

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	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26
Water Lab	Total Dissolved Solids 180°C	Oven	BKK_EN0425	6-Oct-25	6-Oct-26
Water Lab	pH at 25 °C	pH meter	BKK_EN0342	9-Oct-25	9-Oct-26
Water Lab	Total Coliform	Autoclave	BKK_ML0041	4-Mar-25	4-Sep-26
Water Lab	Total Coliform	Incubator	BKK_ML0231	21-Aug-25	21-Aug-26
Water Lab	Total Coliform	Hot Air Oven	BKK_ML0013	9-Oct-25	9-Apr-27
Water Lab	Fecal Coliform	Autoclave	BKK_ML0041	4-Mar-25	4-Sep-26
Water Lab	Fecal Coliform	Incubator	BKK_ML0231	21-Aug-25	21-Aug-26
Water Lab	Fecal Coliform	Hot Air Oven	BKK_ML0013	9-Oct-25	9-Apr-27
Water Lab	Fecal Coliform	Water Bath	BKK_ML0056	4-Feb-26	4-Feb-27
Water Lab	Escherichia coli	Autoclave	BKK_ML0041	4-Mar-25	4-Sep-26
Water Lab	Escherichia coli	Incubator	BKK_ML0231	21-Aug-25	21-Aug-26
Water Lab	Escherichia coli	Hot Air Oven	BKK_ML0013	9-Oct-25	9-Apr-27
Water Lab	Escherichia coli	Water Bath	BKK_ML0056	4-Feb-26	4-Feb-27
Water Lab	Sulfide	Burette	BKK_EN0422	3-Sep-25	3-Sep-26
Water Lab	Sulfide	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26
Water Lab	Oil & Grease	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26
Water Lab	Oil & Grease	Water Bath	BKK_EN0439	9-Oct-25	9-Oct-26
Water Lab	Total Kjeldahl Nitrogen	Digestion Unit	BKK_EN0366	2-Mar-26	2-Mar-27
Water Lab	Total Kjeldahl Nitrogen	Discrete analyzer	BKK_EN0438	3-Sep-25	3-Sep-26
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26
Water Lab	Total Suspended Solids	Oven	BKK_EN0425	6-Oct-25	6-Oct-26
Water Lab	BOD	DO Meter	BKK_EN0017	20-May-25	20-Nov-26
Water Lab	BOD	Incubator	BKK_EN0305	23-Dec-25	23-Dec-26
Water Lab	BOD	Burette	BKK_EN0422	3-Sep-25	3-Sep-26
Water Lab	Settleable Solids	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26
Water Lab	Ammonia Nitrogen	Discrete analyzer	BKK_EN0438	3-Sep-25	3-Sep-26
Water Lab	Total Alkalinity	Burette	BKK_EN0422	3-Sep-25	3-Sep-26
Water Lab	Calcium Hardness	Burette	BKK_EN0422	3-Sep-25	3-Sep-26
Water Lab	Nitrate	Ion Chromatography	BKK_EN0069	24-Jun-25	24-Jun-26
Water Lab	Chloride	Ion Chromatography	BKK_EN0069	24-Jun-25	24-Jun-26
Water Lab	Staphylococcus aureus	Autoclave	BKK_ML0041	4-Mar-25	4-Sep-26
Water Lab	Staphylococcus aureus	Incubator	BKK_ML0231	21-Aug-25	21-Aug-26
Water Lab	Staphylococcus aureus	Hot Air Oven	BKK_ML0013	9-Oct-25	9-Apr-27
Water Lab	Pseudomonas aeruginosa	Autoclave	BKK_ML0041	4-Mar-25	4-Sep-26
Water Lab	Pseudomonas aeruginosa	Incubator	BKK_ML0231	21-Aug-25	21-Aug-26
Water Lab	Pseudomonas aeruginosa	Water Bath	BKK_ML0054	3-Dec-25	3-Dec-26
Water Lab	Pseudomonas aeruginosa	Hot Air Oven	BKK_ML0013	9-Oct-25	9-Apr-27
Water Lab	Cyanuric acid	Spectrophotometer	SGK_CL0100	12-Jan-26	12-Jan-27
Water Lab	Residual Free Chlorine	Chlorine Meter	CHW_FS0109	11-Dec-25	11-Dec-26

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	Teslo 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

Calibration certificate

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.	
Order no.	265054	
Number of pages	4	
Date of calibration	17 Jul 2025	

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

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

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

Calibration certificate No.: **25BCI0265**

Calibration Certificate

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
Twights - 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 g200 g	Center100,0000 g
110,0000 g200,0000 g	Front left100,0001 g
210,0000 g199,9999 g	Back left100,0000 g
310,0000 g200,0000 g	Back right100,0001 g
410,0000 g200,0000 g	Front right100,0001 g
510,0001 g199,9999 g	Maximum deviation from centric loading indication
610,0000 g200,0000 g	Δl _{ecc} max = 0,0001 g
710,0000 g200,0000 g	
810,0001 g200,0000 g	
910,0000 g200,0000 g	
1010,0000 g199,9999 g	
s = 0,00004 g s = 0,00005 g	

Error of indication

Testload <i>L</i>	Indication <i>I</i>	Error <i>E</i>	Expansion factor <i>k</i>	Uncertainty <i>U(E)</i>	Uncertainty relative <i>U_{rel}(E)</i>
0,0100 g	0,0100 g	0,0000 g	2,00	0,00012 g	1,2 %
0,1000 g	0,1000 g	0,0000 g	2,00	0,00013 g	0,13 %
1,0000 g	1,0000 g	0,0000 g	2,00	0,00013 g	0,013 %
2,0000 g	2,0000 g	0,0000 g	2,00	0,00013 g	0,0065 %
5,0000 g	5,0000 g	0,0000 g	2,00	0,00013 g	0,0026 %
10,0000 g	10,0000 g	0,0000 g	2,00	0,00013 g	0,0013 %
20,0000 g	20,0000 g	0,0000 g	2,00	0,00014 g	0,00068 %
50,0000 g	50,0000 g	0,0000 g	2,00	0,00015 g	0,00029 %
100,0000 g	100,0000 g	0,0000 g	2,00	0,00018 g	0,00018 %
200,0000 g	200,0000 g	0,0000 g	2,00	0,00028 g	0,00014 %
220,0000 g	220,0001 g	0,0001 g	2,00	0,00032 g	0,00015 %

Maximum error of indication |E_{max} = 0,0001 g

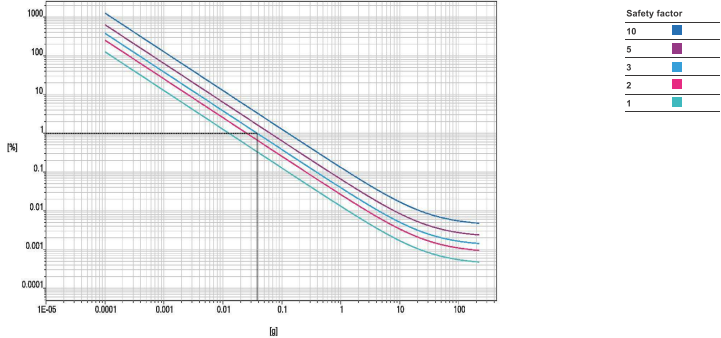
U_{rel}(E) is the quotient of *U(E)* and test load *L*. The uncertainty of measurement *U(E)* is valid only if error *E* is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.
Reference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

End of calibration certificate

Uncertainty of measurement in use

Device adjusted before measurement	Yes		
Temperature deviation considered	1.5 K (isoCAL active)		
Temperature coefficient considered	1 · 10 ⁻⁶ /K		
Uncertainty of the weighing result $U_{91}(W)$	$U_{91}(W) = 0.00013 \text{ g} + 4.19 \cdot 10^{-6} \cdot R$		
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 $U_{91}(W)$	Uncertainty relative $U_{91}(W)_{rel}$
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

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang
10310 Bangkok

Verical®
Version 6.6



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 Suriyawong (Site Calibration Manager)

Date of Issue : 10 OCT 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.



Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260



Certificate No. T251785

Page 2 of 3

Calibration Report

Equipment : Chamber (Oven)
Date of Calibration : 6 October 2025
Environment : Temperature : 24.4-25.8 °C
Line Voltage : 220.5-225.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2019) and AS2853-1986). All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	23-(CH1-10)	T250314	6 April 2026
DATA LOGGER	34970A	T195	T250314	6 April 2026

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant 2 Hour 14 Minute At 104 °C
Fresh Air Dampener ☒ Open ☒ Min ☐ Medium ☐ Max
☐ Close
☐ Not Available

5. Adjustment :

() without adjustment (X) after adjustment

Approved By.

[Signature]



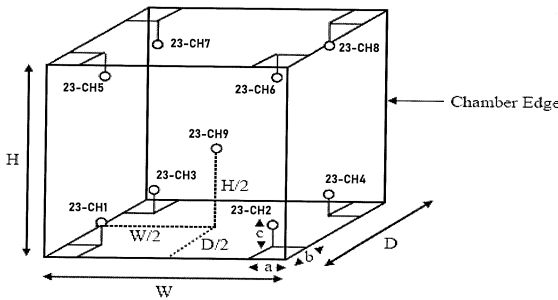
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SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260



Certificate No. T251785

Page 3 of 3

Calibration Report



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

Measurement Results

Average Standard Reading at each position (°C)									
Calibration Point	23-CH1	23-CH2	23-CH3	23-CH4	23-CH5	23-CH6	23-CH7	23-CH8	23-CH9
104	104.13	103.54	103.92	104.37	104.40	104.51	104.18	103.86	103.80
180	180.05	179.82	179.64	179.52	181.20	180.29	180.19	179.35	179.89
Chamber (Oven)			Temperature Distribution						
Setting °C	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k		
	Min , Max	Average							
104.0	-		104.0	104.08	0.28	0.87	0.45	2.00	
180.0	180.0 , 180.1		180.0	179.99	0.37	1.49	0.61	2.00	

* The quoted uncertainty exclude "uniformity"
The calibration result apply only the above calibrated item.
The result of test was found accurate as shown on date and place of test only.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

End of Certificate.

Approved By.

[Signature]



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 : Walalak Sirithean
Approved by :
() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai
Issue Date : 10 October 2025

REVIEW BY
APPROVED BY
NEXT CAL DATE: 09/10/26

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Ref. Standard Thermometer	4982054	110RC044	251708	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 S/N.: 252063043080	4.007	3.996	176.6	0.0046	2.00
	6.965	6.974	1.1	0.0084	2.00
	10.010	9.996	-176.9	0.0070	2.00

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

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.: 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 %.

-o-o-



Metrology

SCI ECO Services Company Limited

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

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

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

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



Certificate No. 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

REVIEW BY
APPROVED BY
NEXT CAL. DATE: 01/09/26

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

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

Certificate No. T250353

Calibration Report

Page 2 of 4

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. _____

FM-L15 118/18-08-66

Metrological Center

SCI ECO Services Company Limited

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

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

Website : www.scieco.co.th

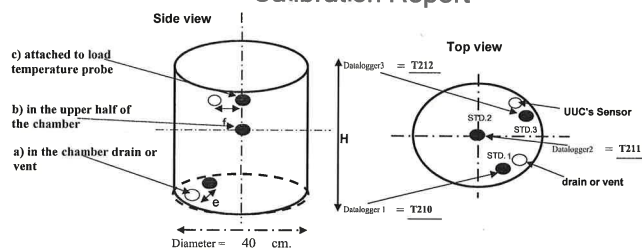
E-Mail : calibrate@scg.co.th

Certificate No. T250353

TEST REPORT (BKK_ML0041)

Page 4 of 4

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 (°C)		
	T210	T211	T212
121	121.18	121.12	121.13

Setting (°C)	Autoclave		Temperature Distribution				
	Min , Max	Average	Average (°C)	Stability (± °C)	Uniformity (± °C)	Uncertainty (± °C)	Coverage Factor k
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

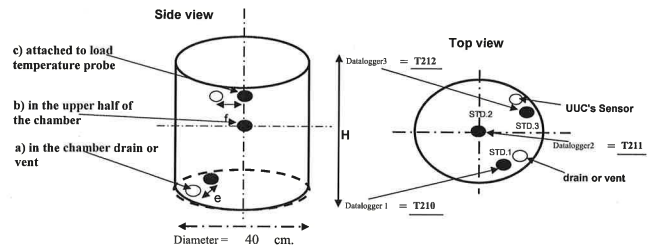
Approved By. _____

FM-L13 108/30-05-57

Certificate No. T250353

Calibration Report

Page 3 of 4



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 (°C)		
	T210	T211	T212
121	121.2	121.1	121.1

Setting (°C)	Autoclave		Temperature Distribution				
	Min , Max	Average	Average (°C)	Stability (± °C)	Uniformity (± °C)	Uncertainty (± °C)	Coverage Factor k
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. _____

FM-L15 118/18-08-66



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 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Khit Ruttanaprapachai

Approved by : _____
Approved Signatory

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

Issue Date : 25 August 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: Sithichok T.
APPROVED BY: _____
NEXT CAL DATE: 21/08/26

End of Certificate

Approved By. _____

FM-L13 108/30-05-57



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.

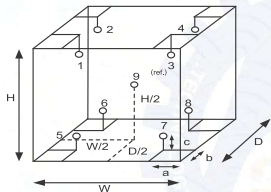
3. This measurement result is traceable to the International System of Unit maintained through :

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



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

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

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



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2508-0459OC-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 k
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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TEL.0-2717-3000-29 FAX.0-2719-9484



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 :

() Chakrit Waewwanjua

() Suwit Imjai

(✓) Kunchit Promprat

Issue Date : 16 October 2025

REVIEW BY: Sithichok 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 :

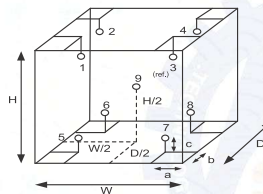
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

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



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

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

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 : 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 <i>k</i>
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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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

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

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

Cert. No.: 26TM111
 Page : 2 of 3

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 :

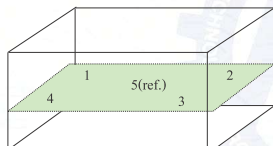
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	
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 <i>k</i>
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 %.

-o0o-



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
Approved by :
() Ponpan Paipim
(✓) Chakrit Waewwanjua
Issue Date : 3 September 2025

REVIEW BY
APPROVED BY
NEXT CAL DATE... 03/09/26

Condition of this result of calibration

- 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	2511740	TPA	17 Jan 2026

This measurement result is traceable to SI Unit
- The certificate is valid only to the item calibrated on date and place of calibration.
- 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 %.

-o0o-

The Uncertainties are for a confidence probability of approximately 95%

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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



Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260



Certificate No. T250873

Page 2 of 4

Certificate of Calibration

Certificate No. T250873 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 :
Date of Issue : 19 JUN 2025

REVIEW BY
APPROVED BY
NEXT CAL DATE... 04/12/26

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

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



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SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260



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

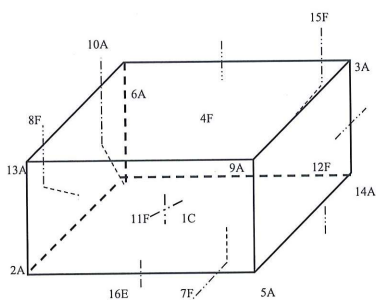
Condition of this results of calibration :

- 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.
- 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
- This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 9244).
- 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
- Adjustment :
(X) without adjustment () after adjustment

Approved By :

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:

FM-TL07 102/27-03-68

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)										
	TN91	TN92	TN93	TN94	TN95	TN96	TN97	TN98	TN99	TN100	TN101
3.0	2.95	2.92	3.09	2.92	3.16	3.50	3.40	3.03	3.14	2.98	3.44
	TN102	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)	Coverage Factor k
	Min	Max				
3.0	2.8	3.9	3.4	3.14	1.20	1.30

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:

FM-TL07 102/27-03-68



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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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 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) 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.



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2510-00420C-13
Procedure Used :-

Cert. No.: 25TM528
Page : 2 of 3

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 :

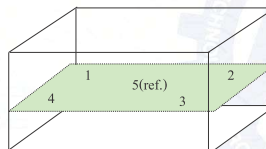
Remark : TPA : Technology Promotion Association (Thailand - Japan)

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)
			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 k
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.

FM-TL04 102/27-03-68



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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 Dampener ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available
- Adjustment :
 (X) without adjustment () after adjustment

Approved By :

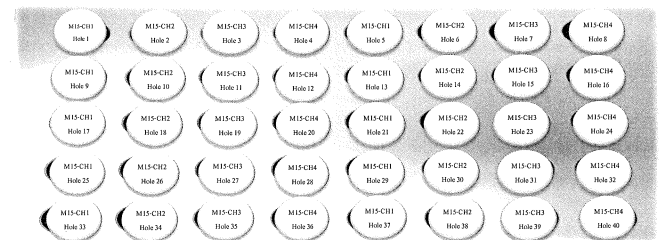


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 51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

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 :

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: 

FM-TL05 102/27-03-68

Report number CGS250901

Calibration Instrument Report

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

Result	Range
1	$>0.995 - 1$

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: 
Apirom Ekviyarakul1194 Soi Wachirathamsothit 57, Sukhumvit 101/1 Rd, Bangkok, Phrakhanong, Bangkok, Thailand 10260
1194 ซอยวชิรธรรมสาธิต 57 ถนนสุขุมวิท 101/1 แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260

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 Dilution 1/1	≤ 1	0.17	☒	☐	
CV% calculated Dilution 1/10	≤ 2	1.4	☒	☐	
CV% calculated Dilution 1/20	≤ 5	3.5	☒	☐	
CV% calculated Dilution 1/50	≤ 10	7.70	☒	☐	
CV% calculated Dilution 1/75	≤ 15	11.11	☒	☐	

ผู้ตรวจสอบ : Arraya M.
(Arraya Meechai)
(05/09/2025)ผู้อนุมัติ : Siriluk P.
(Siriluk Bunnak)
(05/09/2025)

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

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

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

Certificate of Testing

Cert.No.: 25TW101

Page.: 1 of 2

Equipment :

Manufacturer :

Model :

Serial No. :

ID No. :

Received Date :

Test Date :

Reference :

Submitted by :

Laboratory Condition :

Test Procedure :

Tested by :

Approved by :

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

Issue Date :

DO Meter

YSI

5000-230V

09J101147

BKK_EN0017

19 May 2025

20 May 2025

2505-0593DSC-1

ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 ThailandTemperature (25 ± 5) °CHumidity (50 ± 20) %

In - house method : CP-CH9

by Comparison Technique with Azide Modification Method

Walalak Sirithean



Approved Signatory

REVIEW BY	Arraya M.
APPROVED BY	Siriluk P.
NEXT CAL. DATE	31/9/2026



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)	DO Meter Reading	Standard Deviation
(mg/L)	(mg/L)	(mg/L)
8,20	8,21	0,0090

This report was certified only for the instrument we tested. It is allowable to use for study
Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced
other in full, without written approval of the laboratory

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



Certificate of Calibration

Cert. No.: 25LM83
Page.: 1 of 2

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5000-230V
Serial No. : 09J101147
ID No. : BKK_EN0017
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 19 May 2025
Calibrated Date : 20 May 2025
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Warakorn Lerngagrakul
Kunchit
Approved by : Approved Signatory

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

Issue Date : 26 May 2025

The Uncertainties are for a confidence probability of approximately 95%

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



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

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

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with
Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

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

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

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

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 %.

-000-



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* / 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 Metrological Center.

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 :

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

5. Adjustment :

(X) without adjustment () after adjustment

Approved By: [Signature]

FM-TL07 102/27-03-68

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	Average					
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.

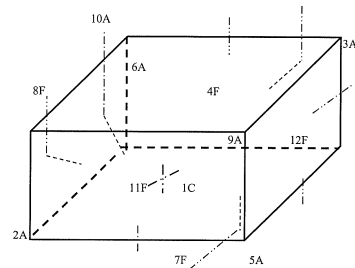
The result of test was found accurate as shown on date and place of test only.

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: [Signature]

FM-TL07 102/27-03-68

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: [Signature]

FM-TL07 102/27-03-68

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	Average					
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: [Signature]

FM-TL07 102/27-03-68

REVIEW BY Autcharawan S.

APPROVED BY Thongnat 67

NEXT CAL. DATE 24/06/26



ARCHEMICA

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.



บริษัท อีอาร์เคมีคัล แล็บ จำกัด
ARCHEMICA LAB CO.,LTD

Operator Signature: [Signature] Date: June 17-24, 2025

(Mr.Soranat Thongnop)

Application Chemist



Certificate of Calibration

Cert. No.: 25TM1661
Page : 1 of 3

Equipment : Water Bath
Manufacturer : Memmert
Model : WPE 45
Serial No. : L707,0058
ID No. : BKK_ML0054

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

Received Order : 03 December 2025
Calibration Date : 03 - 04 December 2025
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 December 2025

REVIEW BY Sithichak T.
APPROVED BY [Signature]
NEXT CAL DATE 03/12/26



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2512-0009OC-1
Procedure Used :-

Cert. No.: 25TM1661
Page : 2 of 3

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	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 :

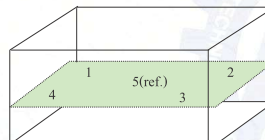
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply (Volt)
	(°C)	(%R.H.)	
Beginning of Calibration	23	61	220
Finished of Calibration	20	64	221



Front

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

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2512-0009OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 25TM1661
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			1	2	3	4	5 (ref.)	
42.0	42.0	42.0	41.990	41.984	41.990	41.978	41.959	0.15
44.0	44.0	44.0	43.988	43.990	43.982	43.981	43.957	0.15
44.5	44.5	44.5	44.503	44.466	44.458	44.503	44.485	0.15
46.0	46.0	46.0	45.999	45.966	45.966	45.995	45.980	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
42.0	0.055	0.019	2
44.0	0.061	0.032	2
44.5	0.063	0.043	2
46.0	0.071	0.031	2

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

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

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

UUC* : Unit Under Calibration

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

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

-o0o-



Certificate of Calibration

Cert.No.: 26CHO12
Page.: 1 of 3

Equipment : Spectrophotometer
Manufacturer : Hach
Model : DR 3900
Serial No. : 2403637
ID No. : SGK_CL0100
Condition As-Received : Used Item
Received Date : 12 January 2026
Calibration Date : 12 January 2026
Reference : 2601-0210OC-3
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.,
Songkhla Branch,
114/1 Moo 8, Kamchanawanich Rd., T.Ban Phru,
A.Hat Yai, Songkhla 90250, Thailand

Calibration Place : Chemistry Room
Ambient Temperature : (25.2 to 24.4) °C (On-Site)
Relative Humidity : (50.7 to 55.2) % (On-Site)
Calibration Procedure : In - house method :
CP-OCH4 based on ASTM E 275-08

Calibrated by : Kunchit Promprat

Approved by :

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

Issue Date : 21 January 2026

REVIEW BY Chanoknan M.
APPROVED BY Kanitta H.
NEXT CAL DATE 12/01/27

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. : 26CHO12
Page : 2 of 3

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 ($\pm$ nm)	Coverage Factor k
418.40	418	0.59	2.00
479.88	480	0.59	2.00
513.75	514	0.59	2.00
537.00	537	0.59	2.00
638.00	638	0.59	2.00
684.70	685	0.59	2.00
747.61	748	0.59	2.00
807.04	807	0.59	2.00



Cert. No. : 26CHO12
Page : 3 of 3

Calibration Results : without adjustment Photometric Accuracy

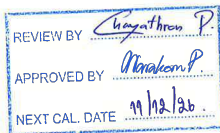
Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement ($\pm$ Abs)	Coverage Factor k
420.0	Zero	0.000	0.0028	2.00
	0.5750	0.573	0.0028	2.00
	0.7156	0.714	0.0028	2.00
	1.0176	1.016	0.0028	2.00
440.0	Zero	0.000	0.0028	2.00
	0.5598	0.557	0.0028	2.00
	0.7037	0.700	0.0028	2.00
465.0	1.0013	0.997	0.0028	2.00
	Zero	0.000	0.0028	2.00
	0.5222	0.521	0.0028	2.00
	0.6646	0.664	0.0028	2.00
546.1	0.9444	0.944	0.0028	2.00
	Zero	0.000	0.0028	2.00
	0.5234	0.522	0.0028	2.00
	0.7007	0.700	0.0028	2.00
590.0	0.9992	0.999	0.0028	2.00
	Zero	0.000	0.0028	2.00
	0.5573	0.554	0.0028	2.00
	0.7760	0.772	0.0028	2.00
635.0	1.1104	1.105	0.0028	2.00
	Zero	0.000	0.0028	2.00
	0.5648	0.563	0.0028	2.00
	0.7654	0.763	0.0028	2.00
635.0	1.0961	1.094	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 %.

-00-



Ref. Job number : #11215

Preventive Maintenance Report

Customers	: ALS Laboratory Group (Thailand) Co., Ltd.
Equipment	: Colorimeter
Controller Model	: ☒ DR300 ☐ Pocket II
Controller Serial No.	: 221108000655
Date of test	: 11/12/2025
Environment temperature	: 25.2 °C
	Humidity : 61.8 %RH

Results

Instrument Checked

Item	Characteristic	Before	After	Remark
1	Visual Inspect	☒ Pass ☐ Fail	☒ Pass ☐ Fail	
2	Power Supply (4.5 ~ 6.0 VDC)	5.8 VDC	5.8 VDC	
3	Display Check	☒ Pass ☐ Fail	☒ Pass ☐ Fail	
4	Keyboard Check	☒ Pass ☐ Fail	☒ Pass ☐ Fail	
5	Function System Program	☒ Pass ☐ Fail	☒ Pass ☐ Fail	

Warning and Error Checked

Item	Event	Before	After
6	Error list	☒ None ☐ Appear	☒ None ☐ Appear

Check with Standard

Item	Characteristic	Before	After	Remark
DPD-CHLORINE-LR				
7	Blank (0.0 mg/l)	0.00 mg/l	0.00 mg/l	
8	Standard C12 No. 1 (0.24 ± 0.09 mg/l)	0.26 mg/l	0.25 mg/l	
9	Standard C12 No. 2 (0.91 ± 0.1 mg/l)	0.92 mg/l	0.92 mg/l	
10	Standard C12 No. 3 (1.59 ± 0.14 mg/l)	1.62 mg/l	1.62 mg/l	
DPD-CHLORINE-HR				
11	Blank (0.0 mg/l)	0.00 mg/l	0.00 mg/l	
12	Standard C12 No. 1 (2.3 ± 0.2 mg/l)	2.4 mg/l	2.4 mg/l	
13	Standard C12 No. 2 (3.9 ± 0.3 mg/l)	4.0 mg/l	4.0 mg/l	
14	Standard C12 No. 3 (7.1 ± 0.6 mg/l)	7.1 mg/l	7.1 mg/l	



Ref. Job number : #11215

Summary of checked

- ☒ The instrument can work normally and efficiently. (เครื่องมือวัดสามารถทำงานได้ปกติและมีประสิทธิภาพ)
☐ The instrument can work but it's requiring to maintenance. (เครื่องมือวัดสามารถทำงานได้แต่ต้องบำรุงรักษา)
☐ The instrument could not work it's requiring to repair. (เครื่องมือวัดไม่สามารถทำงานได้และต้องทำการซ่อมบำรุง)

Remark:

เครื่องมือใช้งานได้ปกติ

Standard Equipment Used

Equipment	Lot No.	Exp date
Standard Absorbance DPD-CHLORINE-LR	Lot No. A4150	Exp date : Jun-28
Standard Absorbance DPD-CHLORINE-HR	Lot No. A4162	Exp date : Jun-26
Digital multi meter	S/N : 86940012	Due date : 01-Sep-26
Thermo hygrometer	S/N : 41432443	Due date : 06-Nov-26

Test By :

(Mr. Puttipong Duangsawat)

Service Engineer

Approved by :

(Mr. Puttipong Duangsawat)

Position : Service Manager

Hach (Thailand) Limited



Report No: 11215

DR300 Maintenance and Calibration Report

Customer: ALS Laboratory Group Site: Phattanakarn
(Thailand) Co., Ltd.
Address: 104 Soi Phattanakarn 40 Sales Order #: 60010181

Model:				Calibration Date:	11 Dec 2025
Serial No:		Tag No.:		Next Calibration:	
Controller Model:				Controller Serial Number:	
Environment Temperature:				Humidity:	

Hardware Checks

Test	Results
Visual Inspection	
Cell Compartment	Pass
Display	Pass
Keypad	Pass
Battery Contacts	Pass

Photometrical Accuracy Checks

λ nm	Filter	Nominal	Min	Max	Actual	Status
-	NG11	-	-	-	-	Pass
-	NG5	-	-	-	-	Pass
-	NG3	-	-	-	-	Pass

Straylight Checks

λ nm	Filter	Standard	Min	Max	Actual	Status
-	BG3	>-	NA	NA	-	Pass

Zero Measurement (Air)

λ nm	Filter	Standard	Tolerance	Actual	Status
Air	NA	0.000	± 0.003 Abs	-	Pass

Remarks

Reference Standard Used

Item	Model/ Part Number	Lot No:	Expiry Date:
Test Filter	VAA10038.99.V00		01 Sep 2026
Digital multi meter	86940012	NA	
Thermo hygrometer	41432443	NA	06 Nov 2026

General Comments

Hach (Thailand) Limited (Branch 00001) Building D Room No. D3 11, 3rd Floor, No. 735/4, Srinakarin Road, Pattanakarn, Suanluang, Bangkok 10250
Contact: Tel: +66 (02) 026-3539 | Fax: +66 (02) 0263572 Tax ID: 0105552107330 E-mail: thmarketing@hach.com | Website: www.th.hach.com
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Hach Thailand declares that the above-described instrument met its tolerance limit size stated in the report at the time of calibration. Hach Thailand further declares that the Calibration System complies with the requirements of the manufacturing standard. The standards and instruments used in the calibration are regularly calibrated at a scheduled interval to maintain the required accuracy level.

It is recommended that the above-described instrument be recalibrated 12 months from the date of this calibration. However, the users may choose to adopt another suitable calibration interval from this instrument's specification table that meet their requirement

Customer Name:

Signature:

Served By: Putthipong Duangsawat

Signature:



Hach (Thailand) Limited (Branch 00001) Building D Room No. D3 11, 3rd Floor, No. 735/4, Srinakarin Road, Pattanakarn, Suanluang, Bangkok 10250
Contact: Tel: +66 (02) 026-3539 | Fax: +66 (02) 0263572 Tax ID: 0105552107330 E-mail: thmarketing@hach.com | Website: www.th.hach.com
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