BY *Jinda K*

APPROVED BY *Siriluk P*

NEXT CAL DATE 17/07/26

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
		<i>Chonchai</i>	<i>Chonchai</i>
		Mr. Chonchai Inthana	Chonchai Inthana

Calibration certificate No.: 25BCI0265

Calibration Certificate

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.	22.5 °C 0.7 K
Tweights - Tplace	
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			Eccentricity	
Test load (nominal): 10 g 200 g			Test load (nominal): 100 g	
	10 g	200 g		
1	10.0000 g	200.0000 g	Center	100.0000 g
2	10.0000 g	199.9999 g	Front left	100.0001 g
3	10.0000 g	200.0000 g	Back left	100.0000 g
4	10.0000 g	200.0000 g	Back right	100.0001 g
5	10.0001 g	199.9999 g	Front right	100.0001 g
6	10.0000 g	200.0000 g	Maximum deviation from centric loading indication	
7	10.0000 g	200.0000 g	Δ/ecc max = 0.0001 g	
8	10.0001 g	200.0000 g		
9	10.0000 g	200.0000 g		
10	10.0000 g	199.9999 g		
s = 0.00004 g		s = 0.00005 g		

Error of indication					
Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
L	I	E	k	$U(E)$	$U_{rel}(E)$
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 \text{ g}$			

U_{rel}(E) is the quotient of U(E) and test load I. 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

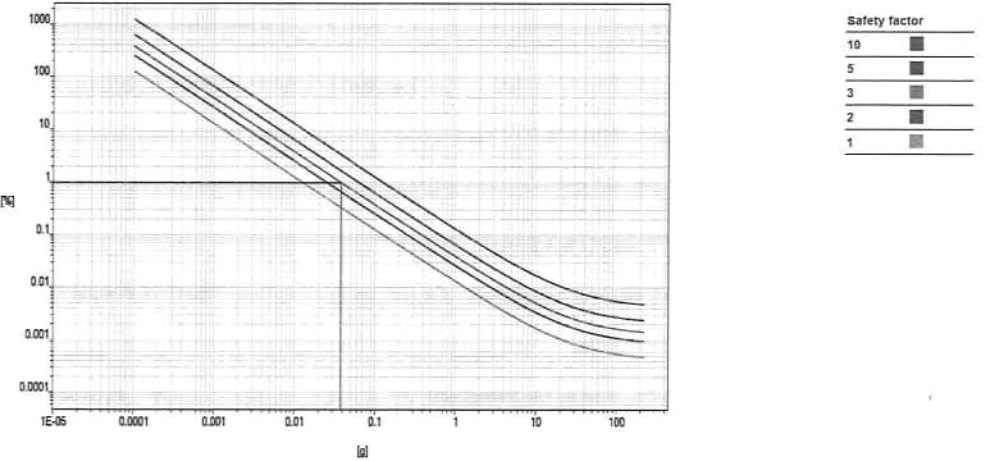
Device adjusted before measurement	Yes
Temperature deviation considered	1.5 K (isoCAL active)
Temperature coefficient considered	1 · 10 ⁻⁶ /K

Uncertainty of the weighing result $U_{gI}(W)$ $U_{gI}(W) = 0.00013 \text{ g} + 4.19 \cdot 10^{-6} \cdot R$

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 $U_{gI}(W)$	Uncertainty relative $U_{gI}(W)_{rel}$
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.: 25TM528
Page : 1 of 3

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 29
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 : 08 October 2025
Calibration Date : 09 October 2025
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
AC Line Voltage : $(220 \pm 22) \text{V}$

Calibrated by : Kunchit Promprat

Approved by :

() 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.

REVIEW BY

APPROVED BY

NEXT CAL DATE 09/10/26



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:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
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 :

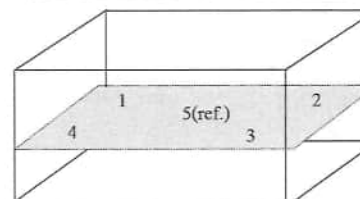
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

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



Front

Position :	Ref. Std. ID No.:
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 %.

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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. T260371

Certificate of Calibration

Page 1 of 4

Equipment : Digestion Unit

Manufacturer : SCP Science

Model : DigiPRER HT

Serial No. : HTC1120480658

Customer Code : BKK_EN0366

ID No. : T2635A5

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

104 Phatthanakan 40, Phatthanakan Rd.,

Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250

Customer Location : Wet Chemistry Lab 1

Date of Receipt : 25 February 2026

Calibrated By : Atiphong Rongrat (Technician)

Approved By :  / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 05 MAY 2026

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. T260371

Calibration Report

Page 2 of 4

Equipment : Digestion Unit
Date of Calibration : 2 March 2026
Environment : Temperature : 23.9 - 26.3 °C
Line Voltage : 221.8 - 225.9 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

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

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

- Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	Type S	M15-(CH1-CH4)	T250749	14 May 2026
DATA LOGGER	34970A	T193	T250749	14 May 2026

- This certificate is traceable to :

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

- Condition of calibrated item : good

Equipment Description :

Time Constant 2 Hour 40 Minute At 380 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

- Adjustment :

(X) without adjustment () after adjustment

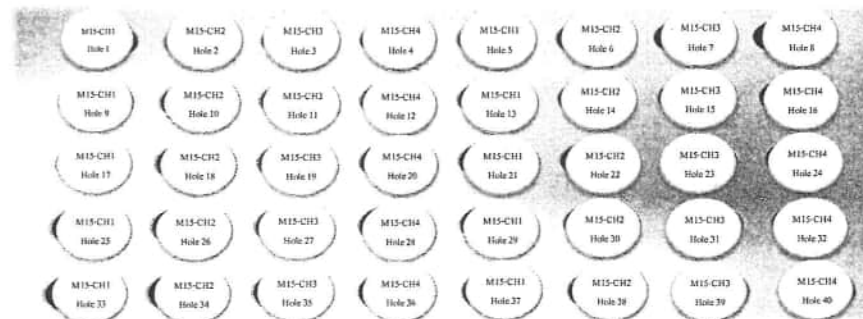
Approved By. [Signature]



Certificate No. T260371

Page 3 of 4

Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M15-CH1 Hole 1	M15-CH2 Hole 2	M15-CH3 Hole 3	M15-CH4 Hole 4	M15-CH1 Hole 5	M15-CH2 Hole 6	M15-CH3 Hole 7	M15-CH4 Hole 8
380.0	380.0	379.8 - 380.2	Max °C	379.9	380.7	380.9	381.1	381.3	381.5	380.5	379.5
			Min °C	379.5	380.2	380.5	380.7	381.0	381.1	380.2	379.2
			Average °C	379.7	380.5	380.7	380.9	381.2	381.3	380.4	379.4
			Stability ± °C	0.2	0.3	0.2	0.2	0.1	0.2	0.2	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M15-CH1 Hole 9	M15-CH2 Hole 10	M15-CH3 Hole 11	M15-CH4 Hole 12	M15-CH1 Hole 13	M15-CH2 Hole 14	M15-CH3 Hole 15	M15-CH4 Hole 16
380.0	380.0	379.8 - 380.2	Max °C	380.1	380.3	380.6	381.1	380.4	380.6	380.3	380.7
			Min °C	379.6	379.8	380.2	380.6	380.1	380.2	379.7	380.4
			Average °C	379.8	380.1	380.4	380.9	380.3	380.4	380.0	380.5
			Stability ± °C	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.2

Approved By. [Signature]



Calibration Report

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M15-CH1 Hole 17	M15-CH2 Hole 18	M15-CH3 Hole 19	M15-CH4 Hole 20	M15-CH1 Hole 21	M15-CH2 Hole 22	M15-CH3 Hole 23	M15-CH4 Hole 24
380.0	380.0	379.8 - 380.2	Max °C	383.0	380.6	380.7	381.2	380.0	380.6	379.3	381.0
			Min °C	382.4	379.8	380.1	380.6	379.3	380.1	378.8	380.5
			Average °C	382.7	380.2	380.4	380.9	379.6	380.4	379.1	380.7
			Stability ± °C	0.3	0.4	0.3	0.3	0.3	0.2	0.3	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M15-CH1 Hole 25	M15-CH2 Hole 26	M15-CH3 Hole 27	M15-CH4 Hole 28	M15-CH1 Hole 29	M15-CH2 Hole 30	M15-CH3 Hole 31	M15-CH4 Hole 32
380.0	380.0	379.8 - 380.2	Max °C	381.3	380.1	380.6	381.4	380.9	381.3	379.9	380.6
			Min °C	381.0	379.7	380.1	380.9	380.5	380.8	379.3	380.2
			Average °C	381.1	379.9	380.3	381.2	380.7	381.0	379.6	380.4
			Stability ± °C	0.2	0.2	0.3	0.3	0.2	0.2	0.3	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M15-CH1 Hole 33	M15-CH2 Hole 34	M15-CH3 Hole 35	M15-CH4 Hole 36	M15-CH1 Hole 37	M15-CH2 Hole 38	M15-CH3 Hole 39	M15-CH4 Hole 40
380.0	380.0	379.8 - 380.2	Max °C	381.3	383.0	383.2	382.3	380.2	380.3	380.2	381.0
			Min °C	380.9	382.4	382.9	381.9	379.9	380.0	379.8	380.7
			Average °C	381.1	382.7	383.0	382.1	380.0	380.2	380.0	380.8
			Stability ± °C	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.1

The expanded uncertainty of temperature measurement was ± 1.68 °C

The calibration result apply only the above calibrated item.

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

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

Approved By: Daza



Calibration Instrument Report

Instrument: Automated Discrete Analyzer
Manufacturer: AMS
Model: SmartChem 600
Serial number: 2401055

Customer: ALS Laboratory Group (Thailand) Co., Ltd.
Address: 104 Phatthanakan 40 Alley, Phatthanakan, Suan Luang, Bangkok 10250

Calibration date: 3 Sep 2025

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

Check fluid to validate the correct functioning of the instrument

INTENDED USE

Check fluid to validate the correct functioning of the instrument.

Purpose

The purpose of this document is to aim at the correct execution of the method and the installation of the Check fluid to validate the correct functioning of the instrument.

COMPOSITION

Fluidic Test CHECK-01 20 x 4.5 mL (liquid) Lot number: 45751 Expiry date: 2027-04

PROCEDURE

The reagent is ready to use. Check fluid to validate the correct functioning of the instrument following method CHECK-01 and WORKPLAN CHECK01 DILUTION.

Results For the correct operation of the machine, the expected results are as follows:

1. Evaluation of calibration Results: R^2

	R^2
Result	1
Range	>0.995 - 1

2. Evaluation of Samples Results:

Dilution	Replicates	Results mg/L	Range	CV% calculated	CV%
1/1	x10	0.604	0.599 - 0.610	0.17	≤ 1
1/10	x10	0.611	0.590 - 0.625	1.37	≤ 2
1/20	x10	0.643	0.535 - 0.675	3.49	≤ 5
1/50	x10	0.689	0.510 - 0.750	7.70	≤ 10
1/75	x10	0.758	0.500 - 0.895	11.11	≤ 15

Validation by: Am
Apirom Ekviriyakul



แบบฟอร์มการประเมินเครื่อง Discrete Analyzer หลังการสอบเทียบ

ชื่อเครื่องมือ : Discrete Analyzer

ID No. BKK_EN0438

S/N :2401055

Parameter	Range	Test Results	Pass	Fail	Remark
Evaluation of calibration	>0.995 -1	1.00	☒	☐	
CV% calculated Dilution1/1	≤ 1	0.17	☒	☐	
CV% calculated Dilution1/10	≤ 2	1.4	☒	☐	
CV% calculated Dilution1/20	≤ 5	3.5	☒	☐	
CV% calculated Dilution1/50	≤ 10	7.70	☒	☐	
CV% calculated Dilution1/75	≤ 15	11.11	☒	☐	

ผู้ตรวจสอบ Arraya M.
(Arraya Meechai)
(05/09/2025)

ผู้อนุมัติ: Siriluk P.
(Siriluk Bunnak)
(05/09/2025)



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

Certificate of Calibration

Page 1 of 3

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 : Boonchai Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 10 OCT 2025

REVIEW BY	<u>Sunda 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.

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 :

- 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

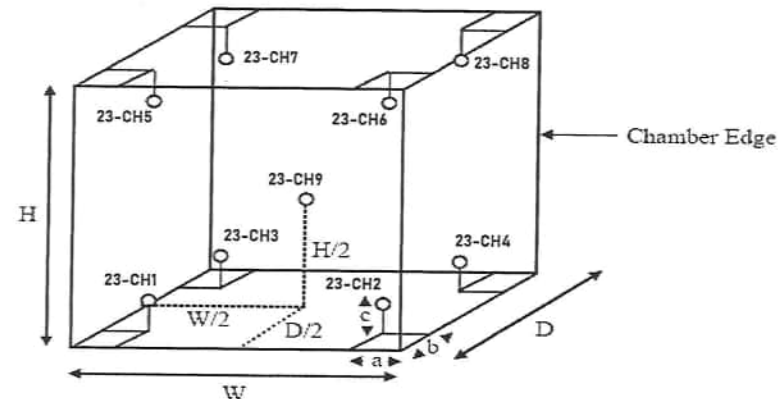
5. Adjustment :

() without adjustment

(X) after adjustment

Approved By

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

Calibration Point	Average Standard Reading at each position (°C)								
	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)
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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 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sirithean
Saithip
Approved by :
Approved Signatory

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

Issue Date : 20 May 2025

REVIEW BY *Jinda K*
APPROVED BY *Saitluk 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).

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

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
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

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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%

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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 : 2505-0593DSC-2
Procedure Used :-

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

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2188080	24I1022	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

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
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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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. T252280

Certificate of Calibration

Page 1 of 4

Equipment : Chamber (Incubator)

Manufacturer : Memmert

Model : ICP 750

Serial No. : F818.0075

Customer Code : BKK_EN0305

ID No. : T9571A4

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 : 17 December 2025

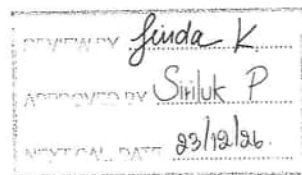
Calibrated By : Atiphong Rongrat (Technician)

Approved By : Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 12 JAN 2026

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 Center.



Metrology Center

SCI ECO Services Company Limited

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



Certificate No. T252280

Page 2 of 4

Calibration Report

Equipment : Chamber (Incubator)

Date of Calibration : 23 December 2025

Environment : Temperature : 23.4-24.9 °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 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)	T250835	24 May 2026
RTD	100 ohm	32-(CH1-10)	T250835	24 May 2026
DATA LOGGER	34970A	T193	T250835	24 May 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 - Minute At 20 °C
 Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

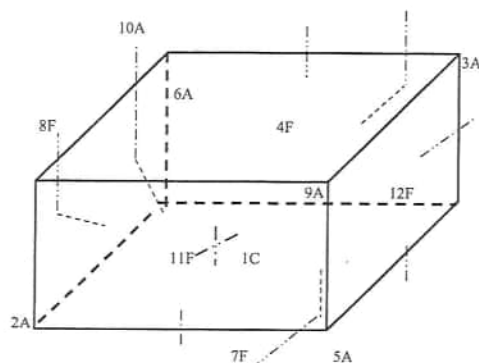
5. Adjustment :

(X) without adjustment

() after adjustment

Approved By: Boonchai Suriyawong

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. Dr. L.

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	20.14	20.33	20.04	20.35	20.03	19.87	19.92	20.24	20.29	20.20	19.93	19.81

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
25	24.96	25.23	25.12	25.17	25.24	24.99	25.09	24.97	25.27	25.08	25.31	25.17

Chamber (Incubator)		Temperature Distribution					
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)	Coverage Factor k
	Min	Max					
20.0	-	20.0	20.09	0.10	0.41	0.38	2.02
25.0	-	25.0	25.13	0.10	0.37	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 % .

Approved By. Dr. L.



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



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

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

REVIEW BY *Srisuda K*
APPROVED BY *Srisuda P*
NEXT CAL DATE 03/09/26

Approved by :
() Ponpan Paipim
(✓) Chakrit Waewwanjua

Approved Signatory

Issue Date : 3 September 2025

Condition of this result of calibration

1. Reference Standard Instruments :

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
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 :

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
10	9.9941	0.0082	2.00
25	24.9804	0.0087	2.00
50	49.9819	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 %.

-oOo-

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.



Certificate No. T260369

Certificate of Calibration

Page 1 of 4

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 : 25 February 2026
 Calibrated By : Atiphong Rongrat (Technician)
 Approved By :  / Boonchai Suriyawong (Site Calibration Manager)
 Date of Issue : 24 APR 2026

REVIEW BY: 
 APPROVED BY: 
 NEXT CAL DATE: 02/03/27

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

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Certificate No. T260369

Page 2 of 4

Calibration Report

Equipment : HOT BLOCK
 Date of Calibration : 5 March 2026
 Environment : Temperature : 24.8-25.5 °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	T250838	24 May 2026
TC	TYPE T	TN251-TN260	T250838	24 May 2026
DATA LOGGER	34970A	T193	T250838	24 May 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 30 Minute At 150 °C
 Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

() without adjustment

(X) after adjustment

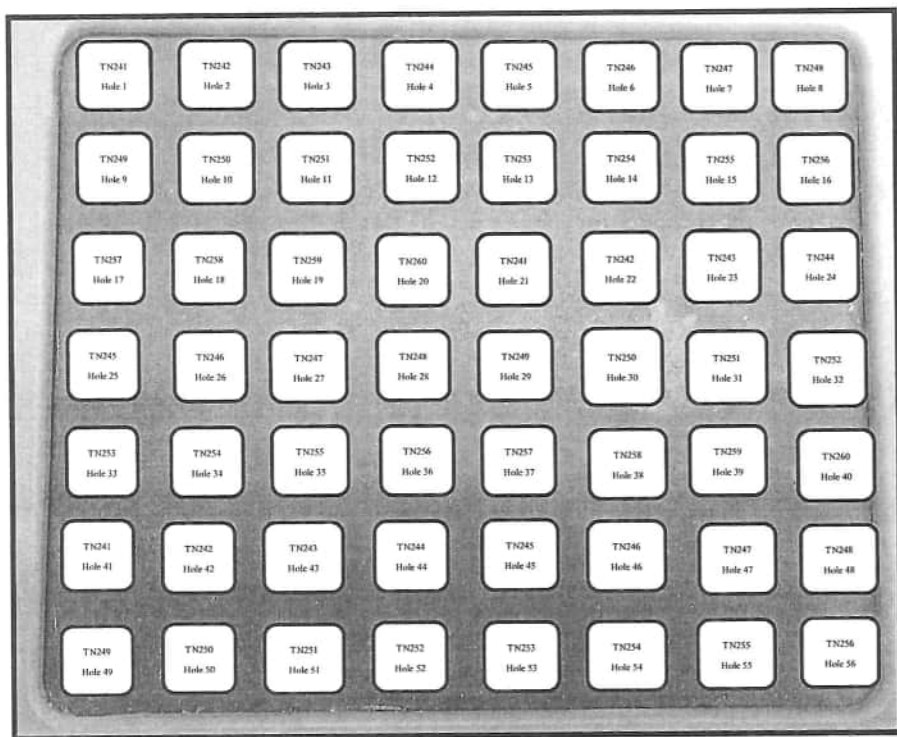
Approved By: 



Certificate No. T260369

Pa 3 of 4

Calibration Report



FRONT CONTROL

Approved By: _____

[Signature]



Certificate No. T260369

Page 4 of 4

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	150.33	148.50	149.89	149.66	151.02	148.31	149.60	149.13	150.29	149.92
	Min	150.18	148.28	149.82	149.42	150.81	148.03	149.41	148.82	150.17	149.82
	Average	149.32	150.10	150.10	149.53	149.39	149.33	149.37	149.60	149.42	149.87
		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
	Max	150.58	149.94	150.85	149.17	149.93	150.16	149.94	150.09	149.46	149.87
	Min	150.42	149.74	150.66	148.94	149.81	149.73	149.82	149.85	149.34	149.75
	Average	150.50	149.84	150.75	149.06	149.87	149.95	149.88	149.97	149.40	149.81
		TN241 Hole 21	TN242 Hole 22	TN243 Hole 23	TN244 Hole 24	TN245 Hole 25	TN246 Hole 26	TN247 Hole 27	TN248 Hole 28	TN249 Hole 29	TN250 Hole 30
	Max	150.04	149.86	149.65	149.81	149.74	149.51	149.32	149.72	150.00	149.23
	Min	149.85	149.60	149.32	149.67	149.58	149.36	149.16	149.60	149.86	148.98
	Average	149.94	149.73	149.49	149.74	149.66	149.43	149.24	149.66	149.93	149.10
		TN251 Hole 31	TN252 Hole 32	TN253 Hole 33	TN254 Hole 34	TN255 Hole 35	TN256 Hole 36	TN257 Hole 37	TN258 Hole 38	TN259 Hole 39	TN260 Hole 40
	Max	149.58	149.90	150.38	149.43	149.21	149.82	149.84	149.10	149.92	149.80
	Min	149.42	149.77	149.19	149.11	149.11	149.66	149.71	148.79	149.71	149.68
	Average	149.50	149.83	149.78	149.27	149.16	149.74	149.78	148.95	149.82	149.74
		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	149.51	149.78	149.28	149.43	149.46	149.54	149.16	149.48	149.55	149.03
	Min	149.38	149.65	149.14	149.26	149.35	149.40	148.97	149.38	149.36	148.89
	Average	149.44	149.71	149.21	149.35	149.40	149.47	149.07	149.43	149.45	148.96
		TN251 Hole 51	TN252 Hole 52	TN253 Hole 53	TN254 Hole 54	TN255 Hole 55	TN256 Hole 56				
	Max	149.78	149.59	150.56	149.47	149.35	149.38				
	Min	149.62	149.39	150.38	149.25	149.10	149.21				
	Average	149.70	149.49	150.47	149.36	149.22	149.30				

HOT BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (± °C)	Uncertainty (± °C)
	Min , Max	Average		
150.2	150.2 , 150.3	150.3	0.22	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]



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



Cert. No. : 25CHO537
Page : 2 of 3

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

REVIEW BY *Jinda K*

APPROVED BY *Siriluk P*

NEXT CAL DATE 08/10/26

Calibrated by : Uthen Kankawi

Approved by :

Saithip
Approved Signatory

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

Issue Date : 9 October 2025

Condition of calibration result

1. Reference Standard Material :

Material	Serial No.	Certificate No.	Due date
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

Certified Values of Reference Material (nm)	UUC Reading (nm)	Uncertainty of Measurement (± nm)	Coverage Factor k
418.40	418	0.59	2.00
479.88	480	0.59	2.00
513.75	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

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. : 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 %.

-000-

**Agilent Technologies**

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
Website: www.agilent.com/chem

BKK_EL0043

Customer Contact:

ALS Laboratory Group (Thailand) Co
Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd
Khwaeng Phatthanakan Khet Suan

TAX ID : 0105540004859

Chanattagarn.lmchom@alsglobal.com
27603068

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

products | applications | software | services

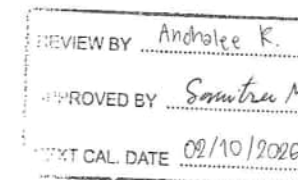
Agilent Technologies (Thailand) Limited, Head Office
U Chu Liang Bldg. 22/F Unit A,D
968 Rama 4 Road, Silom, Bangrak,
Bangkok 10500 Thailand
Tax ID : 0105542068218

SERVICE REPORT

Customer Purchase Order Number:	Customer Number: 70371013
Service Request:	Service Request Date:
Service Order: 6007607368	Service Confirmation: 6906615981

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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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 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	03.10.2025	03.10.2025
1010	5185-5850	ICP-MS Checkout Solutions	1.00	Agreement Entitlement - 100 % covered		

Additional Information:

Service Information:

Problem Description: *WU-EQQ-IM-7900-5001413366		
Service Provided: Perform OQ hardware control. Test logon , tune , BG and stability. Test OQ control of instrument ICPMS=BKK_EL0043 After done the instrument test all pass.		
Service Overview Code: Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
Reported Hours: 5.0	Travel Hours: 1.5	
Customer Field Service Representative Name: Panthev Kurasathain	Customer Field Service Representative Signature: 	Date: 03 Oct 2025
Customer Name: Anchalee Khamjan	Customer Signature: 	Date: 03 Oct 2025
Additional Comments:		



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



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 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

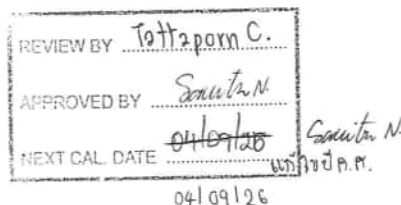
Customer Location : Acid Digestion Lab

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.

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

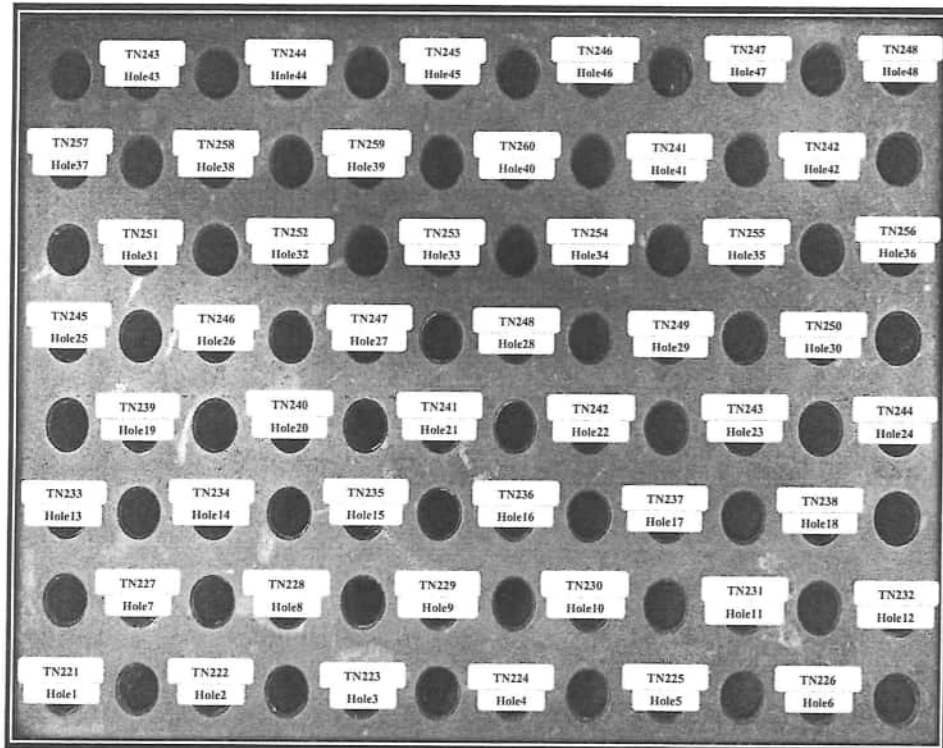
5. Adjustment :

() without adjustment

(X) after adjustment

Approved By: Boonchai

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
	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. 

Calibration Report

Measurement Results:

HEATING BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (± °C)	Uncertainty (± °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. 



NSC-TISI-TIS 17025
CALIBRATION 0244

Certificate No. T250873

Certificate of Calibration

Page 1 of 4

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 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.



NSC-TISI-TIS 17025
CALIBRATION 0244

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 :

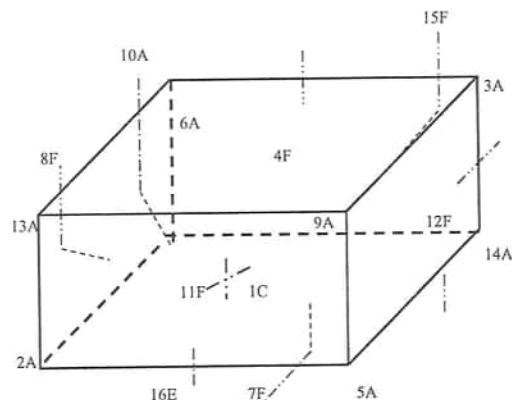
(X) without adjustment () after adjustment

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

	Average Standard Reading at each position (°C)											
Calibration Point	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. _____



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PAITANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 25T1455
Page : 1 of 2

Equipment : Digital Thermometer With Sensor
Manufacturer: Testo
Model : 106
Serial No.: 83638005/0122
ID No.: BKK_LG0059

Condition As-Received: Used Item

Received Date: 22 August 2025

Calibration Date: 05 September 2025
to 09 September 2025

Reference: 2508-0752DSC

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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.

Submitted by: ALS Laboratory Group (Thailand) Co.,Ltd.

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

Procedure used: Calibration were conducted using in-house calibration procedure CP-T01 according to comparison with Industrial
Platinum Resistance Thermometer (IPRT) into liquid bath temperature controller.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Black Stack Thermometer	1560	8C454	25I625	06 Jun 2026
2) PRT Scanner Module	2562	A01303	25I625	06 Jun 2026
3) Industrial Platinum Resistance Thermometer	5627-12	571971	25I625	06 Jun 2026

2. The 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:-

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

REVIEW BY	
APPROVED BY	
NEXT CAL DATE	05/09/26

Calibrated by : Sitthithon Poomai
Issue Date : 11 September 2025

Approved Signatory :

- [] Phalinee Prabpaipal
[] Chatchawan Khunpiluek
[✓] Wanlop Larperkern



Cert. No.: 25T1455
Page.: 2 of 2

Result of Calibration:-

Without Adjustment

Function: Temperature measurement

Dimension of probe : Diameter 3 mm, Length 55 mm Sheath material : Stainless Steel

Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (± °C)
50	25.0062	25.0	-0.0062	0.12
50	45.0015	45.0	-0.0015	0.12

UUC* : Unit Under Calibration

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

-oOo-



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



NSC-TISI-TIS 17025
CALIBRATION 0244



Metrology

SCI ECO Services Company Limited

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



NSC-TISI-TIS 17025
CALIBRATION 0244

Certificate No. T250353

Calibration Report

Page 2 of 4

Certificate No. T250353

Page 1 of 4

Certificate of Calibration

Equipment : Autoclave

Manufacturer : TOMY

Model : SX-700

Serial No. : 48134190

Customer Code : BKK_ML0041

ID No. : T7725A3

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

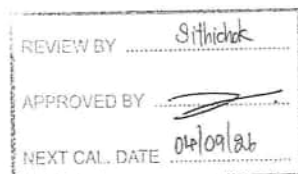
Customer Location : Washing Room

Date of Receipt : 26 February 2025

Calibrated By : Boonchai Suriyawong (Site Calibration Manager)

Approved By :  / Sujjar Naknakred (Site Calibration Manager)

Date of Issue : 10 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.

Equipment : Autoclave
Date of Calibration : 4 March 2025
Environment : Temperature : 22.2-25.4 °C
Line Voltage : 221.1-224.7 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 3 standard temperature recorder into its chamber and test according to WI-T23 inhouse method.(based on BS 2646-1 : 2021)
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	Standard No.	Certificate No.	Due Date
1. Temperature recorder	RTD	T210	T242028	11 December 2025
2. Temperature recorder	RTD	T211	T242029	11 December 2025
3. Temperature recorder	RTD	T212	T242030	11 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 :

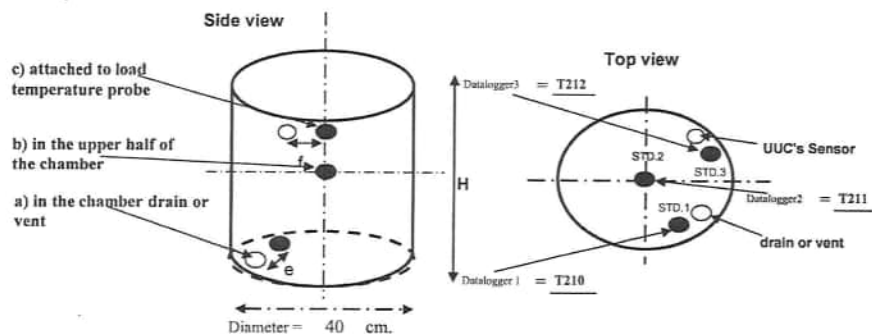
Pressure Indicator 0.11-0.12 MPa At 121 °C Holding time 20 minute

5. Adjustment :

(X) without adjustment () after adjustment

Approved By 

Calibration Report



Remark :

Size of Installed Standard sensor STD.1 : Distance the chamber drain or vent $e \leq 10$ cm. (less than or be equal to 10 cm.)

Size of Installed Standard sensor STD.2 : Geometric Center (upper half of the chamber)

Size of Installed Standard sensor STD.3 : Distance UUC's Sensor $f = 2$ cm.

Measurement Results :

Calibration Point	Average Standard Reading at each position ($^{\circ}\text{C}$)		
	T210	T211	T212
121	121.2	121.1	121.1

Autoclave			Temperature Distribution				
Setting ($^{\circ}\text{C}$)	Reading ($^{\circ}\text{C}$)		Average ($^{\circ}\text{C}$)	Stability ($\pm^{\circ}\text{C}$)	Uniformity ($\pm^{\circ}\text{C}$)	Uncertainty ($\pm^{\circ}\text{C}$)	Coverage Factor k
	Min , Max	Average					
121	-	121	121.2	0.1	0.1	0.65	2.00

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

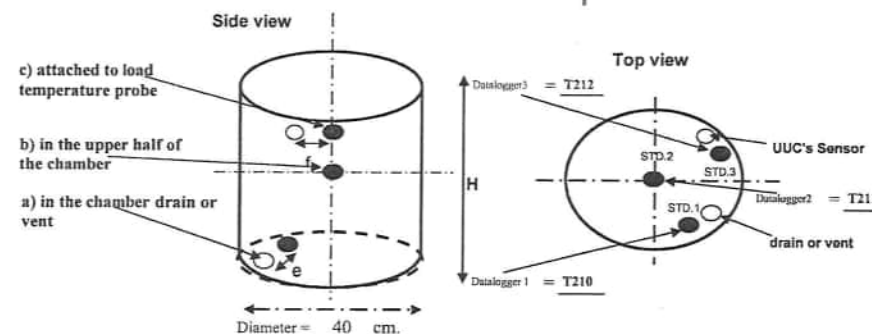
The result of test was found accurate as shown on date and place of test only.

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. _____

Calibration Report



Remark :

Size of Installed Standard sensor STD.1 : Distance the chamber drain or vent $e \leq 10$ cm. (less than or be equal to 10 cm.)

Size of Installed Standard sensor STD.2 : Geometric Center (upper half of the chamber)

Size of Installed Standard sensor STD.3 : Distance UUC's Sensor $f = 2$ cm.

Measurement Results :

Calibration Point	Average Standard Reading at each position ($^{\circ}\text{C}$)		
	T210	T211	T212
121	121.18	121.12	121.13

Autoclave			Temperature Distribution				
Setting ($^{\circ}\text{C}$)	Reading ($^{\circ}\text{C}$)		Average ($^{\circ}\text{C}$)	Stability ($\pm^{\circ}\text{C}$)	Uniformity ($\pm^{\circ}\text{C}$)	Uncertainty ($\pm^{\circ}\text{C}$)	Coverage Factor k
	Min , Max	Average					
121	-	121	121.16	0.10	0.10	0.65	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.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert. No.: 25TM1235
Page : 1 of 3

Equipment : Incubator

Manufacturer : Memmert

Model : IPP750eco

Serial No. : V821.0172

ID No. : BKK_ML0231

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

Location : Incubation & Microbiological Reading

Received Order : 21 August 2025

Calibration Date : 21 August 2025

Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$

Relative Humidity : $(50 \pm 30) \%$

AC Line Voltage : $(220 \pm 22) \text{ V}$

Calibrated by : Khit Ruttanaprapachai

Approved by :

() Chakrit Waewwanjua

() Suwit Imjai

(✓) Kunchit Promprat

Issue Date : 25 August 2025

REVIEW BY Sithichok T.

APPROVED BY [Signature]

NEXT CAL DATE: 21/08/26



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2508-0459OC-2

Cert. No.: 25TM1235
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44073381	25LM82	TPA	17 May 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 :

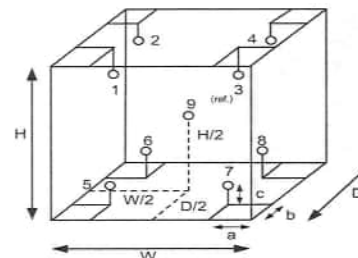
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	21	20
REL.Humid. (%)	62	65
AC Supply (Volt)	222	221



Probe Installation Details :

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

Dimension of Chamber :

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

Position :	Ref. Std. ID No.:
1	25-01RTD-01
2	25-01RTD-02
3	25-01RTD-03
4	25-01RTD-04
5	25-01RTD-05
6	25-01RTD-06
7	25-01RTD-07
8	25-01RTD-08
9 (ref.)	25-01RTD-09

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 : Incubator
 Condition As-Received : Used Item
 Reference : 2508-04590C-2
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Not Available

Cert. No.: 25TM1235
 Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor <i>k</i>
35.0	35.0	35.0	0.12	0.37	0.43	2
37.0	37.0	37.0	0.15	0.47	0.49	2
41.5	41.5	41.5	0.13	0.79	0.84	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	34.834	34.929	34.924	34.849	34.856	34.954	35.002	35.002	35.127	0.30
37.0	36.940	37.065	37.010	36.921	36.883	36.973	37.043	37.045	37.235	0.31
41.5	41.641	41.838	41.742	41.484	41.249	41.427	41.466	41.495	41.926	0.34

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

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

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

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

UUC* : Unit Under Calibration

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

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

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Certificate of Calibration

Cert. No.: 25TM525
 Page : 1 of 3

Equipment : Hot Air Oven
 Manufacturer : Binder
 Model : ED 240/E2
 Serial No. : 00-15533
 ID No. : BKK_ML0013

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

Received Order : 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 : Uthen Kankawi

Approved by :

Approved Signatory

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

Issue Date : 16 October 2025

The Uncertainties are for a confidence probability of approximately 95%

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REVIEW BY Sithichak T.

APPROVED BY [Signature]

NEXT CAL DATE 09/04/27



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2510-0042OC-3

Cert. No.: 25TM525
 Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY59003411	24LM192	TPA	24 Dec 2025

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

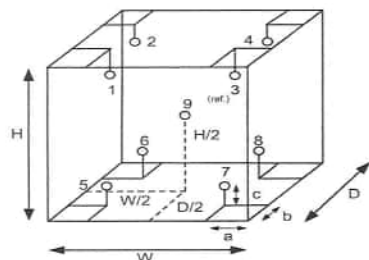
3. This measurement result is traceable to the International System of Unit maintained through :

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :

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

Dimension of Chamber :

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

Environment during calibration		
	Beginning	Finished
Temp. (°C)	23	24
REL.Humid. (%)	54	56
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	23-20TC-01
2	23-20TC-02
3	23-20TC-03
4	23-20TC-04
5	23-20TC-05
6	23-20TC-06
7	23-20TC-07
8	23-20TC-08
9 (ref.)	23-20TC-09



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2510-0042OC-3
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Close

Cert. No.: 25TM525
 Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
170	170	170	0.45	1.3	2.3	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
170	169.588	170.427	168.486	168.900	169.725	169.499	168.946	169.327	169.529	1.3

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

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

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

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

UUC* : Unit Under Calibration

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

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

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



Certificate of Calibration

Cert. No.: 26TM111

Page : 1 of 3

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 45
Serial No. : L712.0429
ID No. : BKK_ML0056

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

Location : Incubation & Microbiological Reading

Received Order : 04 February 2026
Calibration Date : 04 - 05 February 2026
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Preecha Hlahib

Approved by :

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

Issue Date : 16 February 2026

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.

REVIEW BY Sithichok T.
APPROVED BY [Signature]
NEXT CAL DATE 04/02/27



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2602-0026OC-1

Cert. No.: 26TM111
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:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY59003411	25LM177	TPA	26 Dec 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 :

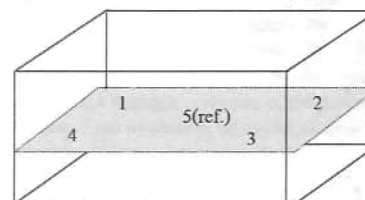
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	25	55	220
Finished of Calibration	20	69	220



Front

Position :	Ref. Std. ID No.:
1	4804539-001
2	4804539-002
3	4804539-003
4	4804539-004
5(ref.)	4804539-005



Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2602-0026OC-1
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 26TM111
 Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			Position					
			1	2	3	4	5 (ref.)	
44.5	44.4	44.4	44.462	44.470	44.480	44.460	44.457	0.15
45.0	44.9	44.9	44.958	44.971	44.983	44.965	44.966	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
44.5	0.051	0.025	2
45.0	0.047	0.032	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 of Calibration

Equipment: pH METER
 Manufacturer: SI Analytics
 Model: TitroLine 7000
 Serial No.: 10013826
 ID No.: BKK_EN0373
 Condition of the item: Normal

Certificate No.: C07250317
 Job No.: WO-00076560
 Issued Date: 30 June 2025
 Due Date: 30 June 2026
 Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd.
 104 Soi Pattanakarn 40, Pattanakarn Rd.,
 Suan Luang, Bangkok 10250 Thailand

REVIEW BY *Jinda K*
 APPROVED BY *Sihluk P*
 NEXT CAL. DATE *30/06/26*

Environment Condition: Temperature 22.3 °C ± 0.1 °C
 Relative Humidity 56.3 % ± 0.4 %

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)
 104 Soi Pattanakarn 40, Pattanakarn Rd.,
 Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Pongpisut Suebchantha
 Calibration Date: 30 June 2025
 The Method Used: In house method, CAL-WI-58, base on ASTM E 70-07
 Traceability: This certificate is traceable to SI Units, Sample Test is assured through primary measurement method Harned cell, through CPAchem Ltd. (ISO/IEC 17034) Certificate No. 1100242, 1100244, 1034231 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA20240602EA

Mr. Pongpisut Suebchantha
 (Mr. Pongpisut Suebchantha)
 Person in charge

Miss Kaewkan Suradech
 (Miss Kaewkan Suradech)
 Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (*k*=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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 DKSH Technology Limited
 2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
 2533 Sukhumvit Road, Bangchak, Phra Khanong, Bangkok 10260
 Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C07-15: 30 Jun 2025

Calibration Results:

pH Scale

Input	pH Meter Reading			Uncertainty of Measurement (mV)	Coverage Factor (k)
	(mV)	Error (mV)	(pH)		
414.12	413.9	-0.22	0.000	0.065	2.00
354.96	354.8	-0.16	1.000	0.065	2.00
295.8	295.7	-0.10	2.001	0.065	2.00
236.64	236.6	-0.04	3.001	0.065	2.00
177.48	177.4	-0.08	4.000	0.065	2.00
118.32	118.3	-0.02	5.000	0.065	2.00
59.16	59.1	-0.06	6.000	0.065	2.00
0	0.0	0.00	7.000	0.065	2.00
-59.16	-59.1	0.06	8.000	0.065	2.00
-118.32	-118.3	0.02	9.000	0.065	2.00
-177.48	-177.4	0.08	10.000	0.065	2.00
-236.64	-236.5	0.14	11.000	0.065	2.00
-295.8	-295.6	0.20	12.000	0.065	2.00
-354.96	-354.8	0.16	13.000	0.065	2.00
-414.12	-413.9	0.22	14.000	0.065	2.00

Sample Test Results

Manufacturer: Thermo Scientific Model: 8157BNUMD Electrode Serial No.: BW1-13563

The three-point calibration using three standard buffer solutions; pH 4.007 , pH 6.988 and pH 10.010

- During calibration, display of pH meter can be adjust to reading; pH 4.007 , pH 6.988 and pH 10.010

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.007	3.999	-0.008	0.0086	2.28
6.988	6.993	0.005	0.0085	2.00
10.010	10.013	0.003	0.013	2.00

Practical slope and zero point*

The three-point calibration using three standard buffer solutions; pH 4.007 , pH 6.988 and pH 10.010

- During calibration, display of pH meter can be adjust to reading; pH 4.007 , pH 6.988 and pH 10.010

The practical slope of the pH electrode; 57.73 (mV/pH), 97.58%

The zero point of the pH electrode; 6.41 (pH)

* Calibration Marked " Not TISI Accredited " in this Certificate have been included for completeness.

The End of Certificate

Checklist for pH Meter

Worksheet number: WO-00076560

Instrument type: pH METER

Model: TitroLine 7000

S/N: 10013826

Check (receive)		Checklist	Check (send)		Note
30 Jun 2025			30 Jun 2025		
Normal	Defective		Normal	Defective	
☒	☐	1. Integrity of the tools	☒	☐	
☒	☐	2. Cleanliness of tools	☒	☐	
☒	☐	3. On-Off Switch	☒	☐	
☒	☐	4. Keypad	☒	☐	
☒	☐	5. Display, Screen Contrast	☒	☐	
☒	☐	6. Electrode and Connection Cable	☒	☐	
☒	☐	7. Electrode (Level KCl)	☒	☐	
☒	☐	8. Electrode (Dust Protection Hood)	☒	☐	
☒	☐	9. Stand	☒	☐	

Recommend :

Mr.Pongpisut Suebchantha

Service Engineer



Certificate of Calibration

Equipment : Digital Thermometer with Probe
Manufacturer: SI Analytics
Model: TitroLine 7000
Serial No.: 10013826
ID No.: BKK_EN0373
Condition of the item: Normal

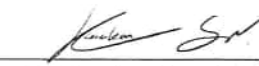
Certificate No. : C15250720
Job No. : WO-00076560
Issued Date : 1 July 2025
Due Date: 30 June 2026
Page: 1 of 2

Customer : ALS Laboratory Group (Thailand) Co., Ltd.
 104 Soi Pattanakarn 40, Pattanakarn Rd.,
 Suan Luang, Bangkok 10250 Thailand

Environment Condition : Temperature: 30 °C ± 10 °C
 Humidity: 55 %RH ± 25 %RH
 Voltage: 220 VAC ± 10 %

Calibration Place : ALS Laboratory Group (Thailand) Co., Ltd.(Wet Chemistry Lab 2)
 104 Soi Pattanakarn 40, Pattanakarn Rd.,
 Suan Luang, Bangkok 10250 Thailand

Calibration By : Ms. Kaewkan Suradech
Calibration Date : 30 June 2025
The Method used : In house method, CAL-WI-69, by comparison with standard thermometer
Traceability : This certificate is traceable to the International System of Unit maintained by: Quality Reborn Co.,Ltd. (QR)



(Miss Kaewkan Suradech)

Person in charge



(Mr. Tweewong Thaihiang)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.



Certificate No.: C15250720

Page: 2 of 2

Reference standard equipment:

Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR24-2043	21 August 2024	21 August 2025

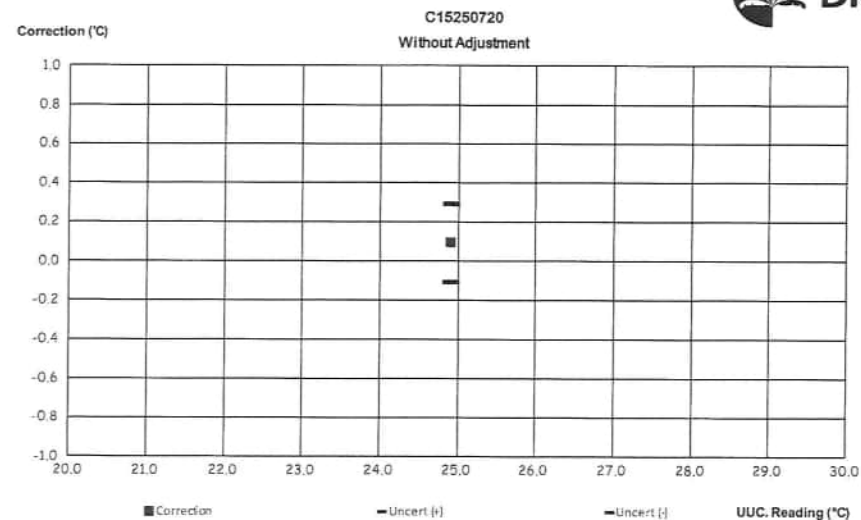
Calibration Results:

Without Adjustment

Sensor Type: RTD Electrode Serial No.: BW1-13563 Channel: -
Diameter (mm): 12 Length (mm): 120 Immersion (mm): 120

Calibrate Point.(°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
25.0	24.994	24.9	0.094	0.20

The End of Certificate



**ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ
(Digital Thermometer Checklist)**

Equipment : Digital Thermometer with Probe

Certificate No. : C15250720

Serial No. : 10013826

Model : TitroLine 7000

Check Date		รายการตรวจเช็ค (Description)	Check before delivery		หมายเหตุ (Remark)
30-Jun-2025			30-Jun-2025		
Normal	Defective		Normal	Defective	
		General			
☒	☐	1. สายไฟ (Electric wire)	☒	☐	
☒	☐	2. Adaptor / Power supply 220 / 110 VAC	☒	☐	
☒	☐	3. การทำงาน (On/Off Switch)	☒	☐	
☒	☐	4. การทำงาน (Selector Key)	☒	☐	
☒	☐	5. หน้าจอแสดงผล (Display)	☒	☐	
☐	☐	6. แบตเตอรี่ (Battery)	☐	☐	ไม่มี
☒	☐	7. สภาพตัวเครื่อง (Equipment Body)	☒	☐	
☒	☐	8. หัววัดเซ็นเซอร์ (Sensor (In / Ex)	☒	☐	

Note :

Ms. Kaewkan Suradech
Service Engineer



Certificate of Calibration

Equipment:	CONDUCTIVITY METER	Certificate No.:	C24250156
Manufacturer:	Thermo Scientific	Job No.:	WO-00076560
Model:	ORION STAR A215	Issued Date:	30 June 2025
Serial No.:	X58031	Due Date:	30 June 2026
ID No.:	BKK_EN0373	Page:	1 of 2
Condition of the item:	Normal		

Customer: ALS Laboratory Group (Thailand) Co., Ltd.
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature 22.5 °C ± 0.1 °C
Relative Humidity 56.2 % ± 0.4 %

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Pongpisut Suebchantha

Calibration Date: 30 June 2025

The Method Used: In house method, CAL-WI-49, base on ASTM D 1125-14 and D 5391-14

Traceability: This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 1066607, 1066608, 1066609


(Mr. Pongpisut Suebchantha)

Person in charge


(Miss Kaewkan Suradech)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

Calibration Results:
Manufacturer: Thermo Scientific **Model :** ORION 013005MD **Electrode Serial No.:** YV1-18416

Before Adjustment

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor (k)	Uncertainty (±)
84.003 $\mu\text{S/cm}$	91.88 $\mu\text{S/cm}$	-7.877 $\mu\text{S/cm}$	2.00	0.68 $\mu\text{S/cm}$
1413.1 $\mu\text{S/cm}$	1445 $\mu\text{S/cm}$	-31.9 $\mu\text{S/cm}$	2.00	11 $\mu\text{S/cm}$
12.881 mS/cm	13.06 mS/cm	-0.179 mS/cm	2.00	0.098 mS/cm

After Adjustment ; at 84.003 $\mu\text{S/cm}$, 1413.1 $\mu\text{S/cm}$, 12.880 mS/cm

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor (k)	Uncertainty (±)
84.003 $\mu\text{S/cm}$	84.14 $\mu\text{S/cm}$	-0.137 $\mu\text{S/cm}$	2.00	0.68 $\mu\text{S/cm}$
1413.1 $\mu\text{S/cm}$	1413 $\mu\text{S/cm}$	0.1 $\mu\text{S/cm}$	2.00	11 $\mu\text{S/cm}$
12.881 mS/cm	12.89 mS/cm	-0.009 mS/cm	2.00	0.098 mS/cm

The End of Certificate
Checklist for Conductivity Meter

Worksheet number: WO-00076560

Instrument type: Conductivity Meter

Model: ORION STAR A215

S/N: X58031

Check (receive)		Checklist	Check (send)		Note
30 Jun 2025			30 Jun 2025		
Normal	Defective		Normal	Defective	
☒	☐	1. Integrity of the tools	☒	☐	
☒	☐	2. Cleanliness of tools	☒	☐	
☒	☐	3. On-Off Swithc	☒	☐	
☒	☐	4. Keypad	☒	☐	*
☒	☐	5. Display, Screen Contrast	☒	☐	
☒	☐	6. Electrode and Connection Cable	☒	☐	
☐	☐	7. Electrode (Dust Protection Hood)	☐	☐	
☒	☐	8. Stand	☒	☐	

Recommend : * ปุ่มกดเลื่อน ขึ้น-ลง,ซ้าย-ขวา กดยาก

Mr. Pongpisut Suebchantha
Service Engineer



Certificate of Calibration

Certificate No.: C15250721

Page: 2 of 2

Equipment : Digital Thermometer with Probe
Manufacturer: Thermo Scientific
Model: ORION STAR A215
Serial No.: X58031
ID No.: BKK_EN0373
Condition of the item: Normal

Certificate No. : C15250721
Job No. : WO-00076560
Issued Date : 1 July 2025
Due Date: 30 June 2026
Page: 1 of 2

Customer : ALS Laboratory Group (Thailand) Co., Ltd.
 104 Soi Pattanakarn 40, Pattanakarn Rd.,
 Suan Luang, Bangkok 10250 Thailand

Environment Condition : Temperature: 30 °C ± 10 °C
 Humidity: 55 %RH ± 25 %RH
 Voltage: 220 VAC ± 10 %

Calibration Place : ALS Laboratory Group (Thailand) Co., Ltd.(Wet Chemistry Lab 2)
 104 Soi Pattanakarn 40, Pattanakarn Rd.,
 Suan Luang, Bangkok 10250 Thailand

Calibration By : Ms. Kaewkan Suradech
Calibration Date : 30 June 2025
The Method used : In house method, CAL-WI-69, by comparison with standard thermometer
Traceability : This certificate is traceable to the International System of Unit maintained by:
 Quality Reborn Co.,Ltd. (QR)

Reference standard equipment:

Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR24-2043	21 August 2024	21 August 2025

Calibration Results:

Without Adjustment

Sensor Type: RTD Electrode Serial No.: YV1-18416 Channel: -
 Diameter (mm): 15 Length (mm): 120 Immersion (mm): 120

Calibrate Point.(°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
25.0	24.994	25.0	-0.006	0.20

The End of Certificate

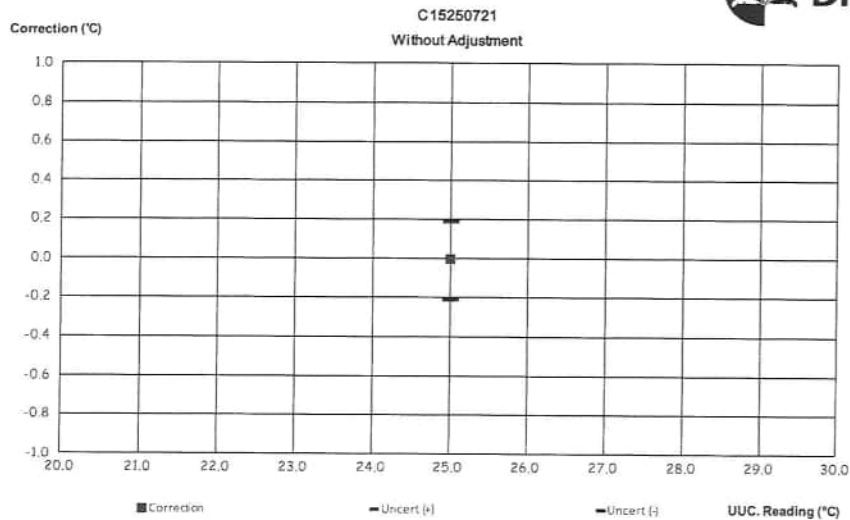

 (Miss Kaewkan Suradech)
 Person in charge


 (Mr. Tweewong Thaihiang)
 Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.



ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ (Digital Thermometer Checklist)

Equipment : Digital Thermometer with Probe

Certificate No. : C15250721

Serial No. : X58031

Model : ORION STAR A215

Check Date		รายการตรวจเช็ค (Description)	Check before delivery		หมายเหตุ (Remark)
30-Jun-2025			30-Jun-2025		
Normal	Defective		Normal	Defective	
		General			
☒	☐	1. สายไฟ (Electric wire)	☒	☐	
☒	☐	2. Adaptor / Power supply 220 / 110 VAC	☒	☐	
☒	☐	3. การทำงาน (On/Off Switch)	☒	☐	
☒	☐	4. การทำงาน (Selector Key)	☒	☐	
☒	☐	5. หน้าจอแสดงผล (Display)	☒	☐	
☐	☐	6. แบตเตอรี่ (Battery)	☐	☐	ไม่มี
☒	☐	7. สภาพตัวเครื่อง (Equipment Body)	☒	☐	
☒	☐	8. หัววัดเซ็นเซอร์ (Sensor (In / Ex)	☒	☐	

Note :

Ms. Kaewkan Suradech

Service Engineer

Certificate of Calibration

Equipment: Automatic Titrator
Manufacturer: SI Analytics
Model: TitroLine 7000
Serial No.: 10013826
ID No.: BKK_EN0373
Type of Titration : Motor - driven
Condition of the item: Normal

Certificate No.: C32250030
Job No.: WO-00076560
Issued Date: 30 June 2025
Due Date: 30 June 2026
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd.
 104 Soi Pattanakarn 40, Pattanakarn Rd.,
 Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature 22 °C ± 0.4 °C
 Relative Humidity 56 % ± 1.4 %
 Atmospheric Pressure 1009 mbar ± 0.4 mbar

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)
 104 Soi Pattanakarn 40, Pattanakarn Rd.,
 Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 30 June 2025

The Method Used: In house method, CAL-WI-57, base on ISO 8655:2002

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C01243206


 (Mr. Atachai Ngamchanat)

Person in charge


 (Miss Kaewkan Suradech)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

Calibration Results:

Nominal Volume 20 ml

Manufacturer: SI Analytics **Burettes Model :** TZ 3920 **Serial No., Nr :** 007734
Exchange Unit Model : WA-20 **Exchange Unit Serial No. :** 10045524 **Nominal Vol.:** 20 ml

Piston burettes of volumetric apparatus for automatic titrator

Volume (%)	Volume (ml)	Measurement Volume (V_{20}) (ml)	Systematic error (trueness)		Random error (precision)		Measurement Uncertainty (μ)	k
			es (%)	es (μ)	CV (%)	S _r (μ)		
10%	2.0000	1.9997	-0.002	-0.3	0.004	0.7	0.73	2.04
50%	10.0000	10.0076	0.038	7.6	0.003	0.7	1.0	2.00
100%	20.0000	20.0026	0.013	2.6	0.003	0.6	1.5	2.00

ISO 8655-3:2002(E) Table 1 - Maximum permissible errors for motor-driven piston burettes

Nominal volume ml	Maximum permissible systematic error		Maximum permissible random error	
	± %	± μ ^a	± % ^b	± μ ^c
≤1	0.6	6	0.1	1
2	0.5	10	0.1	2
5	0.3	15	0.1	5
10	0.2	20	0.07	7
20	0.2	40	0.07	14
25	0.2	50	0.07	17.5
50	0.2	100	0.05	25
100	0.2	200	0.03	30

a Expressed as the deviation of the mean of tenfold measurement from the nominal volume or from the selected volume (see ISO 8655-6:2002, 8.4)

b Expressed as the coefficient of variation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

c Expressed as the repeatability standard deviation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

The End of Certificate

Checklist for Automatic Titrator

Worksheet number: WO-00076560

Instrument type: Automatic Titrator Model: TitroLine 7000

S/N: 10013826

Check (receive)		Checklist	Check (send)		Note
30 Jun 2025			30 Jun 2025		
Normal	Defective		Normal	Defective	
☒	☐	1. Integrity of the tools	☒	☐	
☒	☐	2. Cleanliness of tools	☒	☐	
☒	☐	3. On-Off Swicth	☒	☐	
☒	☐	4. Keypad	☒	☐	
☒	☐	5. Display, Screen Contrast	☒	☐	
☒	☐	6. Piston Burettes	☒	☐	
☒	☐	7. Function Rinsing and Dosing	☒	☐	
☒	☐	8. Dosing silicone tube and Accessories	☒	☐	

Recommend :

Mr. Atachai Ngamchanat
Service Engineer

Certificate of Calibration

Equipment: Automatic Titrator
Manufacturer: SI Analytics
Model: TitroLine 7000
Serial No.: 10013826
ID No.: BKK_EN0373
Type of Titration : Motor - driven
Condition of the item: Normal

Certificate No.: C32250031
Job No.: WO-00076560
Issued Date: 30 June 2025
Due Date: 30 June 2026
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd.
 104 Soi Pattanakarn 40, Pattanakarn Rd.,
 Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature 22 °C ± 0.2 °C
 Relative Humidity 56 % ± 1.9 %
 Atmospheric Pressure 1009 mbar ± 0.2 mbar

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)
 104 Soi Pattanakarn 40, Pattanakarn Rd.,
 Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 30 June 2025

The Method Used: In house method, CAL-WI-57, base on ISO 8655:2002

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C01243206


 (Mr. Atachai Ngamchanat)
 Person in charge


 (Miss Kaewkan Suradech)
 Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

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Certificate No.: C32250031 Page: 2 of 2

Calibration Results:

Nominal Volume 20 ml

Manufacturer: SI Analytics Burettes Model : TZ 3920 Serial No., Nr : 007773

Exchange Unit Model : WA-20 Exchange Unit Serial No. : 10045489 Nominal Vol.: 20 ml

Piston burettes of volumetric apparatus for automatic titrator

Volume (%)	Volume (ml)	Measurement Volume (V_{20}) (ml)	Systematic error (trueness)		Random error (precision)		Measurement Uncertainty (μ)	k
			es (%)	es (μ)	CV (%)	S _r (μ)		
10%	2.0000	2.0009	0.004	0.9	0.004	0.7	0.73	2.04
50%	10.0000	10.0050	0.025	5.0	0.002	0.4	0.90	2.00
100%	20.0000	20.0054	0.027	5.4	0.003	0.5	1.5	2.00

ISO 8655-3:2002(E) Table 1 - Maximum permissible errors for motor-driven piston burettes

Nominal volume ml	Maximum permissible systematic error		Maximum permissible random error	
	$\pm$ %	$\pm \mu$ ^a	$\pm$ % ^b	$\pm \mu$ ^c
≤ 1	0.6	6	0.1	1
2	0.5	10	0.1	2
5	0.3	15	0.1	5
10	0.2	20	0.07	7
20	0.2	40	0.07	14
25	0.2	50	0.07	17.5
50	0.2	100	0.05	25
100	0.2	200	0.03	30

a Expressed as the deviation of the mean of tenfold measurement from the nominal volume or from the selected volume (see ISO 8655-6:2002, 8.4)

b Expressed as the coefficient of variation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

c Expressed as the repeatability standard deviation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

The End of Certificate



Checklist for Automatic Titrator

Worksheet number: WO-00076560

Instrument type: Automatic Titrator Model: TitroLine 7000

S/N: 10013826

Check (receive)		Checklist	Check (send)		Note
30 Jun 2025			30 Jun 2025		
Normal	Defective		Normal	Defective	
☒	☐	1. Integrity of the tools	☒	☐	
☒	☐	2. Cleanliness of tools	☒	☐	
☒	☐	3. On-Off Swith	☒	☐	
☒	☐	4. Keypad	☒	☐	
☒	☐	5. Display, Screen Contrast	☒	☐	
☒	☐	6. Piston Burettes	☒	☐	
☒	☐	7. Function Rinsing and Dosing	☒	☐	
☒	☐	8. Dosing silicone tube and Accessories	☒	☐	

Recommend :

Mr. Atachai Ngamchanat

Service Engineer



REVIEW BY	Autcharawan S.
APPROVED BY	Tanayutorn S.
NEXT CAL. DATE	24/06/26

Certificate of Calibration

ICS-2100: Anion (ID#659)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co., Ltd.

ICS-2100 S/N: 11080010

AS-HV S/N: 5450A36659

For

ALS Laboratory Group (Thailand) Co., Ltd.



Operator Signature: _____

Date: June 17-24, 2025

(Mr.Soranat Thongnop)

Application Chemist