

ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

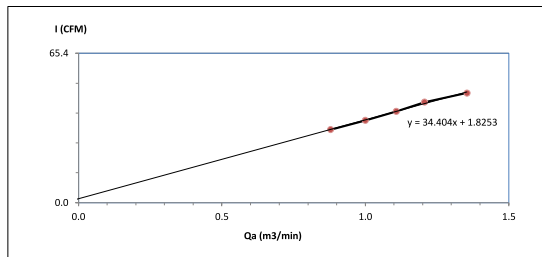
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Particulate Matter (PM-10)	High Volume	CHM_FS0038	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	BKK_EN0403	30-May-25	30-May-26	12
Ambient	Total Suspended Particulate	High Volume	CHM_FS0113	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	BKK_EN0403	30-May-25	30-May-26	12
Ambient	Carbon Monoxide	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Ambient	Carbon Monoxide	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Ambient	Carbon Monoxide	Air Sampling Pump	CHM_FS0070	18-Nov-25	18-Feb-26	3
Ambient	Carbon Monoxide	CO Analyzer	BKK_ML00375	4-Aug-25	4-Aug-26	12
Water Lab	Total Coliform	Autoclave	BKK_ML0041	4-Mai-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-Mai-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	BOD	DO Meter	BKK_EN0017	20-May-25	20-Nov-26	18
Water Lab	BOD	Incubator	BKK_EN0272	24-Dec-25	24-Dec-26	12
Water Lab	BOD	Burette	BKK_EN0422	3-Sep-25	3-Sep-26	12
Water Lab	pH at 25 °C	pH meter	BKK_EN0342	9-Oct-25	9-Oct-26	12
Water Lab	Settleable Solids	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Sulfide	Burette	BKK_EN0422	3-Sep-25	3-Sep-26	12
Water Lab	Sulfide	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
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-Mai-26	2-Mar-27	12
Water Lab	Total Kjeldahl Nitrogen	Discrete analyzer	BKK_EN0438	3-Sep-25	3-Sep-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	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	Ammonia Nitrogen	Discrete analyzer	BKK_EN0438	3-Sep-25	3-Sep-26	12
Water Lab	Total Hardness	Burette	BKK_EN0422	3-Sep-25	3-Sep-26	12
Water Lab	Nitrate	Ion Chromatography	BKK_EN0069	28-Jun-25	28-Jun-26	12
Water Lab	Chloride	Ion Chromatography	BKK_EN0069	28-Jun-25	28-Jun-26	12
Water Lab	Staphylococcus aureus	Autoclave	BKK_ML0041	4-Mai-25	4-Sep-26	18
Water Lab	Staphylococcus aureus	Incubator	BKK_ML0231	21-Aug-25	21-Aug-26	12
Water Lab	Staphylococcus aureus	Hot Air Oven	BKK_ML0013	9-Oct-25	9-Apr-27	18
Water Lab	Pseudomonas aeruginosa	Autoclave	BKK_ML0041	4-Mai-25	4-Sep-26	18
Water Lab	Pseudomonas aeruginosa	Incubator	BKK_ML0231	21-Aug-25	21-Aug-26	12
Water Lab	Pseudomonas aeruginosa	Water Bath	BKK_ML0054	9-Dec-25	9-Dec-26	12
Water Lab	Pseudomonas aeruginosa	Hot Air Oven	BKK_ML0013	9-Oct-25	9-Apr-27	18
Water Lab	Escherichia coli	Autoclave	BKK_ML0041	4-Mai-25	4-Sep-26	18
Water Lab	Escherichia coli	Incubator	BKK_ML0231	21-Aug-25	21-Aug-26	12
Water Lab	Escherichia coli	Hot Air Oven	BKK_ML0013	9-Oct-25	9-Apr-27	18
Water Lab	Escherichia coli	Water Bath	BKK_ML0056	4-Feb-26	4-Feb-27	12
Water Lab	Cyanuric acid	Spectrophotometer	SGK_CL0100	12-Jan-26	12-Jan-27	12



High Volume Air Sampler Calibration Worksheet

Project Site :	The Base Height-Chiangmai Juristic Person Condominium	Barometric Pressure (mm Hg) :	734.4
Calibrate Location :	บริเวณพื้นที่โครงการ	Temperature (°C) :	26.3
Calibrate Date :	12-Jan-26	High Volume ID :	CHM_FS0038
CalibrationSheet No.:	C-120126-CHM_FS0038	High Volume Model :	TE-S009X
Calibrator ID:	CHM_FS0039	High Volume S/N :	5845
Calibrator Model :	TE-S028A	Calibrator Slope :	1.04237
Calibrator S/N :	3680	Calibrator Intercept :	-0.01261

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.879	32	Slope : 34.4044
2	2.6	1.000	36	Intercept : 1.8253
3	3.2	1.108	40	Correlation Coefficient : 0.9979
4	3.8	1.206	44	
5	4.8	1.354	48	



Calibrated by Sittichok Taseeda
(Mr. Sittichok Taseeda)
CHM Field Services Scientist (3)

Approved by Warakorn Pookrak
(Mr. Warakorn Pookrak)
Field Services Supervisor

FORM NO.: F 06-074 REVISION NO.:2 ISSUE DATE: 20/11/23

1

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Accredited by

NSC-TISI-TIS 17025

Calibration 0426

Calibration certificate

Calibration Certificate No. 25BCI0197

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Ohaus	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	EX225D/AD	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.	C309774648 BKK_EN0403	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand)Co., Ltd.	
Order no.	261969	
Number of pages	6	
Date of calibration	30 May 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	30 May 2025	Approval of the Calibration Certificate	Person in charge
		<u>Chnchai Inthana</u>	<u>Chnchai Inthana</u>
		Mr. Chnchai Inthana	Chnchai Inthana

Calibration certificate No.: 25BCI0197

Calibration Certificate

Calibration object

Multi range instrument

Model	EX225D/AD
Serial Number	C309774648
QM Ident. no Inventory no.	BKK_EN0403 —
Range	1 2
Maximum capacity (Max. load)	120.00000 g 220.0000 g
Measured range	120.00000 g 220.0000 g
Scale interval	0.00001 g 0.0001 g

Place of calibration

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

Calibration procedure

EURAMET cg-18, V4.0 - 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

Calibration certificate No.: 25BCI0197

Calibration Certificate

Range 1

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration

30 May 2025

Temperature at place of calibration | Temp. diff.
T_{weights} - T_{place}

21,7 °C | 0,5 K

Measuring conditions

The installation site is suitable. The device was leveled. Balance was loaded up to Max before test.

Comments

Humidity 60,0 %RH.

Measurement results | Measurement uncertainties

Repeatability		Eccentricity	
Test load (nominal): 1 g 100 g		Test load (nominal): 50 g	
1 g	100 g	Center	49,99996 g
1	0,99993 g	Front left	49,99993 g
2	0,99991 g	Back left	49,99993 g
3	0,99992 g	Back right	49,99994 g
4	0,99993 g	Front right	49,99990 g
5	0,99992 g	Maximum deviation from centric loading indication	
6	0,99991 g	Δf _{ecc} max = 0,00006 g	
7	0,99993 g		
8	0,99994 g		
9	0,99995 g		
10	0,99995 g		
s = 0,000014 g		s = 0,000017 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>
0,00000 g	0,00000 g	0,00000 g	2,00	0,000030 g	--
0,01000 g	0,00995 g	-0,00005 g	2,00	0,000037 g	0,37 ‰
0,10000 g	0,09991 g	-0,00009 g	2,00	0,000038 g	0,038 ‰
0,50000 g	0,49985 g	-0,00015 g	2,00	0,000040 g	0,0080 ‰
1,00000 g	0,99991 g	-0,00009 g	2,00	0,000041 g	0,0041 ‰
5,00002 g	4,99997 g	-0,00005 g	2,00	0,000050 g	0,0010 ‰
10,00002 g	10,00003 g	0,00001 g	2,00	0,000069 g	0,00069 ‰
50,00002 g	49,99972 g	-0,00030 g	2,00	0,000091 g	0,00018 ‰
70,00004 g	69,99975 g	-0,00029 g	2,00	0,000117 g	0,00024 ‰
100,00001 g	99,99958 g	-0,00043 g	2,00	0,00017 g	0,00017 ‰
115,00006 g	114,99966 g	-0,00040 g	2,00	0,00028 g	0,00024 ‰
Maximum error of indication		E _{max} = 0,00043 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.

Interpretation of measurement results | Appendix to the calibration certificate

Uncertainty of measurement in use

Range 1

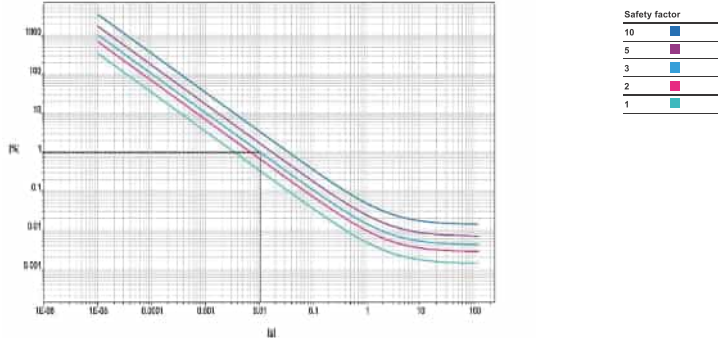
Device adjusted before measurement	Yes
Temperature deviation considered	5 K
Temperature coefficient considered	2 · 10 ⁻⁴ /K

Uncertainty of the weighing result <i>U_gl(W)</i>	<i>U_gl(W)</i> = 0.000035 g + 1,38 · 10 ⁻⁴ · <i>R</i>
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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 <i>R</i>	Uncertainty <i>U_gl(W)</i>	Uncertainty relative <i>U_gl(W)_{rel}</i>
1 %	1,20000 g	0,000052 g	0,0043 ‰
25 %	30,00000 g	0,00045 g	0,0015 ‰
50 %	60,00000 g	0,00086 g	0,0014 ‰
75 %	90,00000 g	0,0013 g	0,0014 ‰
100 %	120,00000 g	0,0017 g	0,0014 ‰

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1,00 ‰
Safety factor	3
Minimum sample weight	0,01045 g

Calibration certificate No.: 25BCI0197

Calibration Certificate

Range 2

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration

30 May 2025

Temperature at place of calibration | Temp. diff.
T_{weights} - T_{place}

21,7 °C | 0,5 K

Measuring conditions

The installation site is suitable. The device was leveled. Balance was loaded up to Max before test.

Comments

Humidity 60,0 %RH.

Measurement results | Measurement uncertainties

Repeatability		Eccentricity	
Test load (nominal): 200 g		Test load (nominal): 100 g	
200 g		Center	99,99984 g
1	199,9998 g	Front left	99,99990 g
2	199,9998 g	Back left	99,99983 g
3	199,9998 g	Back right	99,99979 g
4	200,0000 g	Front right	99,99979 g
5	199,9998 g	Maximum deviation from centric loading indication	
6	199,9999 g	Δf _{ecc} max = 0,00006 g	
7	199,9999 g		
8	200,0000 g		
9	199,9998 g		
10	199,9999 g		
s = 0,000008 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>
0,00000 g	0,00000 g	0,00000 g	2,00	0,000030 g	--
20,00002 g	19,99986 g	-0,00016 g	2,00	0,000069 g	0,00034 ‰
50,00002 g	49,99978 g	-0,00024 g	2,00	0,000091 g	0,00018 ‰
70,00004 g	69,99981 g	-0,00023 g	2,00	0,000117 g	0,00024 ‰
90,00007 g	89,99976 g	-0,00031 g	2,00	0,00018 g	0,00020 ‰
110,00003 g	109,99986 g	-0,00017 g	2,00	0,00028 g	0,00025 ‰
130,00011 g	129,9999 g	-0,0002 g	2,00	0,00028 g	0,00022 ‰
150,0000 g	149,9999 g	-0,0001 g	2,00	0,00028 g	0,00019 ‰
170,0000 g	170,0000 g	0,0000 g	2,00	0,00028 g	0,00016 ‰
200,0000 g	199,9998 g	-0,0002 g	2,00	0,00028 g	0,00014 ‰
220,0000 g	219,9999 g	-0,0001 g	2,00	0,00029 g	0,00013 ‰
Maximum error of indication		E _{max} = 0,0003 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

Interpretation of measurement results | Appendix to the calibration certificate

Uncertainty of measurement in use

Range 2

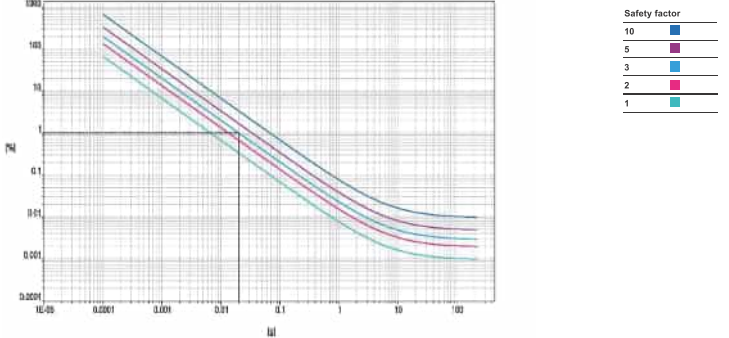
Device adjusted before measurement	Yes
Temperature deviation considered	5 K
Temperature coefficient considered	2 · 10 ⁻⁴ /K

Uncertainty of the weighing result <i>U_gl(W)</i>	<i>U_gl(W)</i> = 0.000067 g + 9,52 · 10 ⁻⁴ · <i>R</i>
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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 <i>R</i>	Uncertainty <i>U_gl(W)</i>	Uncertainty relative <i>U_gl(W)_{rel}</i>
1 %	2,20000 g	0,000088 g	0,0040 ‰
25 %	55,00000 g	0,00059 g	0,0011 ‰
50 %	110,00000 g	0,0011 g	0,0010 ‰
75 %	165,0000 g	0,0016 g	0,00099 ‰
100 %	220,0000 g	0,0022 g	0,00098 ‰

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

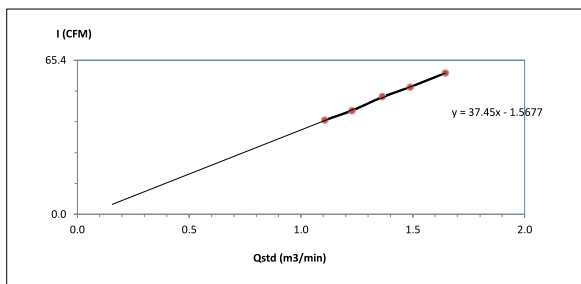
Process accuracy	1,00 ‰
Safety factor	3
Minimum sample weight	0,02019 g



High Volume Air Sampler Calibration Worksheet

Project Site :	The Base Height-Chiangmai Juristic Person Condominium	Barometric Pressure (mm Hg) :	734.4
Calibrate Location :	บริเวณพื้นที่โครงการ	Temperature (°C) :	26.3
Calibrate Date :	12-Jan-26	High Volume ID :	CHM_FS0113
Calibration Sheet No.:	C-120126-CHM_FS0113	High Volume Model :	TE-5170D
Calibrator ID:	CHM_FS0039	High Volume S/N :	1065
Calibrator Model :	TE-5028A	Calibrator Slope :	1.66425
Calibrator S/N :	3680	Calibrator Intercept :	-0.02011

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	3.4	1.1069	40	Slope : 37.4499 Intercept : -1.5677 Correlation Coefficient : 0.9991
2	4.2	1.2280	44	
3	5.2	1.3641	50	
4	6.2	1.4876	54	
5	7.6	1.6449	60	



Calibrated by

(Mr. Sitthichok Taseeda)
CHM Field Services Scientist (3)

Approved by

(Mr. Warakorn Pookrak)
Field Services Supervisor

FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23

Certificate No : 25-AFM-208
Request No : Req-2025-1986

Result of Calibration : Without Adjustment

STD Reading			UUC Reading			Error (cc/min)	Uncertainty	
Temperature (°C)	Pressure (kPa)	Flow (cc/min)	Temperature (°C)	Pressure (kPa)	Flow (cc/min)		(cc/min)	(°C) (kPa)
25.5	100.98	100	-	-	100.02	0.0	3.6	1.0 0.50
25.7	100.97	303	-	-	500.81	-2.2	9.3	1.0 0.50
25.8	100.89	1003	-	-	1000.1	-3	19	1.0 0.50
26.1	100.88	2000	-	-	2001.9	2	38	1.0 0.50
26.5	100.85	3014	-	-	3002.2	-12	57	1.0 0.50
26.7	100.81	4027	-	-	4000.8	-26	76	1.0 0.50
27.0	100.74	5048	-	-	5001.8	-46	95	1.0 0.50

Note: STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition, Air
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

End of Certificate:

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250

Certificate No : 25-AFM-208

Request No : Req-2025-1986

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Mesa Lab
Model : 200-510M
Serial Number : J51114
ID : BKK_FS0614
Location of Calibration : LAB 4 AIR FLOW METER

Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 3 September 2025
Calibration Date : 10 September 2025

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Semidyne	5 May 2026
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Semidyne	6 May 2026
Temperature meter	GT 11	08000057	Qesborn	15 October 2025
Pressure meter	CPQ2400	41000KID1651082	TPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Semidyne AZLA Accreditation No. 3913.01 and MET NSC-TIS-TIS Accreditation No. 0052

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.

Calibration By :

Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :

Mr. Paet Mahavorn
Calibration Engineer Supervisor

Issue Date :

10 September 2025

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.05 Issue date 21/2/25

Certificate No : 25-AFM-208
Request No : Req-2025-1986

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250

Certificate No : 25-AFM-207

Request No : Req-2025-1987

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Mesa Lab
Model : 200-510M
Serial Number : J30026
ID : BKK_FS0618

Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Location of Calibration : LAB 4 AIR FLOW METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 3 September 2025
Calibration Date : 10 September 2025

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Semidyne	5 May 2026
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Semidyne	6 May 2026
Temperature meter	GT 11	08000057	Qesborn	15 October 2025
Pressure meter	CPQ2400	41000KID1651082	TPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Semidyne AZLA Accreditation No. 3943.01 and MET NSC-TIS-TIS Accreditation No. 0052

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %

Calibration By :

Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :

Mr. Paet Mahavorn
Calibration Engineer Supervisor

Issue Date :

10 September 2025

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.06 Issue date 21/2/25

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.05 Issue date 21/2/25

Certificate No : 25-AIM-207
Request No : Req-2025-1987

Result of Calibration : Without Adjustment

STD Reading			UUC Reading			Error	Uncertainty	
Temperature (°C)	Pressure (kPa)	Flow (cc/min)	Temperature (°C)	Pressure (kPa)	Flow (cc/min)		(cc/min)	(°C) (kPa)
25.5	100.88	25	-	-	20.042	0.0	1.6	1.0 0.50
25.5	100.90	50	-	-	49.921	-0.1	3.0	1.0 0.50
25.5	100.91	100	-	-	100.09	0.1	3.6	1.0 0.50
25.4	100.80	150	-	-	150.34	0.3	5.4	1.0 0.50
25.6	100.91	199	-	-	200.17	1.2	7.2	1.0 0.50
25.6	100.95	301	-	-	300.05	-1	11	1.0 0.50
25.7	100.90	402	-	-	401.03	-1	14	1.0 0.50
25.7	100.95	503	-	-	500.28	-1	19	1.0 0.50

Note: STD : Standard UUC : Unit Under Calibration
+ UUC Reference Condition : At atmospheric pressure and room temperature condition, Air []
+ Flow Rate was corrected for non-standard operating conditions by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

Where: Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
meas = Measurement Condition ref = Standard Condition

* Indicates non-accepted

End of Certificate

The results related only to the item submitted. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.26 Issue date 21/2/25

ALS Laboratory Group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd.,
Phatthanakan, Suan Luang, Bangkok 10250
T +66 2 760 3000 F +66 2 760 3197



Certificate of Calibration

Certificate No. : C-181125-CHM_FS0070

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump	Equipment ID : CHM_FS0070
Brand : Gilian	Serial No. : 20191210019
Model/Type : GilAir Plus	Calibration Date : 18-Nov-25
	Next calibration date : 18-Feb-26

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter	Equipment ID : BKK_FS0619
Brand : MesaLabs	Serial No. : 130026
Model/Type : Defender 510-L	Calibration Date : 10-Sep-25
	Due Date : 09-Sep-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter	Equipment ID : BKK_FS0614
Brand : MesaLabs	Serial No. : 151114
Model/Type : Defender 510-M	Calibration Date : 10-Sep-25
	Due Date : 09-Sep-26

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)			Evaluation (Pass/ Fail)
	1	2	3						
Low Flow									
20	20.8	20.8	21.0	20.9	5%	19	-	21	Passed
50	50.5	50.9	51.1	50.8	5%	48	-	53	Passed
100	101.4	101.3	100.8	101.2	5%	95	-	105	Passed
200	205.2	204.7	205.2	205.0	5%	190	-	210	Passed
High Flow									
500	494.4	497.4	493.8	495.2	3%	485	-	515	Passed
1000	1010.8	1019.7	1017.8	1016.1	3%	970	-	1030	Passed
2000	1995.0	1996.0	1994.8	1995.3	3%	1940	-	2060	Passed
2500	2502.2	2506.8	2508.4	2505.8	3%	2425	-	2575	Passed

END OF REPORT

Calibrated By: (Mr. Sithichok Taseeda)

CHM Field Services Scientist (3)

Approved By: (Mr. Warakorn Pookrak)

Field Services Supervisor

Issue date : 19-Nov-25

Page 1 of 1

F06-115 Rev.2 Issue date 27/01/25

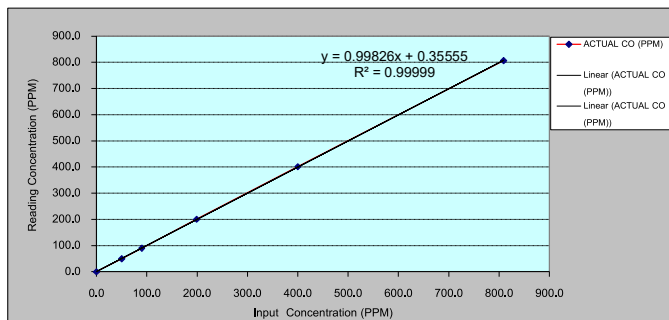
MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : ALS Laboratory Group (Thailand) Co.Ltd.		
EQUIPMENT NAME : CO Analyzer		
MANUFACTURER : Teledyne - API	MODEL : T300	SERIAL NO : 5947
STANDARD GAS CONCENTRATION (PPM) : 808.9	CERTIFIED DATE : CC739972	
CYLINDER PRESSURE (psig) : 900	CERTIFIED DATE : Nov .05 .2020	
CERTIFIED BY : ARGAS SPECIALTY GASES	EXPIRED DATE : Nov .05, 2028	

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.010	0.010	-
1	50.00	49.541	-0.459	-0.918
2	90.00	89.472	-0.528	-0.587
3	199.20	200.522	1.322	0.664
4	400.30	401.311	1.011	0.253
5	808.90	806.978	-1.922	-0.238
AVERAGE (%)				0.523

REVIEW BY: (Mr. Warakorn P.)
APPROVED BY: (Mr. Warakorn P.)
NEXT CAL. DATE: 03/08/26



CALIBRATED BY : คุณอนาม มหาอาจ DATE : 4 สิงหาคม 2568
ต้องการข้อมูลเพิ่มเติมด้านเทคนิคเพิ่มเติม : คุณอนาม มหาอาจ โทรศัพท์ : 02-515-8987
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : Info@kinetics.co.th



Metrology
SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhloi, 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	: (Signature) / 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.

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 :

- 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 .
- 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
- 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 :
Pressure Indicator 0.11-0.12 MPa At 121 °C Holding time 20 minute
- Adjustment :
(X) without adjustment () after adjustment

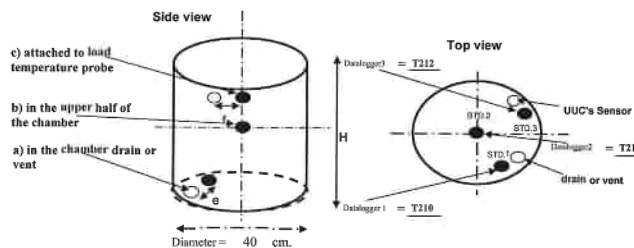
Approved By:

FM-L15 118/18-08-66

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

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

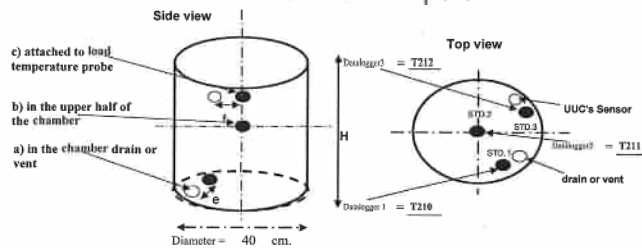
FM-L15 118/18-08-66

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

Autoclave			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (± °C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
	Min	Max					
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 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 Ruttanapraphachai

Approved by :

() 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

Kunchit
Approved Signatory



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.

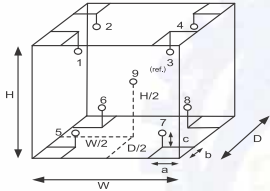
3. This measurement result is traceable to the International System of Unit maintained through :

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)
	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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANIJIANG, SUANIJIANG BANGKOK 10250
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 :

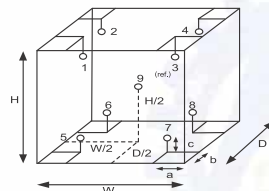
Remark : TPA : Technology Promotion Association (Thailand - Japan)

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)
	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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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.: 25TM460
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 March 2025
Calibration Date : 04 March 2025
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Khit Ruttanaprapachai
Approved by : Kunchit
Approved Signatory

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

Issue Date : 06 March 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 : 2503-0006OC-2

Cert. No.: 25TM460
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	MY44073381	23LM73	TPA	18 May 2025

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

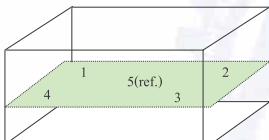
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	49	220
Finished of Calibration	25	51	221



Front

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



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2503-0006OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 25TM460
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.)	
44.5	44.5	44.5	44.489	44.469	44.497	44.476	44.479	0.15
45.0	45.0	45.0	44.990	44.966	44.997	44.983	44.980	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor <i>k</i>
44.5	0.045	0.035	2
45.0	0.047	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.: 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
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 :

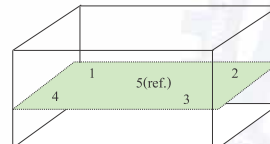
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(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 %.

-000-



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 :

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 Thailand

Laboratory Condition :

Temperature (25 ± 5) °C

Humidity (50 ± 20) %

In - house method : CP-CH9

by Comparison Technique with Azide Modification Method

Tested by :

Walalak Sirithean

Approved by :

Saithip
Approved Signatory

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

Issue Date :

20 May 2025

REVIEW BY *Jinda K.*

APPROVED BY *Saithip 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)	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 9404



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 Lernagatrakul

Approved by : Kunchit
Approved Signatory

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

Issue Date : 26 May 2025

The Uncertainties are for a confidence probability of approximately 95%

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



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

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

Procedure Used :-

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

Condition of this result of calibration

1. Reference standard instrument:-

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 %.

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Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
Bangkok Tel : +668 9205 8851 , +669 81924 0059
Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



Certificate No. T252279

Certificate of Calibration

Page 1 of 4

Equipment : Chamber (Incubator)

Manufacturer : MEMMERT

Model : ICP 750

Serial No. : F818.0033

Customer Code : BKK_EN0272

ID No. : T8041A4

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 : 24 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-TIS-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

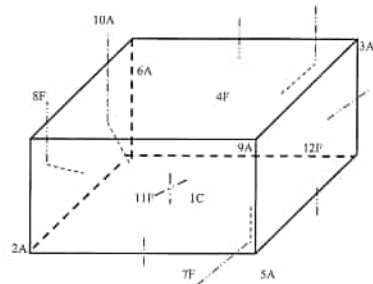
5. Adjustment :

(X) without adjustment () after adjustment

Approved By:

FM-TL07 102/27-03-68

Calibration Report



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:

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	20.11	20.22	20.03	20.39	20.12	19.80	19.89	20.19	20.26	19.97	19.85	20.06

Chamber (Incubator)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)	Coverage Factor k
	Min	Max					
20.0	19.9	20.1	20.0	0.07	0.59	0.39	2.03

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

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.,
Khaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Ambient Temperature : (20 ± 2.5) °C
Relative Humidity : (50 ± 10) %
Barometric Pressure : 753 mmHg
Calibration Procedure : ASTM E 542 - 01

Calibrated by : Srisuda Khamtha

Approved by :
Approved Signatory

() Ponpan Paipim
(✓) Chakrit Waewwanjua

Issue Date : 3 September 2025

The Uncertainties are for a confidence probability of approximately 95%

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



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

Cert.No.: 25CG3385
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

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

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 %.

-o0o-



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



Certificate of Calibration

Cert.No.: 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 :
Approved Signatory

() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saitip 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	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 <i>k</i>
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.

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

Calibration Results

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : PHC281
- Serial No. : 252063043080
Dimension of probe
- Length : 103 mm.
- Diameter : 12 mm.
- Immersion Depth : 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor <i>k</i>
25.0	25.001	25.0	-0.001	0.13	2.00

Remark - UUC* = Unit Under Calibration

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

-o0o-

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 : [Signature] / Boonchai Suriyawong (Site Calibration Manager)
Date of Issue : 19 JUN 2025

REVIEW BY [Signature]
APPROVED BY [Signature]
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.

FM-TL06 102/27-03-68

Certificate No. T250873

Calibration Report

Page 2 of 4

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 0244) .
- 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

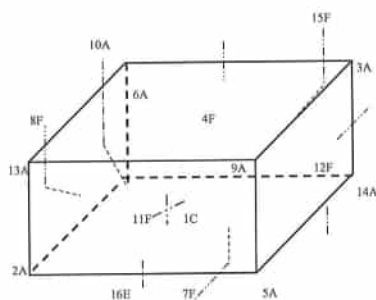
Approved By. [Signature]

FM-TL07 102/27-03-68

Certificate No. T250873

Calibration Report

Page 3 of 4



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. [Signature]

FM-TL07 102/27-03-68

Certificate No. T250873

Calibration Report

Page 4 of 4

Measurement Results

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

Chamber (Cooling Room)			Temperature Distribution			
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)
	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. [Signature]

FM-TL07 102/27-03-68



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2510-0042OC-13
Procedure Used :-

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

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.

REVIEW BY: *Junda K*
APPROVED BY: *Suwit P*
NEXT CAL DATE: 09/10/26

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 :

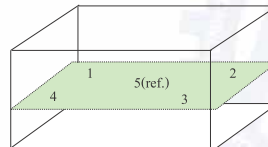
Remark : TPA : Technology Promotion Association (Thailand - Japan)

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 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 %.

-00-



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhroi, 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. T250578

Page 1 of 4

Certificate of Calibration

Equipment : Digestion Unit

Manufacturer : SCP Science

Model : DigiPRER HT

Serial No. : HTC1120480658

Customer Code : BKK_EN0366

ID No. : T2635A5

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

104 Phatthanakan 40, Phatthanakan Rd.,

Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250

Customer Location : Wet Chemistry Lab 1

Date of Receipt : 2 April 2025

Calibrated By : Atiphong Rongrat (Technician)

Approved By : *Boonchai Suriyawong* / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 13 MAY 2025

REVIEW BY: *Junda K*
APPROVED BY: *Suwit P*
NEXT CAL DATE: 09/04/26

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

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



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhloi, 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. T250578

Page 2 of 4

Calibration Report

Equipment : Digestion Unit
Date of Calibration : 9 April 2025
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	M7-(CHI-CH4)	T242035	04 December 2025
DATA LOGGER	34970A	T121	T242035	04 December 2025
- 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.

FM-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

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

Certificate No. T250578

Page 4 of 4

Calibration Report

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
°C	°C	°C	Reading	M7-CHI Block 1	M7-CHI Block 2	M7-CHI Block 3	M7-CHI Block 4	M7-CHI Block 5	M7-CHI Block 6	M7-CHI Block 7	M7-CHI Block 8
380.0	380.0	379.8 - 380.2	Max °C	379.3	379.2	379.1	379.5	380.8	381.1	382.5	381.3
			Min °C	379.1	379.0	378.8	379.2	380.5	380.8	382.1	381.1
			Average °C	379.2	379.1	379.0	379.3	380.6	380.9	382.3	381.2
			Stability ± °C	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
°C	°C	°C	Reading	M7-CHI Block 1	M7-CHI Block 2	M7-CHI Block 3	M7-CHI Block 4	M7-CHI Block 5	M7-CHI Block 6	M7-CHI Block 7	M7-CHI Block 8
380.0	380.0	379.8 - 380.2	Max °C	378.5	378.2	379.5	378.5	380.4	380.8	380.4	380.9
			Min °C	378.2	377.9	379.2	378.2	380.0	380.5	380.1	380.6
			Average °C	378.3	378.0	379.4	378.3	380.2	380.7	380.2	380.8
			Stability ± °C	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
°C	°C	°C	Reading	M7-CHI Block 1	M7-CHI Block 2	M7-CHI Block 3	M7-CHI Block 4	M7-CHI Block 5	M7-CHI Block 6	M7-CHI Block 7	M7-CHI Block 8
380.0	380.0	379.8 - 380.2	Max °C	379.9	380.0	379.8	379.7	380.1	380.2	379.7	379.8
			Min °C	379.6	379.6	379.3	379.3	379.8	379.9	379.4	379.5
			Average °C	379.8	379.8	379.7	379.5	379.9	380.1	379.5	379.7
			Stability ± °C	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.1

The expanded uncertainty of temperature measurement was ± 2.36 °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-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

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

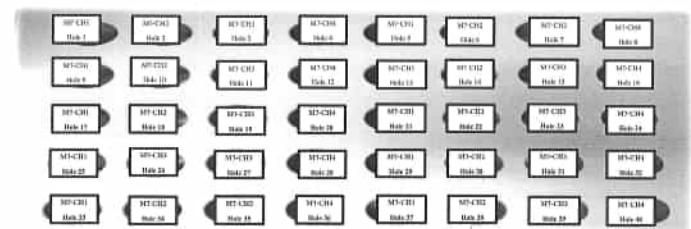
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

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

Certificate No. T250578

Page 3 of 4

Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
°C	°C	°C	Reading	M7-CHI Block 1	M7-CHI Block 2	M7-CHI Block 3	M7-CHI Block 4	M7-CHI Block 5	M7-CHI Block 6	M7-CHI Block 7	M7-CHI Block 8
380.0	380.0	379.8 - 380.2	Max °C	380.0	381.0	380.9	379.8	380.3	380.9	381.3	380.1
			Min °C	379.6	380.8	380.6	379.3	379.9	380.5	380.9	379.6
			Average °C	379.8	380.9	380.7	379.5	380.1	380.7	381.1	379.9
			Stability ± °C	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.3

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
°C	°C	°C	Reading	M7-CHI Block 9	M7-CHI Block 10	M7-CHI Block 11	M7-CHI Block 12	M7-CHI Block 13	M7-CHI Block 14	M7-CHI Block 15	M7-CHI Block 16
380.0	380.0	379.8 - 380.2	Max °C	378.9	378.7	379.8	381.0	382.8	381.3	381.7	380.4
			Min °C	378.3	378.2	379.3	380.7	382.1	380.5	381.3	380.0
			Average °C	378.6	378.5	379.5	380.9	382.4	380.9	381.5	380.2
			Stability ± °C	0.3	0.2	0.3	0.1	0.3	0.4	0.2	0.2

Approved By.

FM-L13 108/30-05-57



Metrology Center

SCI ECO Services Company Limited

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

Bangkok Tel : +668 9205 8851, +669 81924 0059

Saraburi Tel : +669 8247 2360

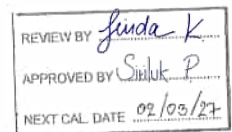
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

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

Calibration Report

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-C111-C114	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 $\frac{2}{40}$ Hour Minute At 380 °C
Fresh Air Dumper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available
- Adjustment :
(X) without adjustment () after adjustment

Approved By: 

FM-TL05 102/27-03-68

Calibration Report**Measurement Results**

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M15-C111 Block 17	M15-C112 Block 18	M15-C113 Block 19	M15-C114 Block 20	M15-C115 Block 21	M15-C116 Block 22	M15-C117 Block 23	M15-C118 Block 24
380.0	380.0	379.8 - 380.2	Max °C	382.0	380.6	380.7	381.2	380.0	380.6	379.5	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-C111 Block 25	M15-C112 Block 26	M15-C113 Block 27	M15-C114 Block 28	M15-C115 Block 29	M15-C116 Block 30	M15-C117 Block 31	M15-C118 Block 32
380.0	380.0	379.8 - 380.2	Max °C	381.3	380.3	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-C111 Block 33	M15-C112 Block 34	M15-C113 Block 35	M15-C114 Block 36	M15-C115 Block 37	M15-C116 Block 38	M15-C117 Block 39	M15-C118 Block 40
380.0	380.0	379.8 - 380.2	Max °C	381.3	381.0	381.2	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	382.0	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

Calibration Report**FRONT****Measurement Results**

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M15-C111 Block 1	M15-C112 Block 2	M15-C113 Block 3	M15-C114 Block 4	M15-C115 Block 5	M15-C116 Block 6	M15-C117 Block 7	M15-C118 Block 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	379.3
			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-C111 Block 9	M15-C112 Block 10	M15-C113 Block 11	M15-C114 Block 12	M15-C115 Block 13	M15-C116 Block 14	M15-C117 Block 15	M15-C118 Block 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	380.5	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: 

FM-TL05 102/27-03-68

BKK_EN0438

Report number CGS250901

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: R²

Result	Range
1	>0.995 - 1

2. Evaluation of Samples Results:

Dilution	Replicates	Results mg/L	Range	CV% calculated	CV%
1/1	x10	0.804	0.599 - 0.810	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: 
Apirorn Ekiriyakul



แบบฟอร์มการประเมินเครื่อง Discrete Analyzer หลังการสอบเทียบ

ชื่อเครื่อง: 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: Sirulok P.
(Sirulok Bunnak)
(05/09/2025)



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Bangkok Tel : +668 9205 8851 , +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

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-TL06 102/27-03-68



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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-TIS1-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 : Am



Metrology Center SCI ECO Services Company Limited

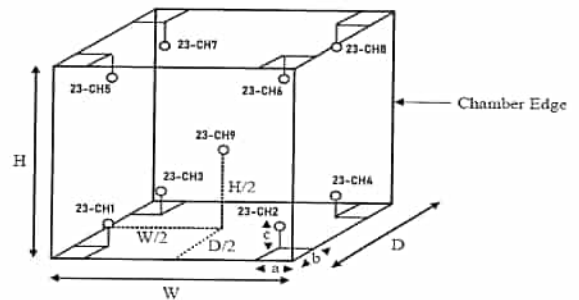
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260



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

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	102.54	103.82	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 b-distribution, providing a level of confidence of approximately 95 % .

End of Certificate.

Approved By : Am



REVIEW BY Autchorowon S.
APPROVED BY Tomaythorn 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: Mr. Soranat Thongnop

Date: June 17-24, 2025

(Mr. Soranat Thongnop)

Application Chemist



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



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 : Kunchit
Approved Signatory

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

Issue Date : 16 December 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 : 2512-0009OC-1

Cert. No.: 25TM1661
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	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 :

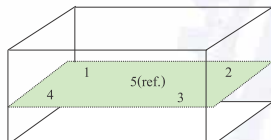
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
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



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 %.

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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

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	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

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 : 3 of 3

Calibration Results : without adjustment

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (±Abs)	Coverage Factor k
420.0	Zero	0.000	0.0028	2.00
	0.5750	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
	1.0013	0.997	0.0028	2.00
465.0	Zero	0.000	0.0028	2.00
	0.5222	0.521	0.0028	2.00
	0.6646	0.664	0.0028	2.00
	0.9444	0.944	0.0028	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5234	0.522	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	0.554	0.0028	2.00
	0.7760	0.772	0.0028	2.00
	1.1104	1.105	0.0028	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5648	0.563	0.0028	2.00
	0.7654	0.763	0.0028	2.00
	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 %.