

ภาคผนวก ง

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ใบรับรองการสอบเทียบเครื่องมือ



High Volume Air Sampler Calibration Worksheet

Project Site: The Base Height-Chiangmai Juristic Person Condominium Barometric Pressure (mm Hg) : 729.8

Calibrate Location : เชียงใหม่จังหวัดเชียงใหม่ Temperature (°C) : 28.9

Calibrate Date : 20-Feb-25 High Volume ID : CHM\_FS0115

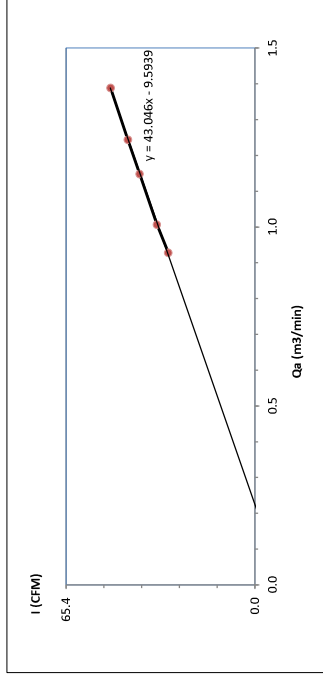
Calibrations/Sample No.: C-200225-CHM\_FS0115 High Volume Model : TE-5009X


Calibrator ID: CHM\_FS0039 High Volume S/N : 1091

Calibrator Model: TE-5028A Calibrator Slope : 1.05066

Calibrator S/N : 3680 Calibrator Intercept : -0.01943

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I-Chart (CFM)	Linear Regression
1	2.2	0.927	30	Slope : 43.0456
2	2.6	1.007	34	Intercept : -9.5939
3	3.4	1.148	40	Correlation Coefficient : 0.9995
4	4.0	1.244	44	
5	5.0	1.388	50	



Calibrated by :  Approved by : 

(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)

(Mr.Sithichok Taseeda)  
Field Scientist(3)



รายงานการสอบเทียบใช้การวิเคราะห์ / วิทยาศาสตร์

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Particulate Matter (PM <sub>10</sub> )	High Volume	CHM_FS0115	-	-	On site Calibration
Ambient	Particulate Matter (PM <sub>10</sub> )	Digital Balance	BKC EN0403	3-Jun-24	3-Jun-25	12
Ambient	Total Suspended Particulate	High Volume	CHM_FS0113	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	BKC EN0403	3-Jun-24	3-Jun-25	12
Ambient	Carbon Monoxide	DRYCAL FLOWMETER	BKC FS0614	9-Sep-24	9-Sep-25	12
Ambient	Carbon Monoxide	DRYCAL FLOWMETER	BKC FS0619	9-Sep-24	9-Sep-25	12
Ambient	Carbon Monoxide	Air Sampling Pump	CHM_FS0064	27-Nov-24	27-Feb-25	3
Ambient	Carbon Monoxide	CO Analyzer	BKC EN0375	5-Aug-24	5-Aug-25	12
Water Lab	Total Coliform	Autoclave	BKC IL10043	26-Sep-24	26-Feb-25	18
Water Lab	Total Coliform	Incubator	BKC IL10010	3-Dec-24	3-Dec-25	12
Water Lab	Total Coliform	Hot Air Oven	BKC IL10013	23-Apr-24	23-Oct-25	18
Water Lab	Fecal Coliform	Autoclave	BKC IL10043	26-Sep-24	26-Feb-25	18
Water Lab	Fecal Coliform	Incubator	BKC IL10010	3-Dec-24	3-Dec-25	12
Water Lab	Fecal Coliform	Hot Air Oven	BKC IL10013	23-Apr-24	23-Oct-25	18
Water Lab	Fecal Coliform	Water Bath	BKC IL10056	4-Mar-25	4-Mar-25	12
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BKC EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Total Suspended Solids	Oven	BKC EN0273	14-May-24	14-Dec-25	18
Water Lab	BOD	DO Meter	BKC EN0205	24-Feb-24	24-Aug-25	18
Water Lab	BOD	Incubator	BKC EN0272	22-Aug-24	22-Aug-25	12
Water Lab	pH at 25 °C	Burette	BKC EN0171	27-Feb-24	27-Aug-25	18
Water Lab	Settleable Solids	Chamber (Cooling Room)	BKC EN0342	17-Oct-24	17-Oct-25	12
Water Lab	Sulfide	Burette	BKC EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Sulfide	Chamber (Cooling Room)	BKC EN0171	27-Feb-24	27-Aug-25	18
Water Lab	Oil & Grease	Electronic Top-Loading Balance	BKC EN0003	4-Jun-25	4-Dec-26	18
Water Lab	Oil & Grease	Digestion Unit	BKC EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Total Kjeldahl Nitrogen	Discrete analyzer	BKC EN0439	29-Oct-24	29-Oct-25	12
Water Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	BKC EN0037	16-Aug-24	16-Aug-25	12
Water Lab	Total Dissolved Solids 180°C	Oven	BKC EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BKC EN0003	14-May-24	14-Nov-25	18
Water Lab	Total Suspended Solids	Oven	BKC EN0273	2-Aug-24	2-Aug-25	12
Water Lab	Staphylococcus aureus	Autoclave	BKC IL10043	26-Sep-24	26-Feb-25	18
Water Lab	Staphylococcus aureus	Incubator	BKC IL10010	3-Dec-24	3-Dec-25	12
Water Lab	Staphylococcus aureus	Hot Air Oven	BKC IL10013	23-Apr-24	23-Oct-25	18
Water Lab	Pseudomonas aeruginosa	Autoclave	BKC IL10043	26-Sep-24	26-Feb-25	18
Water Lab	Pseudomonas aeruginosa	Incubator	BKC IL10010	3-Dec-24	3-Dec-25	12
Water Lab	Pseudomonas aeruginosa	Hot Air Oven	BKC IL10013	23-Apr-24	23-Oct-25	18
Water Lab	Escherichia coli	Autoclave	BKC IL10043	26-Sep-24	26-Feb-25	18
Water Lab	Escherichia coli	Incubator	BKC IL10010	3-Dec-24	3-Dec-25	12
Water Lab	Escherichia coli	Hot Air Oven	BKC IL10013	23-Apr-24	23-Oct-25	18
Water Lab	Escherichia coli	Water Bath	BKC IL10056	4-Mar-25	4-Mar-25	12
Water Lab	Ammonia Nitrogen	Discrete analyzer	BKC EN0037	16-Aug-24	16-Aug-25	12
Water Lab	Chloride	Ion Chromatography	BKC EN0427	21-Nov-24	21-Nov-25	12
Water Lab	Cyanic acid	Spectrophotometer	SGK CL1000	25-Dec-24	25-Dec-25	12
Water Lab	Total Hardness	Burette	BKC EN0296	29-Nov-24	29-May-26	18
Water Lab	Nitrate	Ion Chromatography	BKC EN0427	21-Nov-24	21-Nov-25	12



PLAY SOLUTION TECHNOLOGY COMPANY LIMITED  
139/75 Newong Pongsa Pathana Road, Siam, Chonburi, Thailand 20120  
Tel: +66 2 011 0505 Fax: +66 2 010 7100  
www.playstec.com



## CERTIFICATE OF CALIBRATION

Certificate No. : PST-0125-34

W/O No. : WO-0051-28

### Customer

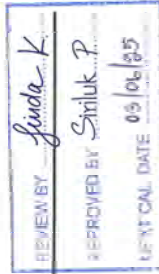
Company : AIS (ABCHATO BY GROUP THAILAND) CO., LTD.  
Address : 104 Phatthanakon Rd, Phatthanakon Road, (Rueong Phatthanakon)  
City / Province : Rattana Suda Uthong, Bangkok  
Zip/Postal : 10250

### Device

Equipment : Electronic Balance  
Manufacture : OHAUS  
Model : ENK250/AD  
Serial No. : C508774648  
Condition : Normal  
Capacity : 130.125g  
Readability : 0.0001 g  
ID No. : BXC\_ENK205

### Environment Conditions

Location of Calibration : Environment Lab  
Ambient Temperature : 20.1 °C ± 3 °C  
Relative Humidity : 70.3 (RH) ± 15 %RH  
Barometric Pressure : 1011.1 (mbar) ± 10 hPa  
Comment :



### Date of Receipt

June 3, 2024

### Date of Calibration

June 3, 2024

### Issue Date

June 3, 2024

### Calibrated by

Mr. Jitichai Sattansham

### Approved by

Mr. Jitichai Sattansham

Calibrator

Approved Signature

The reported measurement result relates only to the measurement and applies only at the time of measurement.

This Certificate is issued in accordance with the conditions of accreditation granted by The Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and is traceable to recognize national standards and to the unit of measurement held at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval or prior written approval of the calibration center, Play Solution Technology Co., Ltd.

F.025

REV 03/30/08/06



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## CERTIFICATE OF CALIBRATION

Certificate No. : PST-0125-34

W/O No. : WO-0051-28

### Result of Calibration

1. Traceability

### 1. Traceability

Measuring Range	g	Normal Value	g	Standard Deviation	g
Measuring Range	230	50	300	0.000072	0.000048

### 2. Directivity (Dependence of Indication from nominal value)

Measuring Range	g	Standard Value	g	Indication	g	Error of Indication	g	Required Uncertainty	g	Factor
0.1	0.01000	0.01000	0.01000	0.01000	-0.000021	0.000082	2.87			
0.1	0.10000	0.10000	0.10000	0.10000	0.000004	0.000082	2.87			
0.5	0.50000	0.50000	0.50000	0.50000	0.000013	0.00008	2.87			
1	1.00000	1.00000	1.00000	1.00000	0.000013	0.00008	2.87			
5	5.00000	5.00000	5.00000	5.00000	0.000009	0.00008	2.87			
10	9.99999	9.99999	9.99999	9.99999	-0.000001	0.00008	2.87			
50	50.00001	49.99998	49.99998	49.99998	-0.000027	0.00016	2.00			
100	100.00000	100.00000	100.00000	100.00000	0.000004	0.00031	2.00			
150	150.00000	150.00000	150.00000	150.00000	0.000009	0.00045	2.00			
200	200.00000	200.00000	200.00000	200.00000	0.000008	0.00060	2.00			

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REV 02/24/08/06



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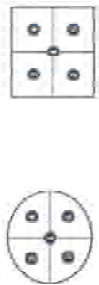
## CERTIFICATE OF CALIBRATION

Certificate No. : PST-012624

W/O No. : W/O-0151-24

### Result of Calibration

3. Accuracy  
Test load at least 1/2 of the maximum capacity, capacity placed below at 1/2 and 1/8 of the distance from the position of the load nearest to the edge.



Position	Indication	g
1	100.00004	
2	100.00005	
3	100.00002	
4	100.00004	
5	100.00003	
Max Deviation	0.00002	

### Standard method

The calibration was performed by using calibration (balance) in-house calibration method : OIML R111 (second ed)  
"JIS S 143 14 Calibration of weighing instruments" edition 1 (December 2013)

### Reference standards instrument

Instrument	OIML Code	S/N	Certification No.	Exp. Date
Standard Weight Set	E2	4000031923	21-118725	November 30, 2024
Standard Weight Set				
Standard Weight Set				

### Measurement Uncertainty

The given measurement uncertainty is the standard of the measurement method by the instrument factor & which is expressed in to a confidence level of about 95% for a normal distribution. The standard uncertainty was calculated according to JGAS J43003.

Traceability: The measurement is traceable to national standard, which require the physical unit of measurement (SI). Through the reference calibration laboratory of Asia Medical and Agricultural Laboratory and Research Center Co., Ltd.

END OF REPORT

F-0239

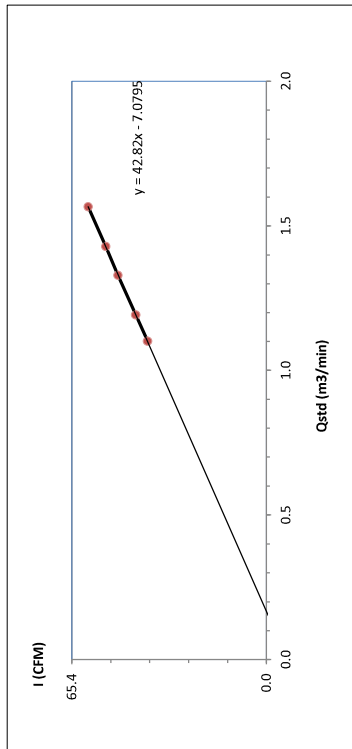
REV:AS 30/05/66



## High Volume Air Sampler Calibration Worksheet

Project Site : The Base Height-Chiangmai Juristic Person Condominium	Barometric Pressure (mm Hg) : 729.8
Calibrate Location : บริเวณพื้นที่โครงการ	Temperature (°C) : 28.9
Calibrate Date : 20-Jan-25	High Volume ID : CHM_FS0113
Calibrationsheet No. : C-200125-CHM_FS0113	High Volume Model : TE-5170D
Calibrator ID : CHM_FS0039	High Volume S/N : 1065
Calibrator Model : TE-5028A	Calibrator Slope : 1.6774
Calibrator S/N : 3680	Calibrator Intercept : -0.0312

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>add</sub> (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	3.4	1.1014	40	Slope : 42.8205
2	4.0	1.1920	44	Intercept : -7.0795
3	5.0	1.3290	50	Correlation Coefficient : 0.9999
4	5.8	1.4290	54	
5	7.0	1.5668	60	



Calibrated by

( Mr.Sittichok Taseeda )  
Field Scientist(3)

Approved by :

(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



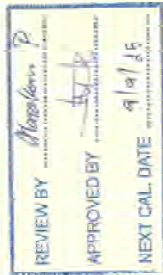
Certificate of Calibration

**Customer**  
Name : ALS Laboratory Group Thailand Co., Ltd.  
Address : 104 Soi Phatthana 40, Phatthana Road, Sam Langk  
Bangkok 10250

Unit Under Calibration Details

Measurement Item : Air Flow Meter  
Manufacturer : Molates  
Model : Defender S10-M  
Serial Number : 151114  
ID : BKK-FS0614  
Location of Calibration : LAB 4 AIR VELOCITY METER  
Calibration Environment and Details  
Temperature : 23.5°C ± 0.1°C  
Humidity : 55 %RH ± 20 %RH  
Barometric Pressure : 1013.0 hPa ± 10 hPa  
Received Date : 30 August 2024  
Calibration Date : 9 September 2024

Accuracy : 1% of Reading  
Sensor Model : -  
Sensor Serial Number : -  
Instrument Status : Used



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	Calibrator 3 Low flow	18501010066	Sensodyne	6 August 2025
Air Flow Meter	Calibrator 3 Standard flow	19031011003	Sensodyne	2 August 2025
Temperature meter	GT 11	08000357	Qesbon	1 March 2025
Pressure meter	CP03400	410006KDU1651802	TFA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensodyne A2LA Accreditation No. 1443.01

Note :

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

Calibration By : WV

Mr. Nopadol Litangrat  
Service Calibration Engineer

Approved By : Mr. Paci Mahasom

Mr. Paci Mahasom  
Calibration Engineer Supervisor  
Issue Date : 9 September 2024



Certificate No : 24-AFM-179

Request No : Req-2024-1987

Result of Calibration : Without adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	NPE (cc/min)	Result
24.70	100.95	100	100.41	0.4	2.8	1.0	N/A
24.90	100.90	502	500.47	-1.5	7.1	5.0	N/A
24.90	100.97	1103	1101.3	-2	14	10.0	N/A
25.00	100.92	2014	2008.9	-5	29	20.1	N/A
25.30	101.02	3043	3058.3	15	44	30.4	N/A
25.30	101.10	4043	4005.1	-38	57	40.4	N/A
25.50	101.15	5052	5003.9	-48	74	50.5	N/A

Note : STD - Standard UUC - Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- 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

Subs = Measurement Condition

ref = Standard Condition

\* Indicates not awarded

MPH = Maximum Permissible Error (Specified to Manufacturer's Specification)

N/A = Not Applicable. Customer does not require a statement of conformity.



Certificate No: 24-APM-177  
Request No: Req-2024-1862

### Decision Rule for Statements of Conformity

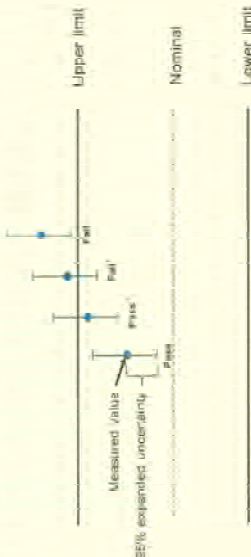
The statistical decision rule employed for the statements of conformity (based calibration result) will be applied using UAC Calibration Standards on the Reporting of Compliance with Specification as follows (Fig. and statements)

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability was within the limit.

Fail<sup>1</sup> - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement (10% exceeds the limit).

Fail<sup>2</sup> - The measurement result was out of the limit. However, a portion of its expanded uncertainty of measurement at 95% is within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability was outside the limit.



End of Certificate

Certificate No: 24-APM-177  
Request No: Req-2024-1862

### Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
24.70	100.02	20	20.192	0.2	1.5	0.2	N/A
24.70	100.00	100	99.523	-0.1	2.8	1.0	N/A
24.70	100.04	201	200.7	-0.3	5.5	2.0	N/A
24.70	100.07	298	300.1	2.1	8.4	3.0	N/A
24.70	100.09	403	395.1	-4	11	4.0	N/A
24.40	101.05	482	477.6	-4.4	6.9	4.8	N/A

Note: STD - Standard UUC - Unit Under Calibration

UUC Reference Condition: At Atmospheric pressure and room temperature condition

Flow Rate was corrected for non-standard operating condition by using equation:

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

where: Q - Flow Rate P - Absolute Pressure T - Absolute Temperature  
Meas - Measurement Condition ref - Standard Condition

\* Indicates non accredited

MPE - Maximum Permissible Error (Specified in Manufacturer's Specification)

N/A - Not Available, Customer does not require a statement of conformity.



### Air Sampling Pump Calibration Report

Air Sampling Pump Detail		
Calibration Date	27 Nov 2024	
Air Sampling Pump II	CHM_FS0064	
Serial No.	20191210013	
Next cal.		27 Feb 2025
Barometric (mmHg)		728
Temperature (°C)		27.5
Reference Standard Low Flow Meter		
Brand	Mesalabs	BKK_FS0619
Model	Defender 510-L	130026
Due Date	9-Sep-25	
Reference Standard High Flow Meter		
Brand	Mesalabs	BKK_FS0614
Model	Defender 510-M	151114
Due Date	9-Sep-25	

Calibration Data					
Air Sampling Pump setting (cc/min)	Reference Standard Flow Reading (cc/min)			Avg. (cc/min)	Acceptable (cc/min)
	1	2	3		
20	19.6	19.4	19.8	19.6	21
50	49.6	50.0	50.1	49.9	52.5
100	100.5	100.8	100.4	100.6	105
200	200.7	197.5	199.9	199.4	210
500	503.0	501.1	497.8	500.6	515
1000	1002.9	1000.5	1005.7	1003.0	1010
2000	2004.1	2003.7	2003.0	2003.6	2020
2500	2513.4	2508.2	2510.1	2510.6	2550

Note : Reference Specifications ± 5% of set flow or ± 3% cc/min whichever is Higher

Calibrated by :  (Mr. Sithichok Taseeda)  
Enviro Field Services

Approved By :  (Mr. Wichan Choonharat)  
Enviro Field Services Manager



FORM NO.: F 06-115 REVISION NO.: 1 ISSUE DATE: 10/04/24

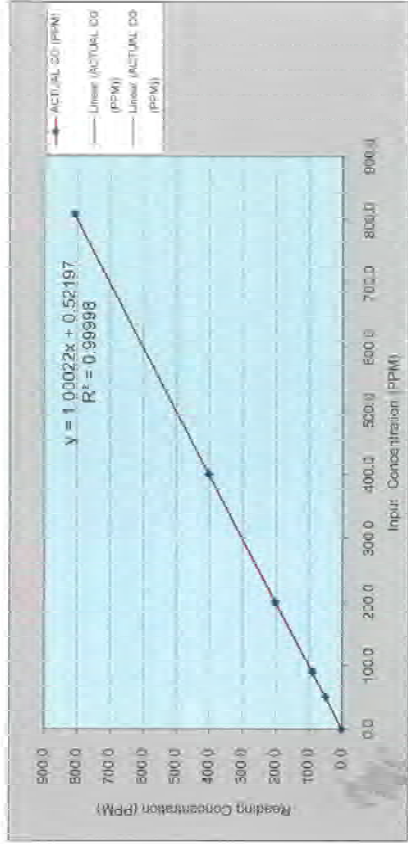
### MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : ALS Laboratory Group (Thailand) Co.Ltd.	
EQUIPMENT NAME : CO Analyzer	
MANUFACTURER : Tedyne - API	MODEL : T300
STANDARD GAS CONCENTRATION (PPM) : 808.9	
CYLINDER PRESSURE (psig) : 900	
CERTIFIED BY : AIRGAS SPECIALTY GASES	
SERIAL NO : 5947	CERTIFIED DATE : OCT31972
	CERTIFIED DATE : Nov 05 2020
	EXPIRED DATE : Nov 05 2028

### CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	DEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.01	0.01	-
1	50.00	49.36	-0.64	-1.28
2	90.00	89.64	-0.36	-0.51
3	199.20	202.08	2.88	1.45
4	400.30	402.41	2.11	0.53
5	808.90	808.47	-0.43	-0.05
AVERAGE (%)				0.76

REVIEW BY :   
APPROVED BY :   
NEXT CAL DATE : 5 Aug 15



CALIBRATED BY : คุณเจนจิรา นพวิทย์	DATE : 58-Mar-2567
ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : คุณเจนจิรา นพวิทย์ 02-515-8367	
เลขที่ 888 ถนนรัชดาภิเษก แขวงจันทริก เขตจตุจักร กรุงเทพฯ 10000 โทรศัพท์ 0-2515-8866 โทรสาร 0-2515-8868 E-Mail info@inmetrics.co.th	



## Certificate of Calibration

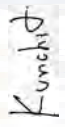
Cert. No.: 24TM1318  
Page : 1 of 3

Equipment : Autoclave  
Manufacturer : AES CHEMUNEX  
Model : Masterlave 528  
Serial No. : 34677152  
ID No. : BKK\_ML0043

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 : 26 September 2024  
Calibration Date : 26 September 2024  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Tawatchai Pama

Approved by :   
Approved Signatory

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

Issue Date : 09 October 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2409-0695OC-6  
Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT03 Based on BS 2646-5 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:-

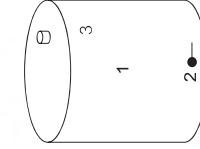
Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49001451	24LM79	TPA	29 May 2025
2. This certificate is valid only to the item calibrated on date and place of calibration.				
3. This certification is traceable to the International System of Unit.				
4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**				

(\*\* = Categorization of pathogens according to hazard and categories of containment, second edition, 1990 )  
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.  
This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source



Beginning of Calibration	Environmental	
	( °C )	( %R.H. ) ( Volt )
Finished of Calibration	25	55 225
	26	50 226

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	24-19TC-01
2 =	Temperature sensor	24-19TC-02
3 =	Exhaust port	24-19TC-03



Cert. No.: 24TM1318  
Page : 3 of 3

Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2409-0695OC-6  
Result of Calibration : ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Operating parameter Set : Temperature = 121.0 °C  
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (bar)	Uncertainty (± °C)	Coverage Factor <i>k</i>
121.0	120.9	1	121.127	0.19	1.5	0.75	2
		2	121.316				
		3	121.292				

Operating parameter Set : Temperature = 38.0 °C Sterilization period = 30 minute							
UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (bar)	Uncertainty (± °C)	Coverage Factor <i>k</i>
38.0	38.0	1	37.698	0.17	0.0	0.61	2
		2	37.865				
		3	37.879				

**Average\*** : The average of 30 values in each position.  
**Stability** : One-half of the greatest maximum difference of measured temperature at any one probe.  
**UUC\*** : Unit Under Calibration  
**Note** : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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



## Certificate of Calibration

Cert. No.: 24TM1398  
Page : 1 of 3

Equipment : Incubator  
Manufacturer : SHEL-LAB  
Model : 1915A  
Serial No. : 0200599  
ID No. : BKK\_ML0010

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

Received Order : 03 December 2024  
Calibration Date : 03 December 2024  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
AC Line Voltage : ( 220 ± 22 ) V

Calibrated by : Kunchit Promprat

*[Signature]*

Approved by : Approved Signatory

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

Issue Date : 17 December 2024

The Uncertainties are for a confidence probability of approximately 95%

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



**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2412-0004OC-1  
**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**

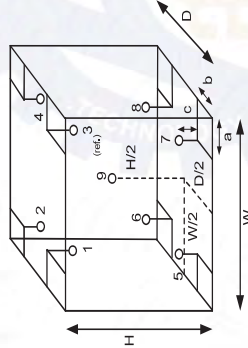
1. Reference standard instrument:-  
**Instrument**      **Serial No.**      **Cert. No.**      **Traceable**      **Due Date**  
1 ) Data Acquisition      MY49023932      24LM119      TPA      27 Jul 2025

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

3. This certification is traceable to the International System of Unit.

**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	24	24
REL.Humid. ( % )	51	55
AC Supply ( Volt )	223	223



**Probe Installation Details :**  
a = 10 cm  
b = 10 cm  
c = 10 cm  
**Dimension of Chamber :**  
D = 0.50 m  
W = 0.75 m  
H = 1.2 m  
Capacity = 0.45 m<sup>3</sup>

Position :	Ref. Std. ID No.:
1	19-16RTD-01
2	19-16RTD-02
3	19-16RTD-03
4	23-16RTD-04
5	19-16RTD-05
6	19-14RTD-06
7	21-16RTD-07
8	19-16RTD-08
9 (ref.)	19-16RTD-09



**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2412-0004OC-1  
**Page :** 3 of 3  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

Calibration Point ( °C )	Measured Temperature ( °C )									Overall Variation ( °C )	Coverage Factor <i>k</i>
	Position										
	1	2	3	4	5	6	7	8	9 (ref.)		
35.0	34.888	34.840	35.116	35.141	34.750	34.896	34.921	35.054	34.768	0.46	2
Uncertainty ( ± °C )											
0.30											

**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)  
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TEL 0-2717-3000-29 FAX 0-2719-9484



## Certificate of Calibration

Cert. No.: 24TM667  
Page : 1 of 3

Equipment : Hot Air Oven  
Manufacturer : Binder  
Model : ED 240E2  
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 : 23 April 2024  
Calibration Date : 23 April 2024  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Tawatchai Pama

Approved by :   
Approved Signatory

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

Issue Date : 26 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2404-04390C-8  
Procedure Used :-

Cert. No.: 24TM667  
Page : 2 of 3

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	MY49001451	24LM44	TPA	17 Mar 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.

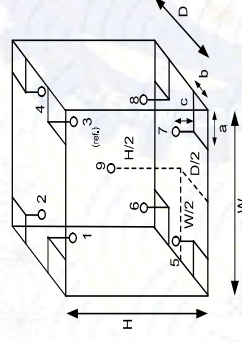
Remark : TPA : Technology Promotion Association ( Thailand - Japan )

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close

Environment during calibration	
Beginning	Finished
Temp. ( °C )	24 23
REL.Humid. ( % )	65 65
AC Supply ( Volt )	223 222



### Probe Installation Details :

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

### Dimension of Chamber :

D = 0.50 m  
W = 0.80 m  
H = 0.60 m  
Capacity = 0.24 m<sup>3</sup>

Position :	Ref. Std. ID No.:
1	24-19TC-01
2	24-19TC-02
3	24-19TC-03
4	24-19TC-04
5	24-19TC-05
6	24-19TC-06
7	24-19TC-07
8	24-19TC-08
9 (ref.)	24-19TC-09



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2404-04390C-8  
Result of Calibration :-  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 24TM667  
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
180	180	180	0.64	2.7	3.7	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	1	2	3	4	5	6	7	8	9 (ref.)	
180	181.009	181.511	180.922	181.359	181.217	183.659	181.664	181.986	181.474	1.5

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



MSC-TB-170317032  
CALIBRATION 0008

## 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 :   
Approved Signatory

( ) Chakrit Waewwanjua  
( ) Suwit Injai  
(✓) 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.

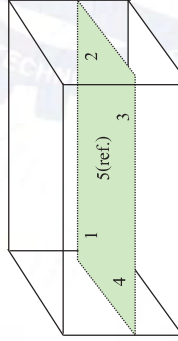
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

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

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

**Heat transfer medium used :** Water

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

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Sartorius (Thailand) Co., Ltd.  
129 Rama 9 Road, Huaykong, Huaykong, Bangkok 10310  
Tel: +66 2643 8351-6, e-mail: service.thailand@sartorius.com



MSCE-245-100-DU  
ANALYTICAL BALANCE

# Certificate

of Calibration

Model Number: MSCE245-100-DU  
Description: Analytical Balance  
Serial Number: 0027405555  
ID No.: BKK-EN0003  
Manufacturer: Sartorius

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

Calibrated Place: Lab Room

Calibrated By: Mr. Chuchai Intanana  
Calibration Date: Friday, August 02, 2024  
Calibration Procedure No.: This calibration was conducted by  
Using in-house calibration procedure number (WI-003)  
Based on UKAS IAB 14:2019

Metrolological data:  
Capacity: 220 g Residuality: 0.0001 g  
Temperature: 23.0 °C ± 5.0 °C  
Humidity: 55.0 % RH ± 10.0 % RH  
Pressure:   
Reasons for calibration: ☒ New Installation ☒ Service / Repair ☒ Recalibration/ Maintenance ☐ Full

## Measurement Method

UKAS Publication Ref: Lab 14  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

## Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 500mg E2, YCS011-522-00	ITS	M72081975	23-Aug-2025
Testo 174 H	Thermo-Hygrometer, Testo 174H	ENTECH	HIT 661303.H661140	12-Nov-2024

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

SOP FM 33 00 February 2022

Mr. Chuchai Intanana (Technical Manager)



REVIEW BY: Junda K.  
APPROVED BY: Chulak P.  
NEXT CAL DATE: 02/08/25

MSCE-245-100-DU  
ANALYTICAL BALANCE

# Certificate

of Calibration

Certificate No.: 24BC0270  
Issued Date: Monday, August 05, 2024  
Reference No.: 240942  
Page No.: 1 of 2

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

Calibrated Place: Lab Room

Calibrated By: Mr. Chuchai Intanana  
Calibration Date: Friday, August 02, 2024  
Calibration Procedure No.: This calibration was conducted by  
Using in-house calibration procedure number (WI-003)  
Based on UKAS IAB 14:2019

Metrolological data:  
Capacity: 220 g Residuality: 0.0001 g  
Temperature: 23.0 °C ± 5.0 °C  
Humidity: 55.0 % RH ± 10.0 % RH  
Pressure:   
Reasons for calibration: ☒ New Installation ☒ Service / Repair ☒ Recalibration/ Maintenance ☐ Full

## Measurement Method

UKAS Publication Ref: Lab 14  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

## Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 500mg E2, YCS011-522-00	ITS	M72081975	23-Aug-2025
Testo 174 H	Thermo-Hygrometer, Testo 174H	ENTECH	HIT 661303.H661140	12-Nov-2024

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

SOP FM 33 00 February 2022

Mr. Chuchai Intanana (Technical Manager)



Sartorius (Thailand) Co., Ltd.  
129 Rama 9 Road, Huaykong, Huaykong, Bangkok 10310  
Tel: +66 2643 8351-6, e-mail: service.thailand@sartorius.com

MSCE-245-100-DU  
ANALYTICAL BALANCE

# Certificate

of Calibration

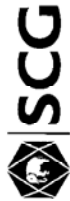
Model Number: MSCE245-100-DU  
Description: Analytical Balance  
Serial Number: 0027405555  
ID No.: BKK-EN0003  
Manufacturer: Sartorius

## Calibration Results : Without Adjustment

Repeatability		Eccentricity (Off-center loading error)	
The repeatability is the ability of a weighing instrument to display nearly identical results under constant test conditions when the same load within a measurement range is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express repeatability quantitatively.		The off-center loading error is related to the difference between the center of the load, i.e. 1/2 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R110).	
Nominal Value (Low Load)	20.0000	Nominal value:	100 g
Tolerance	0.0001	Tolerance	0.0004 g
Nominal Value (High Load)	200.0000		
Tolerance	0.0001		
Standard Deviation	0.00004		

Linearity		Linearity	
The linearity, also called linearity error, describes the deviation of the characteristic curve of a weighing instrument from the linear slope.		The linearity, also called linearity error, describes the deviation of the characteristic curve of a weighing instrument from the linear slope.	
Nominal Value	0.0002 g	Conventional Mass Value	0.0002 g
Tolerance	0.0002 g	Displayed Value	0.0002 g
Nominal Value	0.01 g	Conventional Mass Value	0.0100 g
Tolerance	0.0001 g	Displayed Value	0.0100 g
Nominal Value	0.1 g	Conventional Mass Value	0.1000 g
Tolerance	0.0001 g	Displayed Value	0.1000 g
Nominal Value	1 g	Conventional Mass Value	1.0000 g
Tolerance	0.0001 g	Displayed Value	1.0000 g
Nominal Value	5 g	Conventional Mass Value	5.0000 g
Tolerance	0.0001 g	Displayed Value	5.0000 g
Nominal Value	10 g	Conventional Mass Value	10.0000 g
Tolerance	0.0001 g	Displayed Value	10.0000 g
Nominal Value	20 g	Conventional Mass Value	20.0000 g
Tolerance	0.0001 g	Displayed Value	20.0000 g
Nominal Value	50 g	Conventional Mass Value	50.0000 g
Tolerance	0.0001 g	Displayed Value	50.0000 g
Nominal Value	100 g	Conventional Mass Value	100.0000 g
Tolerance	0.0001 g	Displayed Value	100.0000 g
Nominal Value	200 g	Conventional Mass Value	200.0000 g
Tolerance	0.0001 g	Displayed Value	200.0000 g

SOP FM 33 00 February 2022



## Metrology

SCI ECO Services Company Limited

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

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

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

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



Certificate No. T240904

Page 1 of 3

### Certificate of Calibration

Equipment : Chamber ( Oven )  
Manufacturer : Memmert  
Model : UF 450  
Serial No. : B717.0531  
Customer Code : BKK\_EN0273  
ID No. : T8042A4  
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Laboratory (Oven Room)

Date of Receipt : 08 May 2024

Calibrated By : Preecha Phisassuthikul ( Temperature Calibration Manager )

Approved By : / Nuafun Sungchum (Metrology Manager)

Date of Issue : 23 MAY 2024

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

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

FM-L14 119/18-08-66



## Metrology

SCI ECO Services Company Limited

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



Certificate No. T240904

Page 2 of 3

### Calibration Report

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

#### Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001 ) and AS2853-1986 ) .

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

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	21-(CHI-10)	T231955	17 November 2024
DATA LOGGER	34970A	T121	T231955	17 November 2024

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant : 1 Hour 30 Minute At 104 °C  
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close ☒ Not Available

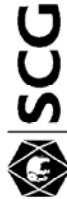
5. Adjustment :

( X ) without adjustment

( ) after adjustment

Approved By :

FM-L15 118/18-08-66



Metrology

SCI ECO Services Company Limited

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

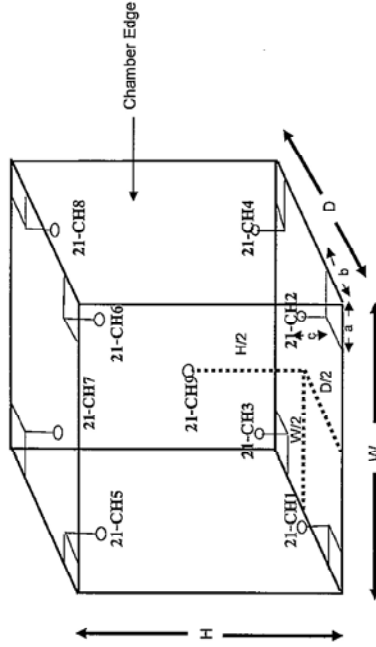


NSC-TIS-TIS 17025  
CALIBRATION 0244

Certificate No. T240904

Page 3 of 3

## Calibration Report



### Remark :

Internal Dimensions of Chamber : W (Width) = 104 cm. , H (Height) = 72 cm. and D (Depth) = 60 cm.  
Size of Installed Standard sensor number 21-CH1 to number 21-CH9 : a = 5 cm. , b = 5 cm. and c = 5 cm.  
Size of Installed Standard sensor number 21-CH9 : W/2 = 104 cm./2 , H/2 = 72 cm./2 and D/2 = 60 cm./2

### Measurement Results

Calibration Point	Average Standard Reading at each position (°C)											
	21-CH1	21-CH2	21-CH3	21-CH4	21-CH5	21-CH6	21-CH7	21-CH8	21-CH9			
104	103.4	103.0	103.7	103.6	103.3	104.6	103.3	104.0	103.9			
180	179.5	181.1	179.2	179.5	179.0	181.3	179.8	179.9	180.2			

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

\* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

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

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing

a level of confidence of approximately 95 % .

End of Certificate

Approved By: 

FM-L15 118/18-08-66



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

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

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

Cert.No.: 24TW28

Page.: 1 of 2

## Certificate of Testing

Equipment : DO Meter  
Manufacturer : YSI  
Model : 5100  
Serial No. : 15L103204  
ID No. : BKK\_EN0205  
Received Date : 01 February 2024  
Test Date : 02 February 2024  
Reference : 2402-0008DSC-10  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand

REVIEW BY



APPROVED BY



NEXT CAL DATE

02/08/25

Laboratory Condition :

Temperature ( 25 ± 5 ) °C

Humidity ( 50 ± 20 ) %

In - house method : CP-CH9

by Comparison Technique with Azide Modification Method

Test Procedure :

Tested by :

Walalak Sirithean

Approved by :



Approved Signatory

(✓) Sathip Meangmai

( ) Warakorn Lengagtrakul

( ) Ponpan Paipim

Issue Date :

7 February 2024



Cert.No.: 24TW28  
Page.: 2 of 2

#### Condition of this result of calibration

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

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

#### 2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

**Result :** Dissolved Oxygen Meter Adjustment With Air 100 %  
Dissolved Oxygen Probe No.: 17A100064

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

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

-o0o-

## Certificate of Calibration

Cert. No.: 24LM15  
Page.: 1 of 2

Equipment : DO Meter with Sensor  
Manufacturer : YSI  
Model : 5100  
Serial No. : 15L103204  
ID No. : BKK\_EN0205  
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand  
Location : TPA Chemistry Calibration Laboratory  
Received Order : 01 February 2024  
Calibrated Date : 02 February 2024  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
AC Line Voltage : ( 220 ± 22 ) V

Calibrated by : Warakorn Lemgagtrakul

Approved by :

Approved Signatory

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

Issue Date : 7 February 2024

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

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



Equipment : DO Meter with Sensor  
Condition As-Received : Used Item  
Reference : 2402-0008DSC-13  
Cert. No.: 24LM15  
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    | 231216    | TPA       | 11 Oct 2024 |
2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This certification is traceable to the International System of Unit.
- Remark : TPA : Technology Promotion Association ( Thailand - Japan )

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

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 17A100064

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	80	20.003	19.92	-0.083	0.15	2.00

UUC\* : Unit Under Calibration

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

-o0o-

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 : 14 August 2024

Calibrated By : Sujjar Naknakred ( Site Calibration Manager )

Approved By :  / Boonchai Suriyawong ( Assistant Calibration Manager )

Date of Issue : 17 AUG 2024

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

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



Metrology

SCIECO Services Company Limited

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



Metrology

SCIECO Services Company Limited

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



Certificate No. T241495

Page 2 of 4

## Calibration Report

Equipment : Chamber ( Incubator )  
Date of Calibration : 22 August 2024 ( Finished Time 11:19 AM )  
Environment : Temperature 22.3-23.0 °C  
Line Voltage 222.5-227.5 V

### Condition of this results of test :

1. This instrument was calibrated by insert 12 standard resistance thermometer into its chamber and test according to W1-T20 ( based on ASTM E145-94 ( Reapproved 2001 ) and AS2853-1986. )  
All data show below were final values and the initial data may be obtained upon 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	27-(CH1-10)	T240709	19 April 2025
RTD	100 ohm	28-(CH1-10)	T240709	19 April 2025
DATA LOGGER	34970A	T149	T240709	19 April 2025

3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 1244. )

### 4. Condition of calibrated item : good

UUC Description :

Time Constant 1 Hour 38 Minute At 20 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

### 5. Result of test :

( ) without adjustment

( X ) after adjustment

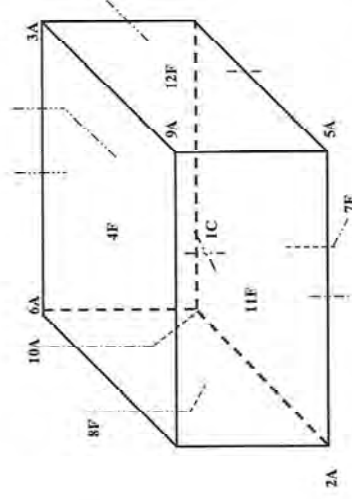
Approved By \_\_\_\_\_

PM-L15 118/18-08-66

Certificate No T241495

Page 3 of 4

## Calibration Report



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

1C =	27-CH1
2A =	27-CH2
3A =	27-CH3
4F =	27-CH4
5A =	27-CH5
6A =	27-CH6
7F =	27-CH7
8F =	27-CH8
9A =	27-CH9
10A =	27-CH10

11F =	28-CH1
12F =	28-CH2

Approved By \_\_\_\_\_

PM-L15 118/18-08-66



Metrology

SCI ECO Services Company Limited

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



Certificate No. T241495

Page 4 of 4

## Calibration Report

### Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	27-CH1	27-CH2	27-CH3	27-CH4	27-CH5	27-CH6	27-CH7	27-CH8	27-CH9	27-CH10
	20.12	20.32	20.29	20.23	20.30	20.34	20.40	20.16	20.34	19.62
20.0	28-CH1	28-CH2								
	19.70	19.65								

Chamber ( Incubator )		Temperature Distribution				
		Reading (°C)	Average (°C)	Stability (± °C)	Uniformity (°C)	Coverage Factor k
20.0	Min, Max	19.9, 20.1	20.0	0.04	0.19	2.00
	Average		20.01			

\* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

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

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By: \_\_\_\_\_

Capacity :

50 mL

Serial No. :

-

ID. No. :

BKK\_EN0171

Manufacturer :

Witeg

Made in :

Germany

Submitted by :

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

Ambient Temperature :

(20 ± 2.5) °C

Relative Humidity :

(50 ± 10) %

Barometric Pressure :

760 mmHg

Calibration Procedure :

ASTM E 542 - 01

Calibrated by :

Natcha Chayingcheiw

Approved by :

Approved Signatory

( ) Unnophol Harachai

(✓) Srisuda Khamtha

( ) Sa-ngeunkam Wongs

Issue Date :

27 February 2024

The Uncertainties are for a confidence probability of approximately 95%

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



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

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

Condition of this result of calibration

1. Reference Standard Instruments :

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
1) Balance	XP205DR	1126143764	140RC004	23MM538	TPA	15 Sep 2024
2) Thermo-Hygrograph	THDX-CE	00016540	140EC001	23H1275	TPA	09 June 2024
3) Thermometer	-	0834181	140EC005	23I848	TPA	10 Aug 2024

This certification is traceable to SI Unit

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

3. True value is converted to true volume at the standard temperature of 20 °C

Calibration result :

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

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

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

-o0o-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUWILUANG, SUANLUANG BANGKOK 10250  
TEL.0-2717-3000-26 FAX.0-2719-9484



MSC-185-187-1025  
CALIBRATION DATA

## Certificate of Calibration

Cert.No.: 24CH1295  
Page.: 1 of 3

Equipment : pH Meter  
Manufacturer : Hach  
Model : HQ411d  
Serial No. : 200100031163  
ID No. : BKK\_EN0342  
Condition As-Received: Used Item  
Received Date : 16 October 2024  
Calibration Date : 17 October 2024  
Reference : 2410-0548DSC-5  
Submitted by :

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

Ambient Temperature : (25 ± 2.5) °C

Relative Humidity : (50 ± 15) %

In - house method :

- CP-CH5 by direct measurement with  
certified reference material (CRM)

- CP-CH8 by comparison with temperature standard

Calibrated by :

Warakorn Lengagatrakul

Approved by :

Sathip

Approved Signatory

( ) Unnoppol Harachai

( ) Ponpan Paipim

(✓) Sathip Meangmai

Issue Date :

21 October 2024

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

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



Cert.No.: 24CH1295  
Page.: 2 of 3

#### Condition of this calibration result

1. Reference Standard Instrument

##### Instrument

1) Ref. Standard Thermometer

**Serial No.** 2188080 **ID No.** 130RC044 **Cert. No.** 2411022 **Due Date** 16 Sep 2025

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)
2. Certified Reference Materials : The measurement results are traceable to SI through Hach Lange GmbH Ltd.  
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00  
: The measurement results are traceable to SI through CPA chem Ltd.,  
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

##### Buffer Solution

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	1034203	27 Sep 2026
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2026
pH 10.010	CPA chem	1034205	27 Sep 2025

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

#### Calibration Results

Function : pH Measurement

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

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.: 230473042902	4.008	4.028	174.6	0.0044	2.00
	6.999	7.014	1.4	0.0084	2.05
	10.010	10.018	-172.8	0.0066	2.00

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



Cert.No.: 24CH1295  
Page.: 3 of 3

#### Calibration Results

Function : Temperature Measurement

(\*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : PHC281  
- Serial No. : 230473042902

Dimension of probe

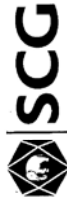
- Length : 103 mm.  
- Diameter : 12 mm.  
- Immersion Depth : 90 mm.

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

**Remark** : UUC\* = Unit Under Calibration

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

-o0o-



## Metrology

SCI ECO Services Company Limited

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

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

Bangkok Tel : +668 9205 6857 Fax : +668 8247 2360

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



Certificate No. T232160

Page 1 of 4

### Certificate of Calibration

Equipment : Chamber ( Cooling Room )

Manufacturer : KOLDTECH

Model : KM 320

Serial No. : TBN-1012061/05

Customer Code : BKK\_EN0167

ID No. : T2463A3

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Laboratory

Date of Receipt : 29 November 2023

Calibrated By : Atiphong Rongrat ( Technician )

Approved By : Boonchai Suriyawong (Site Calibration Manager)

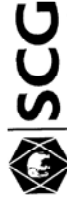
Date of Issue : 09 JAN 2024

REVIEW BY	<u>K. A. A.</u>
APPROVED BY	<u>Sinik P.</u>
NEXT CAL. DATE	<u>06/06/25</u>

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

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

FM-L14 11/9/18-08-66



## Metrology

SCI ECO Services Company Limited

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



Certificate No. T232160

Page 2 of 4

### Calibration Report

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

#### Condition of this results of calibration :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Recapproved 2001 ) and AS2853-1986 ).

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

#### 2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T230773	10 April 2024
TC	TYPE T	TN171-TN180	T230773	10 April 2024
DATA LOGGER	34970A	T149	T230773	10 April 2024

3. This certificate is traceable to : National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244 ).

#### 4. Condition of calibrated item : good

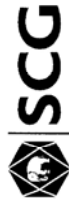
Equipment Description :

Time Constant	1	Hour	30	Minute	At	3	°C	
Fresh Air Damper	<input type="checkbox"/>	Open	<input type="checkbox"/>	Min	<input type="checkbox"/>	Medium	<input type="checkbox"/>	Max
	<input type="checkbox"/>	Close						
	<input checked="" type="checkbox"/>	Not Available						

5. Adjustment : ( X ) without adjustment ( ) after adjustment

Approved By: Boonchai

FM-L15 11/8/18-08-66



Metrology

SCIECO Services Company Limited

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

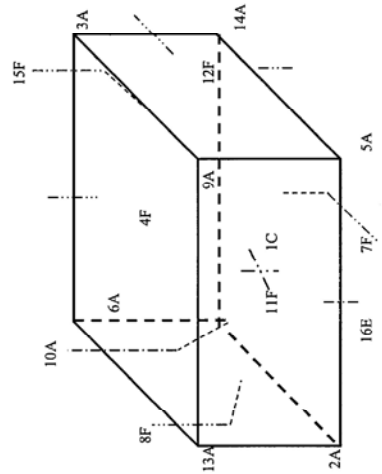


NSC-TIS-TIS 17025  
CALIBRATION 0244

Certificate No. T232160

Page 3 of 4

## Calibration Report

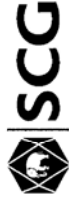


C = Centre, F = Centre of Face, A = Corner, E = Centre of Edge

1C	=	TNI61
2A	=	TNI62
3A	=	TNI63
4F	=	TNI64
5A	=	TNI65
6A	=	TNI66
7F	=	TNI67
8F	=	TNI68
9A	=	TNI69
10A	=	TNI70
11F	=	TNI71
12F	=	TNI72
13A	=	TNI73
14A	=	TNI74
15F	=	TNI75
16E	=	TNI76

Approved By.

FM-L15 118/18-08-66



Metrology

SCIECO Services Company Limited

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



NSC-TIS-TIS 17025  
CALIBRATION 0244

Certificate No. T232160

Page 4 of 4

## Calibration Report

### Measurement Results

Calibration Point	Average Standard Reading at each position (°C)											
	TNI61	TNI62	TNI63	TNI64	TNI65	TNI66	TNI67	TNI68	TNI69	TNI70	TNI71	TNI72
	2.83	3.34	2.95	3.46	3.45	3.76	3.25	3.46	3.39	3.50	3.58	3.42
	TNI73	TNI74	TNI75	TNI76								
	3.33	3.39	3.15	3.43								

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

The calibration result apply only the above calibrated item.

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

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k$  which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By.

FM-L15 118/18-08-66



**Metrology Center**  
**SCI ECO Services Company Limited**  
51 Moo 8, Tukwang, Kaeng Khoi, Saraburi, Thailand 18260  
Bangkok Tel : +668 9205 6851 , +669 81924 0059  
Saraburi Tel : +669 8247 2330  
Website : www.scieco.co.th E-Mail : calibra@scg.co.th



NSC-TISI-TIS 17025  
CALIBRATION 0244

Certificate No. T250873

## Certificate of Calibration

Page 1 of 4

Equipment	: Chamber ( Cooling Room )
Manufacturer	: KOLDTECH
Model	: KM 320
Serial No.	: TBN-1012061/05
Customer Code	: BKK_EN0167
ID No.	: T2463A3
Customer	: ALS Laboratory Group (Thailand) Co.,Ltd. 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250
Customer Location	: Laboratory Room
Date of Receipt	: 28 May 2025
Calibrated By	: Atiphong Rongrat ( Technician )
Approved By	: <u>Boonchai Suriyawong</u> / Boonchai Suriyawong (Site Calibration Manager)
Date of Issue	: <u>19 JUN 2025</u>

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

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

FM-TL06 102/27-03-68



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



NSC-TISI-TIS 17025  
CALIBRATION 0244

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 :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001 ) and AS2853-1986 ).  
All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.

### 2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN91-TN100	T242036	3 December 2025
TC	TYPE T	TN101-TN110	T242036	3 December 2025
DATA LOGGER	34970A	T121	T242036	3 December 2025

### 3. This certificate is traceable to :

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

### 4. Condition of calibrated item : good

### Equipment Description :

Time Constant : 2 Hour Minute At 3 °C  
Fresh Air Damper : ☐ Open ☐ Mir ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

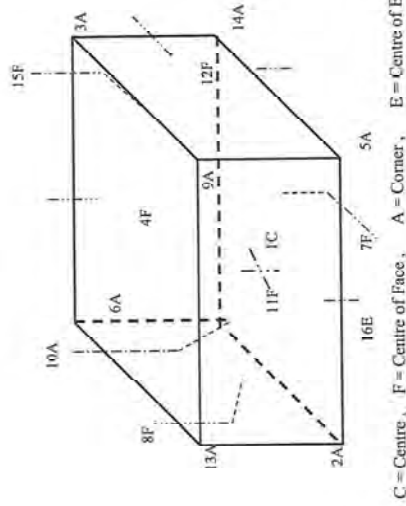
### 5. Adjustment :

( X ) without adjustment ( ) after adjustment

Approved By: Boonchai

FM-TL07 102/27-03-68

## Calibration Report



1C = TN91	12F = TN102
2A = TN92	13A = TN103
3A = TN93	14A = TN104
4F = TN94	15F = TN105
5A = TN95	16E = TN106

1C = TN91
2A = TN92
3A = TN93
4F = TN94
5A = TN95
6A = TN96
7F = TN97
8F = TN98
9A = TN99
10A = TN100
11F = TN101

Approved By.

## Calibration Report

## Measurement Results

Calibration Point	Average Standard Reading at each position ( $^{\circ}\text{C}$ )											
	TN91	TN92	TN93	TN94	TN95	TN96	TN97	TN98	TN99	TN100	TN101	TN102
3.0	2.95	2.92	3.05	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				Coverage Factor <i>k</i>
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)		
	Min	Max						
3.0	2.8	3.9	3.4	3.14	1.20	1.30	1.90	2.04

The calibration result apply only the above calibrated item.

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

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k$  which for a  $t$ -distribution, providing a level of confidence of approximately 95 %.

Approved By.



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



## Certificate of Calibration

Cert. No.: 24TM1618  
Page : 1 of 3

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE29

Serial No. : L622.0282

ID No. : BKK\_EN0439

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

Location : Organic Preparation Lab

Received Order : 29 October 2024

Calibration Date : 29 October 2024

Ambient Temperature : ( 26 ± 10 ) °C

Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Man Pattanapongpalboon

Approved by :   
Approved Signatory

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

Issue Date : 30 October 2024

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

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



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

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 ( IPT ).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument

Serial No. MY57013711 Cert. No. 24LM115 Traceable TPA Due Date 13 Jul 2025

1 ) Data Acquisition

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.

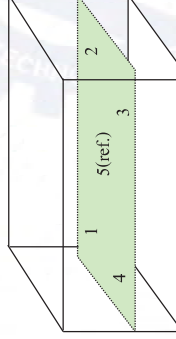
Remark : TPA : Technology Promotion Association ( Thailand - Japan )

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Heat transfer medium used : Water

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



Front

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

Cert. No.: 24TM1618  
Page : 2 of 3



**Equipment :** Water Bath  
**Condition As-Received :** Used Item  
**Reference :** 2410-07820C-4  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source

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

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

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

**Average\* :** The average of 30 values in each position.  
**Uniformity :** The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.  
**Stability :** One-half of the greatest maximum difference of measured temperature at any one probe.  
**UUC\* :** Unit Under Calibration  
**Note :** The reported uncertainty of measurement was included stability and excluded uniformity.

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

-000-



## Metrological Center

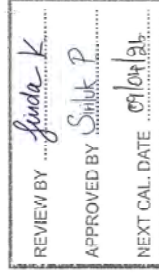
SCI ECD Services Company Limited  
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110  
Telephone : +66 2 586 5792-4 Fax : +66 2 566 5109  
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th


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 ( Site Calibration Manager )  
**Date of Issue** : 13 MAY 2025

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

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



## Metrological Center

SCI ECO Services Company Limited

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

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

Website : www.sdeco.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 :

1. 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 WFI-T10.

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

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	Type S	MT-(CHI-CH4)	T242035	04 December 2025
DATA LOGGER	34970A	T121	T242035	04 December 2025

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

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

5. Adjustment :

( X ) without adjustment ( ) after adjustment

Approved By. *Banla*

FM-L13 108/30-05-57



## Metrological Center

SCI ECO Services Company Limited

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

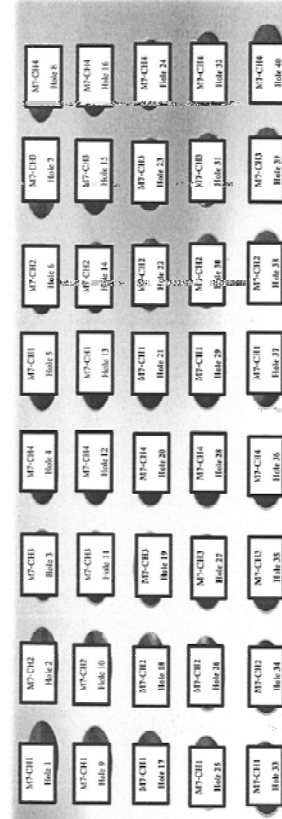
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

Website : www.sdeco.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	MT-CHI 1 Block 1	MT-CHI 2 Block 2	MT-CHI 3 Block 3	MT-CHI 4 Block 4	MT-CHI 5 Block 5	MT-CHI 6 Block 6	MT-CHI 7 Block 7	MT-CHI 8 Block 8
380.0	380.0	379.8 - 380.2	Max °C	380.0	381.0	380.9	379.6	380.3	380.5	381.3	380.1
			Min °C	379.6	380.8	380.6	379.3	379.9	380.5	380.5	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	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
°C	°C	°C	Reading	MT-CHI 9 Block 9	MT-CHI 10 Block 10	MT-CHI 11 Block 11	MT-CHI 12 Block 12	MT-CHI 13 Block 13	MT-CHI 14 Block 14	MT-CHI 15 Block 15	MT-CHI 16 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. *Banla*

FM-L13 108/30-05-57



## Metrological Center

SCIECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhioi, 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 4 of 4

## Calibration Report

### Measurement Results

Cal. Point (°C)	Setting (°C)	Reading (°C)	STD. Reading (°C)	Position of Standards at Block							
				SP-CH1 Hole 17	SP-CH2 Hole 18	SP-CH3 Hole 19	SP-CH4 Hole 20	SP-CH5 Hole 21	SP-CH6 Hole 22	SP-CH7 Hole 23	SP-CH8 Hole 24
380.0	380.0	379.8 - 380.2	0.1	379.2	379.2	379.1	379.5	380.3	381.1	382.5	381.3
				379.1	379.0	378.8	379.2	380.5	380.8	382.1	381.1
				379.2	379.1	379.0	379.3	380.4	380.9	382.3	381.2
				Stability ± °C	0.1	0.1	0.1	0.2	0.2	0.2	0.1

Cal. Point (°C)	Setting (°C)	Reading (°C)	STD. Reading (°C)	Position of Standards at Block							
				SP-CH1 Hole 25	SP-CH2 Hole 26	SP-CH3 Hole 27	SP-CH4 Hole 28	SP-CH5 Hole 29	SP-CH6 Hole 30	SP-CH7 Hole 31	SP-CH8 Hole 32
380.0	380.0	379.8 - 380.2	0.2	378.5	378.2	377.9	378.5	380.4	380.8	380.4	380.9
				378.2	377.9	377.9	378.2	380.0	380.5	380.1	380.6
				378.3	378.0	378.0	378.3	380.2	380.7	380.2	380.8
				Stability ± °C	0.2	0.2	0.1	0.2	0.2	0.1	0.2

Cal. Point (°C)	Setting (°C)	Reading (°C)	STD. Reading (°C)	Position of Standards at Block							
				SP-CH1 Hole 33	SP-CH2 Hole 34	SP-CH3 Hole 35	SP-CH4 Hole 36	SP-CH5 Hole 37	SP-CH6 Hole 38	SP-CH7 Hole 39	SP-CH8 Hole 40
380.0	380.0	379.8 - 380.2	0.2	379.9	380.0	379.8	379.7	380.1	380.2	379.7	379.8
				379.6	379.6	379.5	379.3	379.8	379.9	379.4	379.5
				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	0.2	0.1

The expanded uncertainty of temperature measurement was  $\pm 2.35$  °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: *[Signature]*



บริษัท ดับเบิล เอส ไดแอกโนสติกส์ จำกัด  
DOUBLE S DIAGNOSTICS CO., LTD.

4 ซอยเอกชัย 14 แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10260 โทรศัพท์ (02) 747-7069 โทรสาร (02) 747-7068  
4 Soi Ekkachai 14, Bangkua, Bangkok 10260 Tel. (02) 747-7069 Fax: (02) 747-7068

Maintenance Plan YEAR : 2024

เดือน	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
รวม												

### Periodical maintenance check list for Konelab

	6M	12M	Note
1.Diluent-wash tubing change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.ISE tubing change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3.Syringe check/change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.Dispensing check/ change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.Waste tubing change when necessary	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
6.Lamp check/change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
7.Mixer paddle/paddle change(not Konelab20)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
8.ISE needles check/change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
9.Pump tubing check/ change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
10.Broken/worn out part check /change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
11.Peristaltic pump check /cleaning/ lubrication	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
12.Heating check	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
13.Cooling check	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
14.Dispenser mechanic check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
15.Cuvette transfer mechanic check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
16.Dispenser movement check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
17.Sample/reagent register check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
18.Dispensing tubing tightness check	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
19.Photometer and optics cleaning/check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
20.Workstation PC cleaning if necessary	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
21.Mechanic cleaning/lubrication	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
22.Instrument cleaning if necessary	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
23.Complete analyzer testing with waterblank/QC or sample	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
24.Test parameters/Adjustment/config. Save to USB key	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
25.UPS Test	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Place : R/S LAB Instrument : K20 Analyzer  
Date/Time : 16/8/22 Serial no : 82281  
Service done by : 87985 Install date :  
Signature of customer : 87985 Date/Time : 16/08/2024

Laboratory

Analyzer User

8/16/2024 14:53

Performed

8/16/2024

Lot

WB34

ACCEPTANCE CRITERIA

	Result	Limit	Warning
--	--------	-------	---------

Temperature (°C)	37.8	37.0 +/- 1.0	
------------------	------	--------------	--

Dispensing ratio	15.3	14.8 - 17.2	
CV%	0.89	<1.7	

Photometric noise	0.17	<2.0	
Max SD L340.2 (mM)	0.87	<3.0	
Max SD L340.4 (mM)			

Linearity of photometer			
Slope	1.0141	0.94 - 1.06	
Curvature	0.8053	+/- 0.02	
Max bias from linear fit (mM)	4.5	<15.0	
Max Delta %	-1.16	+/- 6.0	

Linearity of sample dispensing			
Proport. volume XDISP2 (µl)	2.06	1.96 - 2.16	
Proport. volume XDISP4 (µl)	4.14	3.85 - 4.40	
XDISP2 CV%	1.21	<2.0	
XDISP4 CV%	0.90	<2.0	
XDISP10 CV%	0.68	<2.0	

Needle 0 µl volume			
Average (A)	0.005	<0.050	
Standard deviation (A)	0.002	<0.005	
Volume (µl)	0.03	<0.32	

OTHER INFORMATION

Dispensing ratio			
Posit Result (A)			
1	0.1549	Posit L340.2	L340.4
2	0.1549	1	0.15
3	0.1537	2	0.17
4	0.1547	3	0.04
5	0.1547	4	0.16
6	0.1545	5	0.11
		6	0.14
			0.87

Laboratory

Analyzer User

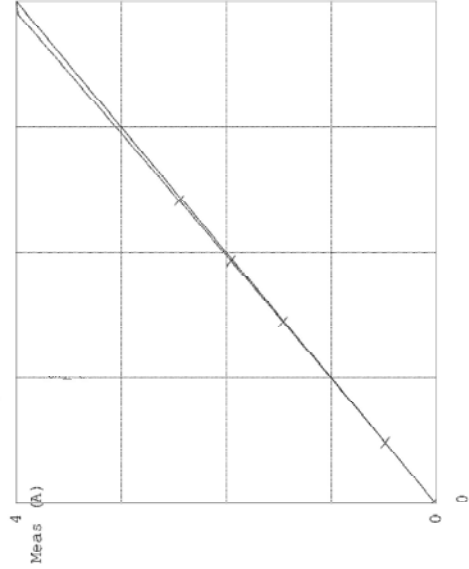
8/16/2024 14:53

Linearity of sample dispensing

Test	Absorbance (A)
XDISP2	0.306
XDISP4	0.612
XDISP10	1.471

Linearity of photometer

L340	Target (A)	Meas (A)	Delta %
1	0.002	0.006	-0.004
2	0.486	0.493	-0.007
3	1.451	1.469	-0.018
4	1.936	1.863	-0.027
5	2.415	2.354	-0.039



Target (A)



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.: 25TM1  
Page : 1 of 3

Equipment : Water Bath  
Manufacturer : Memmert  
Model : WPE 45  
Serial No. : L707.0058  
ID No. : BKK\_ML0054

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

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 : 02 January 2025  
Calibration Date : 02 - 03 January 2025  
Ambient Temperature :  $(26 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$   
AC Line Voltage :  $(220 \pm 22) \text{ V}$

Calibrated by : Preecha Hlahib

Approved by :   
Approved Signatory

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

Issue Date : 14 January 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 : 2501-0001OC-1  
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 ( IPT ).

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument : MY57013711  
Serial No. : 24LM115  
Cert. No. : TPA  
Traceable : 13 Jul 2025

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

3. This certification is traceable to the International System of Unit.

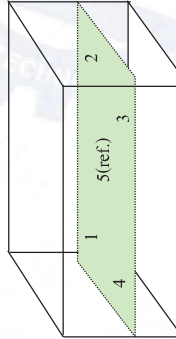
Remark : TPA : Technology Promotion Association ( Thailand - Japan )

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	
Beginning of Calibration	20	62	221
Finished of Calibration	21	57	221



Front

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

Cert. No.: 25TM1  
Page : 2 of 3



**Equipment :** Water Bath  
**Condition As-Received :** Used Item  
**Reference :** 2501-0001OC-1  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source

**Cert. No.:** 25TM1  
**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	42.035	41.994	42.010	42.013	42.023	0.15
44.0	44.0	44.0	44.010	43.969	43.983	43.989	44.008	0.15
44.5	44.5	44.5	44.497	44.458	44.470	44.476	44.497	0.15
46.0	46.0	46.0	46.020	45.976	45.992	45.998	46.016	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor <i>k</i>
42.0	0.047	0.018	2
44.0	0.060	0.025	2
44.5	0.062	0.023	2
46.0	0.057	0.016	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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Bara Scientific

## Certificate of Calibration

Shimadzu LC-HIC

This certificate is to verify that instrument below are calibrated

by Bara Scientific Co., Ltd

Instrument	Serial No.
DGU-403	L22166050657
SIL-20AC	L20176012374
CTO-40S	L22236003442
LC-20ADSP	L20106096217
SPD-40	L22256002616
CDD-10Avp	C21346004484
CBM-40lite	L22126103139

For

ALS Laboratory Group (Thailand) Co., Ltd.

Operator Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: 21 November 2024

(Mr.Thawatchai Toros)

Service Engineer

**SHIMADZU**  
EQUIPMENT ON DEMAND

Bara Scientific Co., Ltd.  
J Chai Leng Building Floor 7, 5th Floor 4 Road Siam Bangkok Building 10600  
Thailand Tel: 0-83313301 (ext 20 lines) Fax: 02-4375506 / 7 woubarascientific.com

Calibrated at 20mmHg 2500

19-05-19 19m00



SCIMET Co., Ltd.  
1194 Soi Wachirahamsathit 57, Bangkok,  
Phraekhanong, Bangkok 10260 Thailand  
Email: scimet2022@gmail.com, Tel: 02 460 9239  
https://www.scimet.co.th



SCIMET Co., Ltd.  
1194 Soi Wachirahamsathit 57, Bangkok, Phraekhanong, Bangkok 10260 Thailand  
Email: scimet2022@gmail.com, Tel: 02 460 9239

Certificate No. C07240192

## Calibration Certificate

Equipment: SPECTROPHOTOMETER  
Model: DR 3900  
Serial No.(or ID): 2403637  
Manufacturer: HACH  
Condition: New

Customer: ALS Laboratory Group (Thailand) Co., Ltd  
114/1 Moo 8, Kamchanwanich Rd T. Ban Phru, A Haiyai, Songkhla 90250

Calibration Place: Hach (Thailand) Limited.  
Branch 00001, Building D Room No. D3 11, 3rd Floor, No. 735/4, Srinakharin Road,  
Pattanakarn, Suanluang, Bangkok 10250 Thailand.

Calibration Date: 25 December 2024

Environment Condition  
Temperature: 22.2 °C ± 0.5 °C  
Humidity: 59.2 %RH ± 2.3 %RH

The Method used  
In-house method, W107, based on ASTM E 275-08 and  
ASTM E 387-04

Traceability

This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.

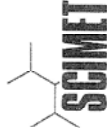
The standard for Photometric Certificate No. 108691 and 108692  
The standard for Wavelength Certificate No. 109010, 114655

(Mr. Siwapan Siljan)  
Person in charge



(Mr. Thalengkeat Pongnigam)  
Authorized signatory

FC07-03: 30 MAY 2023



Certificate No.: C07240192 Page 2 of 3

## Condition of reference standards Instruments / CRM:

Instruments	Set No.	Certificate No.	Due date
Horium Oxide Glass Reference	21512	108691	25-Jan-25
Dicymium Oxide Glass Reference	19722	108692	25-Jan-25
Neutral Density Filter Reference	12276	109010, 114655	2 Feb-25

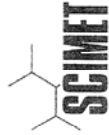
## Calibration Results: Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm

Standard Wavelength (nm)	Unit Under Calibration (nm)	Correction (nm)	Uncertainty of Measurement (± nm)
333.67	333	0.67	0.59
361.02	361	0.02	0.59
417.80	417	0.80	0.59
441.29	441	0.29	0.59
470.88	480	-0.12	0.59
513.75	513	0.75	0.59
528.59	528	0.59	0.59
537.75	537	0.75	0.59
585.56	585	0.56	0.59
641.95	642	-0.05	0.59
684.70	685	-0.30	0.59
747.61	748	-0.39	0.59
807.04	807	0.04	0.59
879.68	880	-0.32	0.59

บริษัท สยามเมทริกซ์ จำกัด (SCIMET CO. LTD.)  
1194 Soi Wachirahamsathit 57, Bangkok, Phraekhanong, Bangkok 10260 Thailand  
Email: scimet2022@gmail.com, Tel: 02 460 9239

FC07-03: 30 MAY 2023



Calibration Results:  
Without Adjustment

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance (Abs)	Unit Under Calibration (Abs)	Correction (Abs)	Uncertainty of Measurement (± Abs)
420 nm	0.0000	0.000	0.0000	0.0045
	0.2373	0.234	0.0033	0.0045
	0.5617	0.561	0.0007	0.0045
	0.7392	0.738	0.0012	0.0045
	1.0550	1.056	-0.0010	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2335	0.231	0.0025	0.0045
	0.5513	0.550	0.0013	0.0045
	0.7230	0.722	0.0010	0.0045
	1.0324	1.032	0.0004	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.2123	0.210	0.0026	0.0045
	0.5035	0.506	-0.0024	0.0045
	0.6735	0.676	-0.0025	0.0045
	0.9615	0.965	-0.0035	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.2201	0.217	0.0031	0.0045
	0.5176	0.520	-0.0024	0.0045
	0.6930	0.694	-0.0010	0.0045
	0.9908	0.994	-0.0032	0.0045
560 nm	0.0000	0.000	0.0000	0.0045
	0.2443	0.241	0.0033	0.0045
	0.5530	0.554	-0.0010	0.0045
	0.7196	0.719	0.0006	0.0045
	1.0301	1.031	-0.0009	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2646	0.261	0.0036	0.0045
	0.5370	0.538	-0.0010	0.0045
	0.6862	0.687	-0.0008	0.0045
	0.9822	0.984	-0.0018	0.0045

The End of Certificate

บริษัท สยามอินเตอร์เทรดดิ้ง จำกัด (SCIMET CO., LTD.)  
194 Soi Wachirathamraddit, 5/7 Bangchali, Prachinburi, Bangkok 10260 Thailand  
Email: scimet202@gmail.com, Tel: 02 460 9239

FC07-03 30 MAY 2023



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 16, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL 0-2717-3000-29 FAX 0-2719-9484



Certificate of Calibration

Cert.No.: 24CG4714  
Page: 1 of 2

Equipment : Burette  
Capacity : 10 mL  
Serial No. :  
ID. No. : BKK\_EN0296  
Manufacturer : Witeg  
Made in : Germany

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

Ambient Temperature : (20 ± 2.5) °C  
Relative Humidity : (50 ± 10) %  
Barometric Pressure : 758 mmHg  
Calibration Procedure : ASTM E 542 - 01

Calibrated by : Sa-ngeunkam Wongsai

Approved by :  
Approved Signatory

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

Issue Date : 29 November 2024

The Uncertainties are for a confidence probability of approximately 95%

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



**Equipment :** Burette  
**Received Date :** 27 November 2024  
**Condition As-Received :** Used Item  
**Calibration Date :** 29 November 2024  
**Reference :** 2411-0850DSC-1

**Cert.No.:** 24CG4714  
**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     | XP205  | B134206712 | 140RC007 | 24MM316         | TPA          | 15 July 2025 |
| 2) Data Logger | HL-20D | 24019652   | 140EC015 | 24H1926         | TPA          | 13 Sep 2025  |
| 3) Thermometer | -      | 1594592    | 140EC010 | 24I175          | TPA          | 20 Feb 2025  |
- This certification is traceable to SI Unit
2. The certificate is valid only to the item calibrated on date and place of calibration.
3. True value is converted to true volume at the standard temperature of 20 °C

**Calibration result :**

Nominal capacity ( mL )	Reading ( mL )	Uncertainty ( $\pm$ mL )	k Factor
1	1.0047	0.0036	2.00
5	5.0020	0.0036	2.00
10	10.0056	0.0038	2.00

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

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

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