

Certificate of Calibration

Represent to Certificate of Calibration No. C29240007

Equipment: Block Digestion Unit Certificate No.: C29240011
Model: KT-20s Issued Date: 22 March 2024
Serial No. (or ID.): 5720210009/5770200073 Job No.: WO-00020429
Manufacturer: Gerhardt Page: 1 of 4
Condition: In Condition Digestion Block: 20 holes.

Customer: ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand.

Environment Condition: Temperature: 25 °C ± 0.7 °C
Humidity: 54 %RH ± 4.1 %RH
Voltage: 225 VAC ± 1.7 VAC



Calibration Place: ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
(Wet Chemistry Lab)
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand.

Calibration By: Mr. Thanathorn Phunook
Calibration Date: 11 March 2024

The Method used: In house method, base on by comparison with standard

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through N.M. Technical Center Laboratory (NTL)
Certificate No.: TC22/0080

(Mr. Thanathorn Phunook)
Person in charge

(Mr. Udon Srichana)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Prachinong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C29-07: 20 Jul 2022

Certificate No.: C29240011

Page: 2 of 4

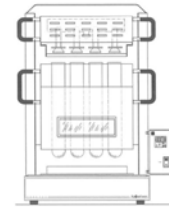
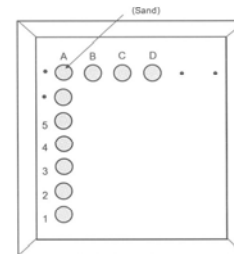


Fig. 1.: Front view



Location of standard

Fig. 2.: Digestion block

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the Digestion block.

Measured Temperature: The average reading of working standard at any positions or location.

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Prachinong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C29-07: 20 Jul 2022

Certificate No.: C29240011

Page: 3 of 4

Calibration Results:
Pre Calibration

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
A1	380	380	380	401.5	21.5	1.5
A2				401.2	21.2	1.5
A3				399.1	19.1	1.5
A4				397.8	17.8	1.5
A5				395.1	15.1	1.5
B1				396.6	16.6	1.5
B2				396.1	16.1	1.5
B3				392.9	12.9	1.5
B4				391.6	11.6	1.5
B5				390.7	10.7	1.5
C1				395.3	15.3	1.5
C2				395.6	15.6	1.5
C3				392.8	12.8	1.5
C4				391.7	11.7	1.5
C5				390.3	10.3	1.5
D1				391.6	11.6	1.5
D2				396.6	16.6	1.5
D3				395.0	15.0	1.5
D4				394.2	14.2	1.5
D5				393.6	13.6	1.5

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Prachinong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C29-07: 20 Jul 2022

Certificate No.: C29240011

Page: 4 of 4

Calibration Results:
Without adjustment

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
A1	380	365	365	382.5	17.5	1.5
A2				382.4	17.4	1.5
A3				382.1	17.1	1.5
A4				379.7	14.7	1.5
A5				378.3	13.3	1.5
B1				380.1	15.1	1.5
B2				380.1	15.1	1.5
B3				378.5	13.5	1.5
B4				378.3	13.3	1.5
B5				379.1	14.1	1.5
C1				380.1	15.1	1.5
C2				380.1	15.1	1.5
C3				378.9	13.9	1.5
C4				378.2	13.2	1.5
C5				377.3	12.3	1.5
D1				380.5	15.5	1.5
D2				380.6	15.6	1.5
D3				378.1	13.1	1.5
D4				378.7	13.7	1.5
D5				377.7	12.7	1.5

The End of Certificate

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Prachinong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C29-07: 20 Jul 2022

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00020429

ชนิดเครื่องมือ: Block Digestion Unit รุ่น: KT-20s
หมายเลขเครื่อง: 5720210009/5770200073

ตรวจสอบ (วัน)		รายการตรวจเช็ค	ตรวจสอบ (สัปดาห์)		หมายเหตุ
11 Mar 2024			11 Mar 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	5. สภาพ Hole	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพผ้าปิด	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input type="checkbox"/>	<input type="checkbox"/>	

ชื่อเจ้าหน้าที่:

Mr. Thanathorn Phunook
Service Engineer

DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand
Delivering Growth - in Asia and Beyond.



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
TEL 0-2717-3008-29 FAX 0-2719-9484


Certificate of Calibration

Cert.No.: 25CH709/1
Page.: 1 of 3

This Certificate was issued to replace the Certificate No.25CH709

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenExcellence
Serial No. : B834291445
ID No. : RYG_EN0152
Condition As-Received: Used Item
Received Date : 12 June 2025
Calibration Date : 18 June 2025
Reference : 2506-0407DSC-2
Submitted by : **ALS Laboratory Group (Thailand) Co.,Ltd.**
Rayong Branch
616/10 Moo 5, T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Walalak Sirinthean

Approved by :

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

Issue Date : 1 July 2025

The Uncertainties are for a confidence probability of approximately 95%

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

REVIEW BY *Photchanas*
APPROVED BY *D. Phunook*
NEXT CAL DATE: 18/12/26



Cert.No.: 25CH709/1
Page.: 2 of 3

Condition of this calibration result
1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 July 2025

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

2. Certified Reference Materials

:The measurement results are traceable to SI through Hach Lenge GmbH Ltd.,
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00
:The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.007	CPA chem	1066665	18 Jan 2027
pH 7.000	Hach Lenge GmbH	C03232	02 Dec 2026
pH 10.010	CPA chem	1066669	18 Jan 2026

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

Calibration Results
Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: B834291445	4.000	177.48	177.3	4.000	0.058	2.00
	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00



Cert.No.: 25CH709/1
Page.: 3 of 3

Calibration Results
Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: 5211504	4.007	4.006	181.1	0.0044	2.00
	7.000	7.000	4.9	0.0084	2.00
	10.010	10.007	-170.6	0.0066	2.00

Function : Temperature Measurement

(°) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLabExpert Pro-ISM
- Serial No. : 5211504
Dimension of probe
- Length : 120 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.001	25.1	0.099	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 %.

-000-



Certificate of Calibration

Certificate No. : 25E1979/1
Page : 1 of 2

This Certificate was issued to replace to the Certificate No. 25E1979

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenExcellence
Serial No. : B834291445
ID No. : RYG_EN0152
Condition As-Received: Used Item
Received Date: 12 June 2025
Calibration Date: 16 June 2025
Reference: 2506-0407DSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 10) %

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

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

**618/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand**

Procedure used: Calibration were conducted using calibration procedure No. CP-E17 According to EURAMET cg-15.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	6315011	25E1627	19 May 2026

2.This result of calibration was made on requested at the point specified by customer.

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

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

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

Calibrated by : Wutchareeporn Peethong
Issue Date : 01 July 2025

Approved Signatory :
[] Phalinee Prabpaipal
[✓] Nuntawat Khamchai
[] Pongsagorn Boonyaporn



Cert. No.: 25E1979/1
Page.: 2 of 2

Result of calibration:- (*) Without adjustment () After adjustment

Function:	DC voltage measurement	Range:	2000 mV	
	Standard Value	UUC* Reading	Error	Uncertainty
	(mV)	(mV)	(mV)	(± μV)
	-200.0000	-199.9	0.1	68
	-150.0000	-150.0	0.0	65
	-100.0000	-100.0	0.0	63
	-50.0000	-50.0	0.0	61
	0.0000	0.0	0.0	58
	50.0000	50.0	0.0	61
	100.0000	100.0	0.0	63
	150.0000	149.9	-0.1	65
	200.0000	199.9	-0.1	68

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

UUC* = Unit Under Calibration.

-000-

SARTORIUS



Accredited by
NSC-TIS-TIS 17025
Calibration 0426

Calibration certificate

Calibration Certificate No. 25BKL0003

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MSU224S-100-DU	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP V1.08.
Serial QM Ident. no.	31709552 RYG_EN0003	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
	618/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.	
Order no.	2230	
Number of pages	4	
Date of calibration	20 Feb 2025	

REVIEW BY *Tharitat*
APPROVED BY *D. Kachen*
NEXT CAL DATE... 20/02/26

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

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

Date 06 Mar 2025 Approval of the Calibration Certificate Person in charge
Chonchai Inthana Mr. Chonchai Inthana
Kachen Kachen Lalee

Calibration certificate No. 25BKL0003

Calibration Certificate

Calibration object

Single range instrument

Model MSU224S-100-DU
Serial Number 31709552
QM Ident. no | Inventory no. RYG_EN0003 | —

Maximum capacity (Max. load) 220,000 g

Measured range 220,000 g

Scale interval 0,0001 g

Place of calibration

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

Calibration procedure

EURAMET cg-18, V4.0 - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	MHB-382SD s/nB011342 Traceable to SI unit through DKSH	21 Aug 2025
Test weight set OIML R111 E2	Certificate No.M2308197S_E2(Traceable to SI unit through TCS)	23 Aug 2025

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration 20 Feb 2025

Temperature at place of calibration | Temp. diff. 24.7 °C | 0.3 K

Measuring conditions

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

Comments

Humidity 62.3 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 10 g | 200 g

	10 g	200 g
1	10,0000 g	200,0000 g
2	10,0000 g	200,0001 g
3	9,9999 g	200,0000 g
4	10,0000 g	200,0000 g
5	10,0000 g	200,0001 g
6	9,9999 g	200,0000 g
7	10,0000 g	200,0000 g
8	10,0000 g	200,0000 g
9	10,0000 g	200,0000 g
10	10,0000 g	200,0001 g
s	0,00004 g	s = 0,00005 g

Eccentricity

Test load (nominal):	100 g
Center	100,0000 g
Front left	100,0000 g
Back left	100,0001 g
Back right	99,9999 g
Front right	99,9999 g
Maximum deviation from centric loading indication	
Δ _{load} max = 0,0001 g	

Error of indication

Testload L	Indication I	Error E	Expansion factor k	Uncertainty U(E)	Uncertainty relative U _{rel} (E)
0,0100 g	0,0100 g	0,0000 g	2,00	0,00012 g	1,2 %
0,1000 g	0,1000 g	0,0000 g	2,00	0,00013 g	0,13 %
0,5000 g	0,5000 g	0,0000 g	2,00	0,00013 g	0,026 %
1,0000 g	1,0000 g	0,0000 g	2,00	0,00013 g	0,013 %
5,0000 g	5,0000 g	0,0000 g	2,00	0,00013 g	0,0026 %
10,0000 g	10,0000 g	0,0000 g	2,00	0,00013 g	0,0013 %
20,0000 g	20,0000 g	0,0000 g	2,00	0,00014 g	0,00088 %
50,0000 g	50,0000 g	0,0000 g	2,00	0,00015 g	0,00029 %
100,0000 g	100,0001 g	0,0001 g	2,00	0,00018 g	0,00018 %
200,0000 g	200,0000 g	0,0000 g	2,00	0,00028 g	0,00014 %
220,0000 g	220,0000 g	0,0000 g	2,00	0,00032 g	0,00015 %
Maximum error of indication		E _{max} = 0,0001 g			

U_{rel}(E) is the quotient of U(E) and test load L. The uncertainty of measurement U(E) is valid only if error E is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.

Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty multiplied by the documented

Expansion factor, determined in accordance with the European Calibration Guideline EURAMET-08-18, V4.0. There is a 95 % probability that the value of the

measurand will be in the assigned value range.

End of calibration certificate

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

Verical®
Version 6.5

Page 3 | 4

Uncertainty of measurement in use

Device adjusted before measurement

Yes

Temperature deviation considered

1,5 K (isoCAL active)

Temperature coefficient considered

1 · 10⁻⁶/K

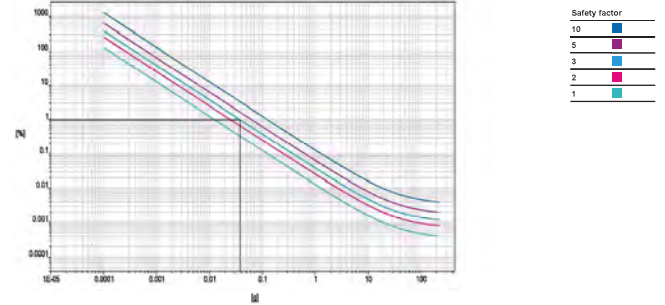
Uncertainty of the weighing result U₀₁(W)

U₀₁(W) = 0,00013 g + 3,42 · 10⁻⁶ · R

Reference note: The current uncertainty of measurement is calculated by entering the reading R into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET-08-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication R	Uncertainty U ₀₁ (W)	Uncertainty relative U ₀₁ (W) _{rel}
1 %	2,2000 g	0,00014 g	0,0063 %
25 %	55,0000 g	0,00032 g	0,00058 %
50 %	110,0000 g	0,00051 g	0,00046 %
75 %	165,0000 g	0,00069 g	0,00042 %
100 %	220,0000 g	0,00088 g	0,00040 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy 1,00 %
Safety factor 3
Minimum sample weight 0,0380 g

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

Verical®
Version 6.5

Page 4 | 4



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLIUANG, SUANLIUANG BANGKOK 10250
TEL 0-2717-3000-29 FAX 0-2719-9454



Certificate of Calibration

Cert. No.: 24TM635
Page : 1 of 3

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB22

Serial No. : L513.0648

ID No. : RYG_EN0061

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5, T. Maenam Khu,
A. Pluakdaeng,
Rayong 21140, Thailand

Location : Wet Chemistry Lab

Received Order : 21 March 2024

Calibration Date : 21 March 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

() Ponthippa Tameyakul
() Unnopphol Harachai
(x) Suwit Imjai

Issue Date : 23 March 2024

REVIEW BY: *Thanitak*
APPROVED BY: *D. J. J.*
NEXT CAL DATE: 21/09/25



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2403-0563OC-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 (IPTRT).

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	MY57013711	23LM115	TPA	11 Jul 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.

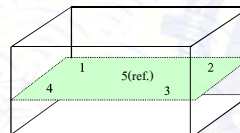
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	25	55	222
Finished of Calibration	25	57	223



Front

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

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 : 2403-0563OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 24TM635
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			Position					
			1	2	3	4	5 (ref.)	
85.0	85.0	85.0	84.428	84.424	84.489	84.507	84.477	0.18

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
85.0	0.19	0.11	2

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

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

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

UUC* : Unit Under Calibration

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

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

-o0o-

© 2024 by Agilent Technologies

Agilent CrossLab Compliance Services

Certificate of System Qualification

GC-OQ - GCMS-OQ

System ID: GM-10
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Patthanakarn 40, Patthanakarn Rd., Kwang Suan Luang, Khet Suan Luang, Bangkok 10250
Date: November 21, 2024 2:12:44 PM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.55, GCMS.02.56
Overall Qualification Status: Pass

REVIEW BY: Suchada T.
APPROVED BY: Nant Smit
NEXT CAL. DATE: 21-May-25

CDS Logon Verification - GC

Logon: asbkk env03

Overall CDS Logon Verification Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890

Front MMI

Setpoint Status: Pass

Setpoint Actual
Inlet Pressure: 25.0 psi 25.2 psi
Accuracy: 0.2 psi
Agilent Recommended: <= 1.2

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 1 / 15

© 2024 by Agilent Technologies

Agilent CrossLab Compliance Services

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 230.0 228.2 °C

Accuracy: -1.8 °C

Agilent Recommended: >= -1.0 °C % setpoint in K (-5.0 °C)
<= 1.0 °C % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 100.0 100.7 °C

Accuracy: 0.7 °C

Agilent Recommended: >= -1.0 °C % setpoint in K (-3.7 °C)
<= 1.0 °C % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

NOTE: This test's 2 comment(s) and 0 deviation(s) are available in the Attachments section.

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average
Temperature: 100.0 100.7333 °C

Stability: 0.1 °C

Agilent Recommended: <= 0.5

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 2 / 15

© 2024 by Agilent Technologies

Agilent CrossLab Compliance Services

Overall GC Oven Temperature Stability Test Status

Pass

NOTE: This test's 1 comment(s) and 0 deviation(s) are available in the Attachments section.

Tune EI

Tested Combination1 Front MMI / External TQ

Name: 7000D

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Scouting Run

Tested Combination1 Front MMI / External TQ

Injection Tower

Name: 7693A

Source: EI - Extractor

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Instrument Detection Limit

Tested Combination1 Front MMI / External TQ

Injection Tower

Name: 7693A

Source: EI - Extractor

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 3 / 15

Setpoint Status:

Injection Volume on Column:

Pass

1.0 uL

Minimum RSD:

Area

4.58 %

Agilent Recommended:

<= 12.00

Status:

Pass

Retention Time

0.01 %

<= 1.00

Pass

Instrument Detection Limit:

1.54238 fg

Agilent Recommended:

<= 4.03800

Status:

Pass

Overall Instrument Detection Limit Test Status

Pass

Mass Ratio Precision

Tested Combination1

Front

MMI

/ External

TQ

Name:

Injection Tower

Source:

7693A

EI - Extractor

Setpoint Status:

Pass

Injection Volume on Column:

0.5 uL

RSD:

Area Mass 1

Abundance's

2.23 %

Agilent Recommended:

<= 5.00

Pass

Mass Ratio

0.10 %

<= 5.00

Pass

Overall Mass Ratio Precision Test Status

Pass

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 4 / 15

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GM-10
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Inlet	Front
Detector	External
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN18180003
Firmware Revision	A.11.02
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 5 / 15

Sampler 2

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN18170137
Firmware Revision	A.11.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3442B
Serial Number	CN18153080
Firmware Revision	B.02.05
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	7890
Type	MMI
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Inlet 2

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 6 / 15

Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	TQ
Name	7000D
Model Number	G7000D
Serial Number	US1826U108
Firmware Revision	G.7000.085A
High Vacuum System	Turbo Pump
Liquid Injection Scouting Run Standard	OFN Std

MS EI Source 1

Manufacturer	Agilent Technologies
Source Type	EI - Extractor
Number of filaments	2

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 7 / 15

Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer: Supasak Nimsongtham
Logged On User Name: supasak.nimsongtham@agilent.com
Signature Creation Date: November 21, 2024
Reason for Signature: Executed protocol and published this original version of document

ACE Self Qualification Status

The installed version of ACE used to deliver this service passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder location SDS\ClearStore\AceSelfQualification.

Regulatory Disclaimer

This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

Warranty

Agilent Technologies makes no warranty of any kind to this material, including but not limited to, the implied warranties or merchantability and fitness for a particular purpose. Agilent Technologies shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 8 / 15

User Name: supasak.nimsongtham
Report Generated by Hostname: SCG1115HWK
System ID: GM-10
Print Date: November 21, 2024 2:12:46 PM

GM-10 2024 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2024 11:58:17 AM	Audit	Session Created	Session	Host Name: SCG1115HWK, Drive Serial Number: C2031778
November 21, 2024 11:58:17 AM	start	Configuration	Session	None
November 21, 2024 11:58:17 AM	Audit	Entitlement	Licensing	User is Field Engineer and does not require an unlock code
November 21, 2024 12:01:59 PM	Audit	Eq. Loaded	Session	EQP details for primary technique [GC] - File path: [ProtocolPacks\GC\Configurations\02_55\GC_02_55.eqp], EQP File Name: [GC_02_55.eqp], EQP Name: [AgilentRecommended] Protocol Revision: [GC_02_55] EQP details for hyphenated technique [GCMS] - File path: [ProtocolPacks\GCMS\Configurations\02_56\GCMS_02_56.eqp], EQP File Name: [GCMS_02_56.eqp], EQP Name: [AgilentRecommended]
November 21, 2024 12:02:04 PM	End	Configuration	Session	None
November 21, 2024 12:02:12 PM	start	Qualification	Session	QG
November 21, 2024 12:02:12 PM	start	Execution	CDS Logon Verification - GC - 7890 - Qualitative test	None
November 21, 2024 12:03:09 PM	End	Execution	CDS Logon Verification - GC - 7890 - Qualitative test	Run Count: 1

Page 1 / 7

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 9 / 15

User Name: supasak.nimsongtham
Report Generated by Hostname: SCG1115HWK
System ID: GM-10
Print Date: November 21, 2024 2:12:46 PM

GM-10 2024 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2024 12:03:11 PM	start	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No setpoints associated	None
November 21, 2024 12:03:20 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No setpoints associated	Run Count: 1
November 21, 2024 12:03:23 PM	start	Execution	Inlet Pressure Accuracy - Front MM: Pressure Controlled Inlet - S: 20.0 psi - L: <= 1.2 psi	None
November 21, 2024 12:03:29 PM	End	Execution	Inlet Pressure Accuracy - Front MM: Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
November 21, 2024 12:03:30 PM	start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
November 21, 2024 12:06:02 PM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
November 21, 2024 12:06:05 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1
November 21, 2024 12:06:07 PM	start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
November 21, 2024 12:06:20 PM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

Page 2 / 7

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 10 / 15

User Name: supasak.nimsongtham
Report Generated by Hostname: SCG1115HWK
System ID: GM-10
Print Date: November 21, 2024 2:12:46 PM

GM-10 2024 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2024 12:06:23 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1
November 21, 2024 12:06:25 PM	start	Execution	GC Oven Temperature Stability - 7890 - Temperature - Oven - S: 100.0°C - L: <= 0.5°C	None
November 21, 2024 12:07:10 PM	Audit	Data	GC Oven Temperature Stability - 7890 - Temperature - Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
November 21, 2024 12:07:14 PM	End	Execution	GC Oven Temperature Stability - 7890 - Temperature - Oven - S: 100.0°C - L: <= 0.5°C	Run Count: 1
November 21, 2024 12:07:16 PM	start	Execution	Tune EI - 70000 TQ - Source - None EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
November 21, 2024 12:07:26 PM	End	Execution	Tune EI - 70000 TQ - Source - None EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count: 1
November 21, 2024 12:07:28 PM	start	Execution	Tune EI - 70000 TQ - Source - None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None
November 21, 2024 12:07:39 PM	End	Execution	Tune EI - 70000 TQ - Source - None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	Run Count: 1
November 21, 2024 12:07:41 PM	start	Execution	Scouting Run - Injection Tower, Front MM, TQ - Source - EI - Extractor - Part of GCMS System Preparation	None

Page 3 / 7

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 11 / 15

User Name: supalak.simsongthum System ID: GM-10
Report Generated by Hostname: SCG1115HKC Print Date: November 21, 2024 2:12:46 PM

GM-10 2024 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2024 12:08:53 PM	Audit	Data	Scouting Run - Injection Tower, Front MM, TQ - Source - E1 - Extractor - Part of GCMS System Preparation	Data files Path: C:\GM-10\OQ2024\DL001.D
November 21, 2024 12:09:23 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 - [Integration Type: Injection Baseline Correction Mode: Advanced Initial Slope Sensitivity: 10 Initial Peak Width: 0.01 Initial Area Reject: 0 Initial Height Reject: 50 Integration: Off at 0 Integration: On at 4]
November 21, 2024 12:09:50 PM	End	Execution	Scouting Run - Injection Tower, Front MM, TQ - Source - E1 - Extractor - Part of GCMS System Preparation	Run Count: 1
November 21, 2024 12:09:53 PM	Start	Execution	Instrument Detection Limit - Injection Tower, Front MM, TQ - Source - E1 - Extractor - RSD L (Area) <= 12.00% - RSD L (Ret. Time) <= 1.00%	None
November 21, 2024 12:16:46 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MM, TQ - Source - E1 - Extractor - RSD L (Area) <= 12.00% - RSD L (Ret. Time) <= 1.00%	Data files Path: C:\GM-10\OQ2024\DL001.D
November 21, 2024 12:16:46 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MM, TQ - Source - E1 - Extractor - RSD L (Area) <= 12.00% - RSD L (Ret. Time) <= 1.00%	Data files Path: C:\GM-10\OQ2024\DL002.D

Page 4 / 7

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 12 / 15

User Name: supalak.simsongthum System ID: GM-10
Report Generated by Hostname: SCG1115HKC Print Date: November 21, 2024 2:12:46 PM

GM-10 2024 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2024 12:16:46 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MM, TQ - Source - E1 - Extractor - RSD L (Area) <= 12.00% - RSD L (Ret. Time) <= 1.00%	Data files Path: C:\GM-10\OQ2024\DL003.D
November 21, 2024 12:16:46 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MM, TQ - Source - E1 - Extractor - RSD L (Area) <= 12.00% - RSD L (Ret. Time) <= 1.00%	Data files Path: C:\GM-10\OQ2024\DL004.D
November 21, 2024 12:16:47 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MM, TQ - Source - E1 - Extractor - RSD L (Area) <= 12.00% - RSD L (Ret. Time) <= 1.00%	Data files Path: C:\GM-10\OQ2024\DL005.D
November 21, 2024 12:16:47 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MM, TQ - Source - E1 - Extractor - RSD L (Area) <= 12.00% - RSD L (Ret. Time) <= 1.00%	Data files Path: C:\GM-10\OQ2024\DL006.D
November 21, 2024 12:16:47 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MM, TQ - Source - E1 - Extractor - RSD L (Area) <= 12.00% - RSD L (Ret. Time) <= 1.00%	Data files Path: C:\GM-10\OQ2024\DL007.D
November 21, 2024 12:16:47 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MM, TQ - Source - E1 - Extractor - RSD L (Area) <= 12.00% - RSD L (Ret. Time) <= 1.00%	Data files Path: C:\GM-10\OQ2024\DL008.D
November 21, 2024 12:16:47 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MM, TQ - Source - E1 - Extractor - RSD L (Area) <= 12.00% - RSD L (Ret. Time) <= 1.00%	Data files Path: C:\GM-10\OQ2024\DL009.D

Page 5 / 7

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 13 / 15

User Name: supalak.simsongthum System ID: GM-10
Report Generated by Hostname: SCG1115HKC Print Date: November 21, 2024 2:12:46 PM

GM-10 2024 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2024 12:16:47 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MM, TQ - Source - E1 - Extractor - RSD L (Area) <= 12.00% - RSD L (Ret. Time) <= 1.00%	Data files Path: C:\GM-10\OQ2024\DL010.D
November 21, 2024 12:18:15 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 - [Integration Type: Injection Baseline Correction Mode: Advanced Initial Slope Sensitivity: 10 Initial Peak Width: 0.01 Initial Area Reject: 0 Initial Height Reject: 50 Integration: Off at 0 Integration: On at 4]
November 21, 2024 12:22:43 PM	End	Execution	Instrument Detection Limit - Injection Tower, Front MM, TQ - Source - E1 - Extractor - RSD L (Area) <= 12.00% - RSD L (Ret. Time) <= 1.00%	Run Count: 1
November 21, 2024 12:22:52 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front MM, TQ - Source - E1 - Extractor - L (RSD) <= 5.00%	None
November 21, 2024 12:27:32 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MM, TQ - Source - E1 - Extractor - L (RSD) <= 5.00%	Data files Path: C:\GM-10\OQ2024\MRP002.D
November 21, 2024 12:27:38 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MM, TQ - Source - E1 - Extractor - L (RSD) <= 5.00%	Data files Path: C:\GM-10\OQ2024\MRP003.D
November 21, 2024 12:27:38 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MM, TQ - Source - E1 - Extractor - L (RSD) <= 5.00%	Data files Path: C:\GM-10\OQ2024\MRP004.D

Page 6 / 7

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 14 / 15

User Name: supalak.simsongthum System ID: GM-10
Report Generated by Hostname: SCG1115HKC Print Date: November 21, 2024 2:12:46 PM

GM-10 2024 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2024 12:27:38 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MM, TQ - Source - E1 - Extractor - L (RSD) <= 5.00%	Data files Path: C:\GM-10\OQ2024\MRP005.D
November 21, 2024 12:27:39 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MM, TQ - Source - E1 - Extractor - L (RSD) <= 5.00%	Data files Path: C:\GM-10\OQ2024\MRP006.D
November 21, 2024 12:27:39 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MM, TQ - Source - E1 - Extractor - L (RSD) <= 5.00%	Data files Path: C:\GM-10\OQ2024\MRP007.D
November 21, 2024 12:33:20 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 - [Integration Type: Injection Baseline Correction Mode: Advanced Initial Slope Sensitivity: 10 Initial Peak Width: 0.01 Initial Area Reject: 0 Initial Height Reject: 50 Integration: Off at 0 Integration: On at 4]
November 21, 2024 12:36:42 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front MM, TQ - Source - E1 - Extractor - L (RSD) <= 5.00%	Run Count: 1
November 21, 2024 12:37:11 PM	End	Qualification	Session	OQ
November 21, 2024 12:37:11 PM	Start	Reporting	Session	None
November 21, 2024 1:11:02 PM	Audit	Reporting	Session	Report Generated: Certificate
November 21, 2024 1:37:20 PM	Audit	Reporting	Session	Report Generated: Report

Page 7 / 7

Date: November 21, 2024 2:12:44 PM
System ID: GM-10

Page 15 / 15

Certificate of Calibration

Cert.No.: 24CHO568
Page.: 1 of 3

Equipment :	Spectrophotometer	
Manufacturer :	HACH	
Model :	DR3900	REVIEW BY ... <i>Junda</i>
Serial No. :	2021559	
ID No. :	BKK_EN0356	APPROVED BY ... <i>Saithip</i>
Condition As-Received:	Used Item	
Received Date :	29 October 2024	NEXT CAL DATE ... 29/10/2025
Calibration Date :	29 October 2024	
Reference :	2410-07820C-1	
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand	
Calibration Place :	Wet Chemistry Lab 2	
Ambient Temperature :	(21.8 to 21.5) °C (On-Site)	
Relative Humidity :	(58.2 to 59.3) % (On-Site)	
Calibration Procedure :	In - house method : CP-0CH4 based on ASTM E 275-08	
Calibrated by :	Warakorn Lernagatrakul <i>Saithip</i>	
Approved by :	Approved Signatory	
() Unnophol Harachai () Ponpan Paipim (✓) Saithip Meangmai		
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.

Cert. No. : 24CHO568
Page : 2 of 3

Condition of calibration result

1. Reference Standard Material :

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

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

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

Calibration Results : without adjustment

Wavelength Accuracy

Certified Values of Reference Material	UUC Reading	Uncertainty of Measurement	Coverage Factor
(nm)	(nm)	(\pm nm)	k
418.40	418	0.59	2.00
479.88	480	0.59	2.00
513.75	514	0.59	2.00
537.00	536	0.59	2.00
638.00	638	0.59	2.00
747.61	748	0.59	2.00
807.04	808	0.72	2.05



Cert. No. : 24CHO568
Page : 3 of 3

Calibration Results : without adjustment
Photometric Accuracy

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

Remark

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

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

-o0o-



Agilent Technologies

Agilent Technologies (Thailand) Limited
U CHU LIANG BUILDING, 22/F UNIT A,1
888 RAMA 4 ROAD, BILMA, BANGKOK,
Bangkok 10260 Thailand

Tel: +852 612 6161
Fax: +852 612 4134
Email: cs@agile.com
Website: www.agile.com/zhcn

BKK_EL0043

Customer Contact:

ALS Laboratory Group (Thailand) Co
Ltd (Head Office)
104 Phatthanakan 40 Phatthanakan R
Klongkiet Phatthanakan Khet Suan
TAX ID : 010554004853
chanattagan.amelin@alsthal.com
227150760

Invoice To:
ALS Laboratory Group (Thailand) Co
Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd
Khwaeng Phatthanakan Khet Suan

Delivery Site:
ALS Laboratory Group (Thailand) Co
Ltd Head Office

104 Phatthanakan 49 Phatthanakan Rd
Rangeng Phatthanakan Nhet Duen

LOCATION
 Name
 Bldg
 Lab
 Dept

SERVICE REPORT

Customer Purchase Order Number:	Customer Number: 78371013
Service Request:	Service Request Date:
Service Order: 6096676060	Service Confirmation: 6905905441

REVIEW BY Tattaporn C.
APPROVED BY Smith N
NEXT CAL DATE 3/4/2026

Direct inquiries to:
Contact Name: CUSTOMER SERVICE CENTER
Contact E-mail: ccc_smt@agilent.com
Contact Telephone: +862 837 6363
Contact Fax: +862 822 4234

Learn more about Agilent's Special Offers, Products, Services and our full range of laboratory productivity solutions optimized for your applications and workflow. Visit us at www.agilent.com/chem

Agilent Technologies (Thailand) Limited, Head Office
17 Chuang Wang Bldg 22/F Unit A-0
998 Rama 4 Road, Siam, Bangkok
Bangkok 10500 Thailand
Tel: 02-010542058/9

Dubank R.A. Bangkok Branch
309 Interchange 21 Building, Sukhumvit Road, Khlongtoey New
Sub-division, Wattana District, Bangkok 10110 Thailand
Acc. No. 012-4452-007.
IMB/Krung Thai Bank PLC
Biam-Syapore Br. #16/1-2 Rama 1 Rd. Pattanamon, BKK 10330
Thailand

1588/183463

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-IM-7699	ICPMS 7500 System			
GB410A	SPS 4 Autosampler	AU15430722	ICP MS 7500	SYS-IM-7500
GB411A	ISIS 3 for Agilent, 7850/7980/8500	JP16510227	ICP MS 7500	SYS-IM-7500
G3292A	PSC 610ST Chiller	2U15A1948	ICP MS 7500	SYS-IM-7500
GB483A	Agilent 7990 ICP-MS	JP16471169	ICP MS 7500	SYS-IM-7500

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1008	EOD	Enterprise Operational Qualification	1.00	Agreement Entitlement: 100 % covered	04.10.2024	04.10.2024
1010	5185-5050	ICP-MS Checkout Solutions	1.00	Agreement Entitlement: 100 % covered		

Additional Information:

Page 2 of 3

Service Information:

Problem Description: *WU-EOD-IM-7500-5001253655		
Service Provided: Perform DG Hardware, Test CDS (ogen, auto sampler), Auto tune, BD and 20 Min stability. 1. calibrate the instrument No BKK_EL0043 test all pass.		
Service Overview Code: Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
Reported Hours: 7.8	Travel Hours: 2.8	
Customer Field Service Representative Name: Pantep Kurosehai	Customer Field Service Representative Signature: 	Date: 08 Oct 2024
Customer Name: Supakwan Mak	Customer Signature: 	Date: 08 Oct 2024
Additional Comments:		

Page 3 of 3



Metrological Center

SCI ECO Services Company Limited

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

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

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

Certificate No. T250355

Page 1 of 6

Certificate of Calibration

Equipment : HEATING BLOCK
Manufacturer : Environmental Express
Model : SC 196
Serial No. : 6974CECW3285
Customer Code : BKK_EL0054
ID No. : T5306A3
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250
Customer Location : Acid Digestion Lab
Date of Receipt : 26 February 2025
Calibrated By : Atiphong Rongrat (Technician)
Approved By :  / Boonchai Suriyawong (Site Calibration Manager)
Date of Issue : 17 MAR 2025

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

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



Metrological Center

SCI ECO Services Company Limited

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

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

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

Certificate No. T250355

Page 2 of 6

Calibration Report

Equipment : HEATING BLOCK
Date of Calibration : 4 March 2025
Environment : Temperature : 24.4-24.9 °C
Line Voltage : 221.6-226.3 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20.

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

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	IN221-IN230	T240712	19 April 2025
TC	TYPE T	TN231-TN240	T240712	19 April 2025
TC	TYPE T	TN241-TN250	T240401	16 March 2025
TC	TYPE T	TN251-TN260	T240401	16 March 2025
DATA LOGGER	34970A	T193	T240401	16 March 2025

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant : 2 Hour 40 Minute At 95 °C
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

() without adjustment (X) after adjustment

Approved By: 



Metrological Center

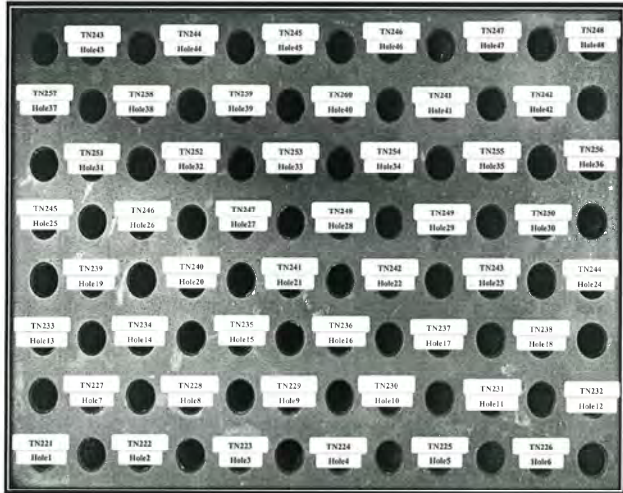
SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, 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. T250355

Page 3 of 6

Calibration Report



FRONT CONTROL

Approved By:

FM-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, 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. T250355

Page 4 of 6

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)					
R1 Hole1-Hole6	TN221	TN222	TN223	TN224	TN225	TN226
CAL POINT	Max	94.85	95.37	95.03	95.25	95.52
	Min	94.17	94.66	94.38	94.63	94.87
	Average	94.51	95.02	94.70	94.94	95.20
R2 Hole7-Hole12	TN227	TN228	TN229	TN230	TN231	TN232
	Max	94.71	94.56	94.79	95.32	95.44
	Min	94.05	93.88	94.10	94.65	94.90
	Average	94.38	94.22	94.44	94.99	95.17
R3 Hole13-Hole18	TN233	TN234	TN235	TN236	TN237	TN238
	Max	95.26	95.43	95.40	95.71	95.41
	Min	94.54	94.64	94.71	95.10	94.86
	Average	94.90	95.03	95.06	95.41	95.13
R4 Hole19-Hole24	TN239	TN240	TN241	TN242	TN243	TN244
	Max	95.13	95.06	95.68	96.16	95.80
	Min	94.39	94.43	94.86	95.51	94.88
	Average	94.76	94.75	95.27	95.83	95.12
R5 Hole25-Hole30	TN245	TN246	TN247	TN248	TN249	TN250
	Max	94.95	95.81	95.39	95.82	95.66
	Min	94.47	95.03	94.67	94.99	94.84
	Average	94.71	95.42	95.03	95.41	95.25
R6 Hole31-Hole36	TN251	TN252	TN253	TN254	TN255	TN256
	Max	96.07	95.34	96.28	95.39	94.93
	Min	95.28	94.55	95.51	94.62	94.13
	Average	95.67	94.95	95.90	95.00	94.54
R7 Hole37-Hole42	TN257	TN258	TN259	TN260	TN241	TN242
	Max	95.15	95.63	96.11	95.09	95.34
	Min	94.38	94.88	95.32	94.28	94.54
	Average	94.76	95.25	95.71	94.69	94.94
R8 Hole43-Hole48	TN243	TN244	TN245	TN246	TN247	TN248
	Max	95.84	95.87	95.44	95.72	95.65
	Min	95.06	95.10	94.60	94.95	94.87
	Average	95.45	95.48	95.02	95.34	95.26

Approved By:

FM-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, 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. T250355

Page 5 of 6

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)					
R1 Hole1-Hole6	TN221	TN222	TN223	TN224	TN225	TN226
CAL POINT	Max	104.48	104.40	104.60	105.27	105.24
	Min	104.15	104.02	104.25	104.94	104.91
	Average	104.32	104.21	104.42	105.10	105.08
R2 Hole7-Hole12	TN227	TN228	TN229	TN230	TN231	TN232
	Max	105.20	105.45	105.58	105.96	105.81
	Min	104.92	105.14	105.29	105.64	105.53
	Average	105.06	105.29	105.43	105.80	105.67
R3 Hole13-Hole18	TN233	TN234	TN235	TN236	TN237	TN238
	Max	106.09	106.14	105.83	106.25	105.97
	Min	105.80	105.89	105.57	106.00	105.69
	Average	105.94	106.01	105.70	106.13	105.83
R4 Hole19-Hole24	TN239	TN240	TN241	TN242	TN243	TN244
	Max	105.87	105.75	105.30	105.07	105.22
	Min	105.62	105.52	105.13	104.90	105.05
	Average	105.74	105.63	105.21	104.98	105.14
R5 Hole25-Hole30	TN245	TN246	TN247	TN248	TN249	TN250
	Max	105.52	105.54	105.52	105.75	105.97
	Min	105.45	105.35	105.31	105.57	105.81
	Average	105.53	105.44	105.41	105.66	105.89
R6 Hole31-Hole36	TN251	TN252	TN253	TN254	TN255	TN256
	Max	106.19	106.34	106.47	105.96	105.76
	Min	106.02	106.16	106.31	105.77	105.58
	Average	106.10	106.25	106.39	105.87	105.67
R7 Hole37-Hole42	TN257	TN258	TN259	TN260	TN241	TN242
	Max	106.21	105.59	105.45	105.36	106.08
	Min	106.04	105.42	105.28	105.20	105.90
	Average	106.12	105.51	105.37	105.28	105.99
R8 Hole43-Hole48	TN243	TN244	TN245	TN246	TN247	TN248
	Max	106.54	106.33	105.78	105.38	105.42
	Min	106.38	106.16	105.60	105.20	105.25
	Average	106.46	106.25	105.69	105.29	105.33

Approved By:

FM-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, 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. T250355

Page 6 of 6

Calibration Report

Measurement Results:

Setting (°C)	HEATING BLOCK		Temperature Distribution	
	Reading (°C)		Stability (°C)	Uncertainty (°C)
	Min	Max		
102.0	-	102.0	0.43	0.83
107.0	-	107.0	0.20	0.70

* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

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

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

Approved By:

FM-L13 108/30-05-57

Certificate No. T250873

Page 1 of 4

Certificate of Calibration

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

REVIEW BY [Signature]
APPROVED BY [Signature]
NEXT CAL DATE 04/12/26

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

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

FM-TL06 102/27-03-68

Certificate No. T250873

Page 2 of 4

Calibration Report

Equipment : Chamber (Cooling Room)
Date of Calibration : 4 June 2025
Environment : Temperature : 23.4-24.9 °C
Line Voltage : 221.4-230.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

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

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN91-TN100	T242036	3 December 2025
TC	TYPE T	TN101-TN110	T242036	3 December 2025
DATA LOGGER	34979A	T121	T242036	3 December 2025
- This certificate is traceable to : National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 9244).
- Condition of calibrated item : good
Equipment Description :
Time Constant : 2 Hour 20 Minute At : 3 °C
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available
- Adjustment : (X) without adjustment () after adjustment

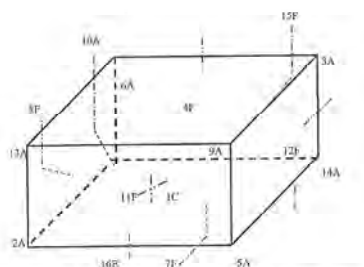
Approved By. [Signature]

FM-TL07 102/27-03-68

Certificate No. T250873

Page 3 of 4

Calibration Report



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

1C = TN91	12F = TN102
2A = TN92	13A = TN103
3A = TN93	14A = TN104
4F = TN94	15F = TN105
5A = TN95	16E = TN106
6A = TN96	
7F = TN97	
8F = TN98	
9A = TN99	
10A = TN100	
11F = TN101	

Approved By. [Signature]

FM-TL07 102/27-03-68

Certificate No. T250873

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)										
	TN91	TN92	TN93	TN94	TN95	TN96	TN97	TN98	TN99	TN100	TN101
3.0	2.95	2.92	3.09	2.92	3.16	3.50	3.40	3.03	3.34	2.98	3.44
	TN103	TN104	TN105	TN106							
	3.19	3.06	3.46	2.92							

Setting (°C)	Temperature Distribution					
	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)
	Min	Max	Average			
3.0	2.8	3.9	3.4	3.14	1.20	1.30
						1.90
						2.04

The calibration result apply only the above calibrated item.

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

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

Approved By. [Signature]

FM-TL07 102/27-03-68

REVIEW BY	Oran T.
APPROVED BY	Savit N.
NEXT CAL. DATE	12/06/2026

Maintenance Protocol

Atomic Fluorescence Spectrometer mercur DUO / mercur DUO plus

Maintenance works basic unit

tightness visual check inside the Mercur
visual check if gold-traps are broken
visual check if spectrometer is contaminated
visual check of the fluorescence cell
visual check of the absorption cell, incl. window
reactor cleaning
check pump-hose, if necessary change it
check swivel drive (SEV)
check drying-hose, output gas-liquid-separator
test Bubble-Sensor
check gas flows
check volume flows, reagents
recording stray light values
measurement with 30 ng/l

Maintenance works Autosampler

Serial No.: 701 739

lubricate the dosing-winding (Teflon-grease-spray)
clean the dosing cylinder, if necessary exchange it
lubricate the winding system of the height drive with some drops of oil
check the toothed belt
check the position of the mechanical stopper (height: 13mm)
check the pump rate of mixing pump (<14s AS52, typ.7s/<20s AS523, typ.10s)
check the pump rate of washing cup
check the electrical hose connections for good contact
check the connectors of the magnetic valves
check the dosing hose for buckling, if necessary exchange it

Serial-No.: K170A0143 Customer-No.:
Date: 12 December 2024 Carried out by: Srichai Fak-on

Maintenance with following Operational Qualification (OQ)
(requires a separate OQ protocol)

Company	บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด
User	
Department	ห้องแล็บปฏิบัติการ
Street	104 ซอย 40 ถนนพัฒนาการ แขวงสวนหลวง เขตสวนหลวง
Zip Code, City	กรุงเทพมหานคร 10250
Country	ประเทศไทย
Phone	
Fax	
E-mail	

Device parameter	nominal value	actual value
visual check general tightness inside the Mercur	o.k.	<input type="checkbox"/> changed
visual check Goldtraps	o.k.	<input type="checkbox"/> changed
visual check spectrometer		
Fluorescence cell	o.k.	<input type="checkbox"/> changed
Absorption cell, incl. window	o.k.	<input type="checkbox"/> changed
lens	o.k.	<input type="checkbox"/> changed
Swivel drive (SEV)	o.k.	<input type="checkbox"/> changed
check pump hoses	o.k.	<input type="checkbox"/> changed
check hoses and hose connections	o.k.	<input type="checkbox"/> changed
check and clean reactor	o.k.	<input type="checkbox"/> changed
check drying hose output Gas-liquid-separator	o.k.	<input type="checkbox"/> changed
check bubble-sensor	o.k.	<input type="checkbox"/> not o.k.
Check gasflow		
Argon pressure valve 4	1.2 - 1.6 bar	1.6 bar
Valve 1	10 Nl/h or 0.166 NL/min	0.142 NL/min
Valve 2	50 Nl/h or 0.833 NL/min	0.786 NL/min
Valve 3	5 Nl/h or 0.083 NL/min	0.080 NL/min
Valve 4	10 Nl/h or 0.166 NL/min	-
Check liquidflow		
Acid	2.5ml/min ± 1 ml	2.5 ml/min
Red-agent	2.5ml/min ± 1 ml	2.5 ml/min
Sample	10ml/min ± 2 ml	10 ml/min
Adventitious light - values	(V)	from file
100	0	0
200	0	0
300	0	0
350	0	0
400	1	1
450	2	3
500	6	7
550	13	15
575	18	21
600	25	29

Device parameter	nominal value	actual value
Analytical parameters Fluorescence cell		
Conditions: max conc.: 10 µg/L PMT-voltage: 360 V		
Blank-solution without enrichment / FBR 30 ng/L	Int > 0.0015 RSD < 3 %	Int: 0.00044 Int: 0.00037 RSD: 3.30 %
Conditions: max conc.: 1.7 µg/L PMT-voltage: 350 V		
Blank-solution with enrichment / FBR 30 ng/L	Int > 0.008 RSD < 3 %	Int: --- Int: --- RSD: --- %
Fok. factor (Int ₂ / Int ₁)	> 3.5	---
Analytical parameters Absorption cell		
Blank-solution without enrichment / FBR 100 ng/L	Ext. > 0.0012 RSD < 5 %	Ext.: 0.0011 Ext.: 0.00039 RSD: 2.98 %
Comments		
การใส่สาร Tech: With enrichment ไม่สามารถวัดค่าได้เนื่องจาก Valve 4 (Gas flow) ไม่ทำงาน แต่สามารถปรับ Board control ให้ค่าได้ 24 Vol. ทบทวนที่ห้อง Tech: With enrichment ค่าสามารถวัดค่า Gas box		

Signature Technician

12 December 2024
Place, Date (DD/MM/YYYY)

Signature Customer

12 December 2024
Place, Date (DD/MM/YYYY)Maintenance Protocol manual D003 (mercur D003 plus) update 07.06.2018 Version 2.1 Rev.
Analytik Jena AG | Friedrich-Straße 10 | 07745 Jena, Germany

3/3

Service Report

Customer's address:	Customer's Ref. No. Co. no. Service 2024					
บริษัท ออสมิเตอร์ จำกัด (มหาชน) 104 หมู่ 40 ถนนพหลโยธิน กรุงเทพมหานคร 10250						
104 หมู่ 40 ถนนพหลโยธิน กรุงเทพมหานคร 10250						
E-mail:	Phone:	Fax:				
Job No. 2412571PB	User:	Service Engineer: ศุภชัย ธิญญ	Date: 12/12/2024	Page: 1/1		
Instrument model: Mercury	Serial No. K17040143	Software Version No. vswAS 4.7.0.0				
<input type="checkbox"/> Repair (RE)	<input checked="" type="checkbox"/> Maintenance (PM)	<input type="checkbox"/> Installation (IN)	<input type="checkbox"/> Warranty	<input type="checkbox"/> Application (AP)	<input type="checkbox"/> Site Prep (SP)	<input type="checkbox"/> Validation (V)
Fault / Claim: แจ้ง PM เครื่อง Mercury (Contact year 2025 / 1 Time)						
<input type="checkbox"/> Error Code						
Action taken:						
• Maintenance work basic unit						
• Check Device parameters						
• Check gas flow						
• Check liquid flow						
• Check Advantus light-Values						
• Test run Analytical parameter Fluorescence cell						
• Test run Analytical parameter Absorption cell						
Action Pending / Recommendation:						
• แจ้งช่างในโรงงาน Tech: Without enrichment use Hg absorption						
• Hg low pressure lamp (Energy 4.0 eV) PMT voltage 350 V แทนที่หลอด						
แจ้งช่างในโรงงาน Hg low pressure lamp						
<input type="checkbox"/> Spare Part						
<input checked="" type="checkbox"/> Instrument Configuration:						
Item No.	Name	Quantity	Unit Price			
1. Hg3.326	S-valve assembly 2940 (Gas box)	1				
2. Hg7-Hol. Box	Hg low pressure lamp	1				
3.						
4.						
5.						
6.						
7.						
8.						
Herein the undersigned confirm the time spent on the work performed, the perfect function of the device, and the receipt of the specified spare parts. (Validated hours and kilometers can only be against the bill of the service engineer)				Date / Signature of Customer	Date / Signature of Service Engineer	Work completed?
				Orawan T.	ศุภชัย ธิญญ	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Services are subject to the General Terms and Conditions of Analytik Jena AG, which will be sent on request.

12/12/2024 11:37 Page 1/4

Mercur

Report file: C:\WinAAS\TMP\2024\DeclPro_008
Program version: 4.7.10.0 Printed on: 12/12/2024 11:37
Recording started on 12/12/2024 11:27 GMT+7.0
Operator: PSU/OTA
Laboratory: ALG-BKK
Code: II_Hg067_2024
Remarks:
Food/water

Method parameters

Method: Without enrichment / FBR 30 ng/L PM24052023
Created on 5/24/2023 Time 12:27
Program: ---

Parameters Mercur Technique: Hg fluorescence

Line	263.7 nm		
Lamp type	Hg-LP		
Integr. mode	Peak height	Integr. time	30 s
PMT	300 V	Peak smoothing	12/11
AZ time	5 s		
Delay	0 s		
Working mode	w/o enrich.	System cleaning	Acid
FBR technique	uri	Wash time acid	10 s
Pump speed	3	Soaking time	20 s
Sample load time	10 s	Gas load time	5 NL/h
Reaction time	10 s		
Waiting time AZ	5 s		
Delay	0 s		
Purge time1	28 s		
Purge time2	15 s	Gas wash time2	10 NL/h

Autosampler

Autosampler: ASS1S/F
Working mode: continuous
Tray type: 87/139

Dilution: ---

Mercur

12/12/2024 11:37 Page 2/4

QC parameters

QC type	Conc. check	QC check samp. 2	---
QC check samp. 1	---	Conc.	---
Conc.	---	Error limit	---
Error limit	---	Reaction	flag + continue
Rep. measurement	off	QC std.2 no.	1(30.000 ng/L)
QC std.1 no.	1(30.000 ng/L)	QC std.2 limit	± 50.00%
QC std.1 limit	± 50.00%	Reaction	flag + continue
QC std. act.	flag + continue	Reaction	off
Expect. blank vals.	0.0100 ± 0.0100	QC Recal factor	Off
QC precision	off		

Calibration settings

Calib. meth	Standard calib.	Calib. unit	ng/L
No. standards	1	Conversion fac.	1000000
Type of standards	---	Standard prep.	Premixed
		Blank correct.	---
Output unit	µg/L	Recalib. std. no.	---
Calib. stat.	Mean	Conversion fac.	1000
Stuck sol. 1	---	Meas. cycles	3
Stuck sol. 3	---	Blind cycles	1
Type of cal. curve	linear	Stock sol. 2	---
Weighted cal.	off	Stock sol. 4	---
Check of cal. curve	no outlier test	Intercept	calculated
		Grubbs stat.	off

Sample statistics

Stat. mode	Mean	Meas. cycles	2
Confid. level	95.4 %	Blind cycles	1
Grubbs stat.	---		

Calibration standards

No	Name	Status	Pos	Conc./ng/L	Ints	SD	RSD/%
1	Cal-Zero	(-)	79	0.000	H: 0.000445 A: 0.009614	0.000017	3.813
2	Cal-Std1	(-)	80	30.000	H: 0.002375 A: 0.03603	0.000031	1.306

Mercur

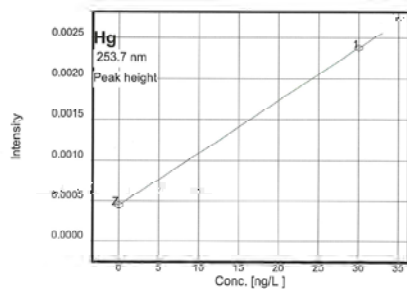
Calibration function 1 12/12/2024 11:36 Calibration (Peak height)

Intro-k1+k2*xconc

k1=0.000446 k2=0.000064

Recal. factor: ---

Slope	0.00006 Ints/(ng/L)	R2-adjusted	1.0000
sc0	1.00000 ng/L		
Lower limit	0 ng/L	Upper limit	33.0 ng/L
Detection limit	---	Deter. limit	---



Measurements and events (sorted by time)

Ha	Without enrichment / FBR 30ng/L_PM 24052023					12/12/2024	11:26
ID	Conc.	Ints	BG	SD	RSD/%	Int. type	Time
Cal-Zero		0.000438				PKH	11:26
		0.000436					11:31
		0.000465					11:32
	0ng/L	0.000445		0.000017000	3.813		11:32
Cal-Std1		0.002402				PKH	11:34
		0.002341					11:35
		0.002361					11:36
	30.00ng/L	0.002375		0.000031020	1.306		11:36
Calibration	Calibration function: 01						11:36

Mercur

Mercur

Mercur

Report file: C:\WinAAS\TMP\2024\DeclPro_010
 Program version: 4.7.10.0 Printed on: 12/12/2024 13:31
 Recording started on 12/12/2024 13:16 GMT+7.0

Operator: PSU.OTA
 Laboratory: ALS-BKK
 Code: II_Hg067_2024

Remarks:
 Food/water

Method parameters

Method: Without enrichment / Abs / FBR 100ng/L_PM 24052023
 Created on: 12/12/2024 Time: 12:42
 Program: ---

Parameters Mercur Technique: Hg absorption

Line	253.7 nm	Integr. time	55 s
Lamp type	Hg-LP		
Integr. mode	Peak height		
PMT	225 V	Peak smoothing	8/5
AZ time	5 s		
Delay	8 s		

Working mode	w/o enrich.	System cleaning	Acid
FBR technique	on	Wash time acid	15 s
Pump speed	4	Soaking time	20 s
Sample load time	8 s	Gas load time	5 NL/h
Reaction time	12 s		
Waiting time AZ	16 s		
Delay	10 s		
Purge time1	50 s		
Purge time2	10 s	Gas wash time2	10 NL/h

Autosampler

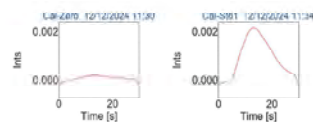
Autosampler	AS51S/F	I ray type	87/139
Working mode	continuous		

Dilution

Mercur

Peak plots

Hg



QC parameters

QC type	Conc. check	QC check samp. 2	---
QC check samp. 1	---	Conc.	---
Conc.	---	Error limit	---
Error limit	---	Reaction	flag + continue
Rep. measurement	off	QC std.1 no.	1(100.00 ng/L)
QC std.1 no.	1(100.00 ng/L)	QC std.2 no.	1(100.00 ng/L)
QC std.1 limit	± 50.00%	QC std.2 limit	± 0.00%
QC std. act.	flag + continue		
Expected blank val.	0.0100± 0.0100	Reaction	flag + continue
QC precision	off	Reaction	off
		QC Recal.factor	Off

Calibration settings

Calib. meth	Standard calib.	Calibr. unit	ng/L
No. standards	1	Conversion fac.	1000000
Type of standards	---	Standard prep.	Premixed
		Blank correct.	---
		Recalib. std. no.	---
Output unit	µg/L	Conversion fac.	1000
Calib. stat.	Mean	Meas. cycles	3
		Blind cycles	1
Stock sol. 1	---	Stock sol. 2	---
Stock sol. 3	---	Stock sol. 4	---
Type of cal. curve	linear	Intercept	calculated
Weighted cal.	off	Grubbs stat.	off
Check of cal. curve	no outlier test		

Sample statistics

Stat. mode	Mean	Meas. cycles	2
Confid. level	95.4 %	Blind cycles	1
Grubbs stat.	---		

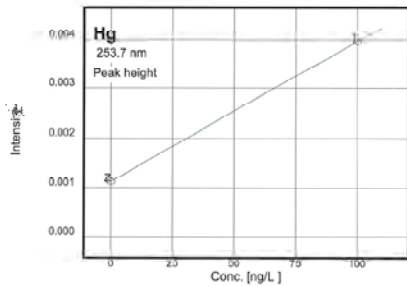
Calibration standards

Hg

No	Name	State	Pos	Conc./ng/L	Abs	SD	RSD/%
1	Cal-Zero	(-)	79	0.00	H: 0.001129 A: 0.039764	0.000086 0.004386	7.666 11.23
2	Cal-Std1	(-)	81	100.00	H: 0.003856 A: 0.077650	0.000114 0.004290	3.567 6.081

4810107

Calibration function 1 12/12/2024 13:31 Calibration (Peak height)			
Abs=k1+k2*conc			
k1=0.001130 k2=0.000028 Recal. factor: ---			
Slope	0.00003 Abs/(ng/L)	R2-adjusted	1.0000
sc0	1.00000 ng/L	Charact. conc.	154.568 (ng/L)/1%
Lower limit	0 ng/L	Upper limit	110. ng/L
Detection limit	---	Deter. limit	---



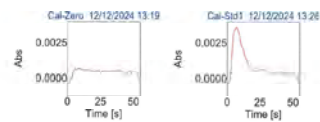
Measurements and events (sorted by time)

Ha	Without enrichment / Abs / FBR 100ng/L FM 24052023					12/12/2024	13:16
IP	Conc.	Abs	RG	SD	RSD%	Int. type	Time
Cal-Zero		0.001092				PKH	13:19
		0.001227					13:20
		0.001099					13:22
	0ng/L	0.001126		0.000086805	7.666		13:22
Cal-Std1		0.003649				PKH	13:26
		0.004069					13:27
		0.003832					13:29
	100 ng/L	0.003950		0.00011825	2.993		13:29
Calibration	Calibration function: 01						13:31

Mercur

Peak plots

Hg



Mercur



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. T250353

Page 1 of 4

Certificate of Calibration

Equipment : Autoclave

Manufacturer : TOMY

Model : SX-700

Serial No. : 48134190

Customer Code : BKK_ML0041

ID No. : T7725A3


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

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

Customer Location : Washing Room

Date of Receipt : 26 February 2025

Calibrated By : Boonchai Suriyawong (Site Calibration Manager)

Approved By :  / Sujjar Naknakred (Site Calibration Manager)

Date of Issue : 10 Mar 2025

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

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



Metrology

SCI ECO Services Company Limited

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



Certificate No. T250353

Page 2 of 4

Calibration Report

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

Condition of this results of calibration :

1. This equipment was calibrated by insert 3 standard temperature recorder into its chamber and test according to WI-T23 inhouse method. (based on BS 2646-1 : 2021)
All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.

Instrument	Model	Standard No.	Certificate No.	Due Date
1. Temperature recorder	RTD	T210	T242028	11 December 2025
2. Temperature recorder	RTD	T211	T242029	11 December 2025
3. Temperature recorder	RTD	T212	T242030	11 December 2025

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

4. Condition of calibrated item : good

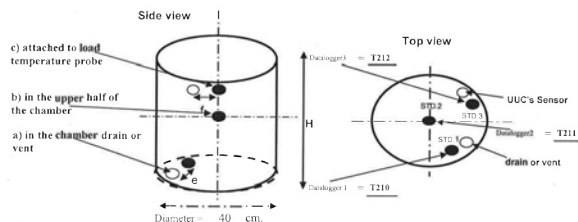
Equipment Description :

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

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

Approved By. 

Calibration Report



Remark :

- Size of Installed Standard sensor STD.1 : Distance the chamber drain or vent ≤ 10 cm. (less than or be equal to 10 cm.)
- Size of Installed Standard sensor STD.2 : Geometric Center (upper half of the chamber)
- Size of Installed Standard sensor STD.3 : Distance UUC's Sensor $t = 2$ cm.

Measurement Results :

Calibration Point	Average Standard Reading at each position (°C)		
	T210	T211	T212
121	121.2	121.1	121.1

Autoclave		Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (± °C)	Uncertainty (± °C)
	Min.	Max.				
121	*	121	121.2	0.1	0.1	0.65
						Coverage Factor k
						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.

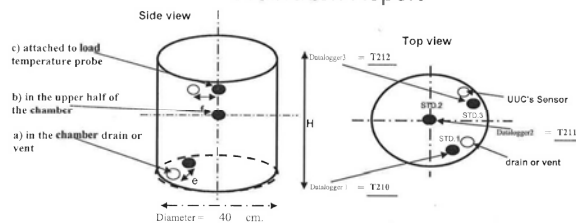
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %.

End of Certificate

Approved By: _____

FM-L15118/18-08-66

Calibration Report



Remark :

- Size of Installed Standard sensor STD.1 : Distance the chamber drain or vent ≤ 10 cm. (less than or be equal to 10 cm.)
- Size of Installed Standard sensor STD.2 : Geometric Center (upper half of the chamber)
- Size of Installed Standard sensor STD.3 : Distance UUC's Sensor $t = 2$ cm.

Measurement Results :

Calibration Point	Average Standard Reading at each position (°C)		
	T210	T211	T212
121	121.18	121.12	121.13

Autoclave		Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (± °C)	Uncertainty (± °C)
	Min.	Max.				
121	*	121	121.16	0.10	0.10	0.65
						Coverage Factor k
						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-L13108/30-05-57



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



Certificate of Calibration

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

Equipment : Incubator

Manufacturer : Memmert

Model : IPP750eco

Serial No. : V821.0172

ID No. : BKK_ML0231

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

Location : Incubation & Microbiological Reading

Received Order : 21 August 2025

Calibration Date : 21 August 2025

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Khit Rutanaprapachai

Approved by :

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

Issue Date : 25 August 2025

The Uncertainties are for a confidence probability of approximately 95%

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



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

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44073381	25LM82	TPA	17 May 2026

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

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

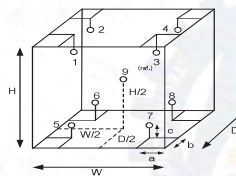
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration : (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

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



Probe Installation Details :

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

Dimension of Chamber :

D = 0,60 m
W = 1,0 m
H = 1,2 m
Capacity = 0,75 m³

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



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2508-0459OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

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

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

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

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

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

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

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

UUC* : Unit Under Calibration

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

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

-o0o-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
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 240/E2
Serial No. : 00-15533
ID No. : BKK_ML0013

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

Location : Media Preparation Room

Received Order : 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 : 2404-0439OC-8

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

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	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.

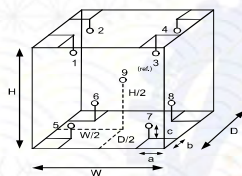
Remark : TPA : Technology Promotion Association (Thailand - Japan)

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	D = 0.50 m
b = 10 cm	W = 0.80 m
c = 10 cm	H = 0.60 m
	Capacity = 0.24 m ³

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 : 2404-0439OC-8
Result of Calibration :- (*) Without Adjustment
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 %.

-o0o-



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.,
Khaeng 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 Rutanaprapachai

Approved by :
Approved Signatory

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

Issue Date : 06 March 2025

The Uncertainties are for a confidence probability of approximately 95%

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

REVIEW BY :
APPROVED BY :
NEXT CAL DATE : 04/03/26



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2503-0006OC-2
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 (IPTT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44073381	23LM73	TPA	18 May 2025

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

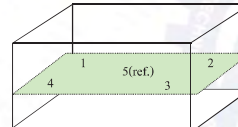
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

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



Front

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

BKK_EL0037



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)
			Position					
			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 %.

-o0o-



Agilent Technologies

Agilent Technologies (Thailand) Limited
11 (N) LAMING BLDG, 22/F UNIT A,B
888 RAMA 4 ROAD, SUKUM, BANGKOK
Bangkok 10550 Thailand
Tel: +662 837 8888
Fax: +662 832 8281
Email: info.asia@agilent.com
Website: www.agilent.com/thailand

Customer Contact:

ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40 Phatthanakan Rd
Khaeng Phatthanakan Khet Suan
TAX ID : 0105540004859
Chanatagarn.inchom@agilent.com
2760268

Invoice To:

ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40 Phatthanakan Rd
Khaeng Phatthanakan Khet Suan

SERVICE REPORT

Customer Purchase Order Number:	Customer Number:
70371913	
Service Request:	Service Request Date:
Service Order:	Service Confirmation:
0105540004859	0105540004859

REVIEW BY :
APPROVED BY :
NEXT CAL DATE : 31 Mar 2026

Delivery Site:

ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40 Phatthanakan Rd
Khaeng Phatthanakan Khet Suan

Location:
Room:
Bldg:
Lab:
Dept:

Direct Inquiries to:

Contact Name: Customer Contact Center
Contact E-mail: info.asia@agilent.com
Contact Telephone: +662 837 8888
Contact Fax: +662 832 8281

products | applications | software | services

Learn more about Agilent's Special Offers, Products, Services and our full range of laboratory productivity solutions optimized for your applications and workflows. Visit us at www.agilent.com/thailand

Agilent Technologies (Thailand) Limited Head Office
11 (N) LAMING BLDG, 22/F UNIT A,B
888 RAMA 4 ROAD, SUKUM, BANGKOK
Bangkok 10550 Thailand
Tax ID : 0105540004859

Chonabhai A, Bangkok Branch
388 Interchange 21 Building, Sukhumvit Road, Nongkroo Har
Sub-district, Wattana District, Bangkok 10116 Thailand
Tel: +662 4453 807
THAIARANG Thai Bank PCL
Siam Square Bldg, 410-11-2 Floor 1 Tel: Pothammarat 088 16108
Thailand

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-ID-5100	ICP-DES 5100/5110 System			
GB010A	Aquint 5100-SVOV ICP-DES Spectrometer	AN16010605	ICP-DES 5100	SYS-ID-5100
GB010A	SPS + Autosampler	ALH544764	ICP-DES 5100	SYS-ID-5100

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	EQO	Enterprise Operational Qualification	1.00	Agreement Entitlement 100 % covered	22.09.2024	23.09.2024
1010	6010030100	Bottle ICP-DES Wavecal soln 500ml, 5 ppm	1.00	Agreement Entitlement 100 % covered		
1020	5100-7001	Calibration blank solution Bpcc HMD3	1.00	Agreement Entitlement 100 % covered		

Additional Information:

Service Information:

Problem Description: YUQ-DG-ID-5100-3001293696		
Service Provided: Complete UQ/IV 5100ICPDES Equipment ID: BQR_E18037, all test passed		
Service Overview Code: Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
Reported Hours: 4.0	Travel Hours: 2.0	
Customer Field Service Representative Name: Steven Onkhem	Customer Field Service Representative Signature: 	Date: 23 Sep 2024
Customer Name: CHANATTAGARN IMCHBM	Customer Signature: 	Date: 23 Sep 2024
Additional Comments:		



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



Certificate of Calibration

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

Equipment : pH Meter
Manufacturer : Hach
Model : HQ411d
Serial No. : 200100031163
ID No. : BKK_EN0342
Condition As-Received: Used Item
Received Date : 16 October 2024
Calibration Date : 17 October 2024
Reference : 2410-0548DSC-5
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemgagrakul
Approved by : 
Approved Signatory
Issue Date : 21 October 2024

() Unnopphol Harachai
() Ponpan Paipim
(✓) Sathip Meangmai

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

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1)Ref. Standard Thermometer	2188080	130RC044	2411022	16 Sep 2025

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :The measurement results are traceable to SI through Hach Lenge GmbH Ltd.
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00
:The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

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

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

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode	4.008	4.028	174.6	0.0044	2.00
S/N.: 230473042902	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 k
25.0	25.002	25.0	-0.002	0.13	2.00

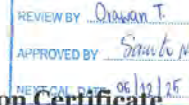
Remark : UUC* = Unit Under Calibration

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-



BKK_EL0128



Performance Verification Certificate for Mercury Analyzer

PRODUCT ID : Quicktrace M-8000 , Teledyne Leeman Labs

Equipment ID : BKK_EL0128 Mercury Analyzer
S/N: US22133002

BKK_EL0129 Autosampler
S/N: 052222A560

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

Date of Qualified : December 6, 2024
Next Due date : December 6, 2025

This certifies for products which was performed in acceptable criteria specifications

Autosampler & Sample Introduction	PASSED
Analyzer	PASSED
Gas Liquid Separator & Dryer	PASSED
CVAFS Detector	PASSED
Electronics/Mechanical	PASSED
Data station/PC	PASSED
Analytical test	PASSED

Provided by :
Scientist Instrument Co., Ltd.
113 Soi Ekachai 44, Ekachai Road
Khlong Bang Phran, Bangchen
Bangkok 10150 Thailand

Certified by :
Thunraphol Sakdayos
Service Engineer



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



Certificate of Calibration

Cert.No.: 25CHO537
Page.: 1 of 3

Equipment : Spectrophotometer
Manufacturer : HACH
Model : DR3900
Serial No. : 2021559
ID No. : BKK_EN0356
Condition As-Received : Used Item
Received Date : 08 October 2025
Calibration Date : 08 October 2025
Reference : 2510-0042OC-11
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Calibration Place : Wet Chemistry Lab 2
Ambient Temperature : (21.9 to 21.9) °C (On-Site)
Relative Humidity : (62 to 65) % (On-Site)
Calibration Procedure : In - house method :
CP-0CH4 based on ASTM E 275-08
Calibrated by : Uthen Kankawi
Approved by :
Sathip Meangmai
Approved Signatory
Issue Date : 9 October 2025

REVIEW BY :
APPROVED BY :
NEXT CAL DATE : 08/10/26



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

Condition of calibration result

1. Reference Standard Material :

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

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certificate is traceable to the International System of Unit maintained through :
- Starna Scientific Ltd.

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

Calibration Results : without adjustment

Wavelength Accuracy

Certified Values of Reference Material (nm)	UUC Reading (nm)	Uncertainty of Measurement (± nm)	Coverage Factor k
418.40	418	0.59	2.00
479.88	480	0.59	2.00
513.75	513	0.59	2.00
537.00	536	0.59	2.00
638.00	638	0.59	2.00
747.61	748	0.59	2.00
807.04	807	0.59	2.00

The Uncertainties are for a confidence probability of approximately 95%

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



Cert. No. : 25CHO537

Page : 3 of 3

Calibration Results : without adjustment

Photometric Accuracy

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

Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- UUC = Unit Under Calibration

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

-o0o-