

ภาคผนวก จ

ใบรับรองการสอบเทียบเครื่องมือ



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right partner.

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	pH at 25 °C	pH meter	BKK_EN0072	12-Sep-22	12-Mar-24	18
Water Lab	Dissolved Oxygen	Burette	BKK_EN0171	30-Aug-22	1-Mar-24	18
Water Lab	Dissolved Oxygen	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Oil & Grease	Electronic Top-Loading Balance	BKK_EN0002	8-Feb-23	8-Feb-24	12
Water Lab	Oil & Grease	Water Bath	BKK_EN0148	4-Jul-23	4-Jan-25	18
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BKK_EN0002	8-Feb-23	8-Feb-24	12
Water Lab	Total Suspended Solids	Oven	BKK_EN0273	29-Nov-22	29-May-24	18
Water Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	BKK_EN0002	8-Feb-23	8-Feb-24	12
Water Lab	Total Dissolved Solids 180°C	Oven	BKK_EN0273	29-Nov-22	29-May-24	18
Water Lab	BOD	DO Meter	BKK_EN0205	3-Aug-22	3-Feb-24	18
Water Lab	BOD	Incubator	BKK_EN0305	5-Apr-23	5-Apr-24	18
Water Lab	COD	Hot Block	BKK_EN0222	25-Apr-23	25-Apr-24	12
Water Lab	COD	Spectrophotometer	BKK_EN0018	15-Sep-23	15-Sep-24	12
Water Lab	Lead	ICP-MS	BKK_EL0043	6-Apr-23	6-Oct-24	18
Water Lab	Lead	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Lead	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH1222

Page.: 1 of 2

## Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Mettler Toledo
Model :	Seven Compact S220
Serial No. :	B520948426
ID No. :	BKK_EN0072
Condition As-Received:	Used Item
Received Date :	09 September 2022
Calibration Date :	12 September 2022
Reference :	2209-0312DSC-1
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)

REVIEW BY	Sinluk P.
APPROVED BY	KL AL
NEXT CAL. DATE	12/03/24

Calibrated by : Warakorn Lerngagtrakul

Approved by :

*Malee*

Approved Signatory

- ( ☒ ) Malee Butkruea  
( ☐ ) Saithip Meangmai  
( ☐ ) Warakorn Lerngagtrakul

Issue Date : 15 September 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



Cert. No.: 22CH1222

Page.: 2 of 2

**Condition of this calibration result**

## 1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023

This certification is traceable to the International System of Unit maintained at:-

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,  
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	823320	20 June 2024
pH 6.985	CPA chem	794122	14 Feb 2023
pH 10.008	CPA chem	823323	20 June 2023

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 Fluke at pH (4,7,10)**

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement ( ±mV )	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: B520948426	4.000	177.48	177.4	4.000	0.058	2.00
	7.000	0.00	0.0	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading ( mV )	Uncertainty of pH measurement ( ± )	Coverage factor <i>k</i>
pH Electrode S/N.: PCE-86-EX1001	4.008	3.999	153.9	0.0055	2.09
	6.985	7.017	-13.7	0.0084	2.00
	10.008	9.996	-179.0	0.0078	2.06

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

-oOo-

Mahu.

a 1126274



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CG3154

Page.: 1 of 2

## Certificate of Calibration

Equipment :	Burette
Capacity :	50 mL
Serial No. :	-
ID. No. :	BKK_EN0171
Manufacturer :	Witeg
Made in :	Germany
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. 104 Phatthanakan 40, Phatthanakan Rd. Khwaeng Phatthanakan, Khet Suan Luang Bangkok 10250 Thailand
Ambient Temperature :	(20 ± 2.5) °C
Relative Humidity :	(50 ± 10) %
Barometric Pressure :	759 mmHg
Calibration Procedure :	ASTM E 542 - 01
Calibrated by :	Panward Pramklam

REVIEW BY	<i>Sin'luk P.</i>
APPROVED BY	<i>KLAL</i>
NEXT CAL. DATE	<i>29/03/2024</i>

Approved by :

Approved Signatory

- ( ) Pornthippa Tameyakul  
( ) Malee Butkruea  
(☒) Ponpan Paipim  
( ) Srisuda Khamtha

Issue Date :

31 August 2022

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.

A 0044607



Equipment : Burette  
Received Date : 26 August 2022  
Condition As-Received : Used Item  
Calibration Date : 30 August 2022  
Reference : 2208-0918DSC-2

Cert.No.: 22CG3154

Page.: 2 of 2

**Condition of this result of calibration**

1. Reference Standard Instruments :

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID. No.</u>	<u>Certificate No.</u>	<u>Traceability</u>	<u>Due date</u>
1) Balance	AE200S	N03679	140RC001	21MM429	NIMT	22 Sep 2022
2) Thermo-Hygrograph	THDX-CE	00016540	140EC001	22H1243	NIST,NIMT	09 June 2023
3) Thermometer	-	1594592	140EC010	22I181	NIMT	10 Feb 2023

This certification is traceable to SI Unit

2. The certificate is valid only to the item calibrated on date and place of calibration.  
3. True value is converted to true volume at the standard temperature of 20 °C

**Calibration result :**

<b>Nominal capacity ( mL )</b>	<b>Reading ( mL )</b>	<b>Uncertainty ( ± mL )</b>	<b>k Factor</b>
50	49.9959	0.010	2.00

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

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

-o0o-

**a 1123908**



# Metrological Center

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.co.th



Certificate No. T221644

Page 1 of 4

## Certificate of Calibration

Equipment : Chamber ( Cold Room )

Manufacturer : KOLDTECH

Model : KM 320

Serial No. : TBN-1012061/05

Customer Code : BKK\_EN0167

ID No. : T2463A3

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250


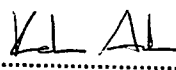
Customer Location : Environmental Laboratory

Date of Receipt : 27 June 2022

Calibrated By : Sujjar Naknakred ( Site Calibration Manager )

Approved By :  / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 04 JUL 2022

REVIEW BY	
APPROVED BY	
NEXT CAL. DATE	30/12/23

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

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

Certificate No. T221644

Page 2 of 4

## Calibration Report

**Equipment** : Chamber ( Cold Room )  
**Date of Calibration** : 30 June - 1 July 2022  
**Environment** : Temperature : 18.9-23.7 °C  
Line Voltage : 222.9-226.5 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 ( based on ASTM E145-94 ( Reapproved 2001) and AS2853-1986 ).  
All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T210009	30 July 2022
TC	TYPE T	TN171-TN180	T210009	30 July 2022
DATA LOGGER	34970A	T149	T210009	30 July 2022

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 3 Hour - Minute At 3 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

5. Adjustment :

( ) without adjustment

( X ) after adjustment

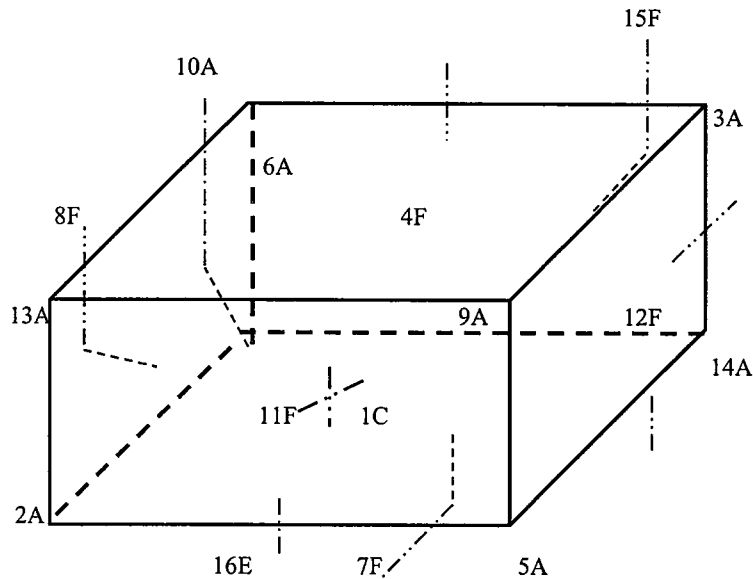
Approved By. 



Certificate No. T221644

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## Calibration Report



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

1C	=	TN161
2A	=	TN162
3A	=	TN163
4F	=	TN164
5A	=	TN165
6A	=	TN166
7F	=	TN167
8F	=	TN168
9A	=	TN169
10A	=	TN170

11F	=	TN171
12F	=	TN172
13A	=	TN173
14A	=	TN174
15F	=	TN175
16E	=	TN176

Approved By. 

Certificate No. T221644

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## Calibration Report

**Measurement Results:**

Average Standard Reading at each position (°C)										
Calibration Point	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170
3	2.71	2.82	2.75	2.89	2.95	3.68	3.02	2.96	3.03	2.85
	TN171	TN172	TN173	TN174	TN175	TN176				
	2.97	3.02	2.89	3.04	2.97	3.33				

Chamber ( Cold Room )			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage
	Min , Max	Average					Factor <i>k</i>
3.0	2.9 , 4.0	3.2	2.99	1.05	1.30	1.66	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 % .

Approved By. 

**Sartorius (Thailand) Co., Ltd.**

129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310

Tel: +66 2643 8361-6, e-mail: service.thailand@sartorius.com

**SARTORIUS**

# Certificate

## of Calibration

REVIEW BY	<u>Sirilut P.</u>
APPROVED BY	<u>LL AL</u>
NEXT CAL. DATE	<u>8/2/24</u>

Model Number : MSE224S-100-DUDescription : Analytical BalanceSerial Number : 26207042ID No. : BKK\_EN0002Manufacturer : SartoriusCertificate No. : 23BCI0072Issued Date : Monday, February 13, 2023Reference No. : 203245Page No. : 1 of 2Customer Name : ALS Laboratory Group (Thailand)Co., Ltd.104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250.Calibrated Place : Balance RoomCalibrated By : Mr. Chonchai InthanaCalibration Date : Wednesday, February 08, 2023**Calibration**Procedure No. : This calibration was conducted by  
Using in-house calibration procedure number (WI-003)Based on UKAS LAB 14 : 2019**Metrological data :**Capacity : 220 g Readability : 0.0001 g**Ambients Conditions:**Temperature : 23.2 °C ± 5.0 °CHumidity : 60.0 % RH ± 10.0 % RHPressure :                      ±                     **Reasons for calibration**☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ MaintenanceEquipment Condition: ☒ Good Operate ☐ Fair**Measurement Method****UKAS Publication Ref :Lab 14**

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

**Traceability:**

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2, YCS011-522-00	SPC-RT	C02212565	14-Sep-2023
MHB-382SD	Humidity/Barometer/Temp Lutron MHB-382SD	DKSH	C19220444	5-Sep-2023

This certificate relate and apply this equipment only.

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

SOP FM 33 03 February 2022

  
Mr. Chonchai Inthana (Technical Manager)S  
T  
A  
M  
P

# Certificate of Calibration

Model Number : MSE224S-100-DU  
 Description : Analytical Balance  
 Serial Number : 26207042  
 ID No. : BKK\_EN0002  
 Manufacturer : Sartorius

Certificate No. : 23BCI0072  
 Issued Date : Monday, February 13, 2023  
 Reference No. : 203245  
 Page No. : 2 of 2

## Calibration Results : Without Adjustment

### Repeatability

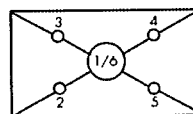
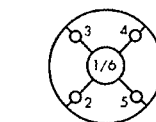
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.

Nominal Value : (Low Load)	20.0000	200.0000
20 g	20.0000	199.9999
Tolerance	20.0000	200.0000
0.0001 g	20.0000	199.9999
	20.0001	200.0000
	20.0000	200.0000
Nominal Value : (High Load)	20.0000	199.9999
200 g	20.0000	199.9999
Tolerance	20.0000	200.0000
0.0001 g	20.0000	199.9999
	20.0001	199.9999
Standard Deviation	0.00004	0.00005

### Eccentricity (Off-center loading error)

The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).

Nominal value : 50 g  
 Tolerance 0.0004 g



Difference	
1	—
2	-0.0001
3	0.0000
4	0.0001
5	0.0000
6	—

### Linearity

The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolerance 0.0002 g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00014
0.1	0.1000	0.1000	0.0000	0.00014
1	1.0000	1.0000	0.0000	0.00014
2	2.0000	2.0000	0.0000	0.00014
5	5.0000	5.0000	0.0000	0.00014
10	10.0000	10.0000	0.0000	0.00014
20	20.0000	20.0000	0.0000	0.00014
50	50.0000	50.0000	0.0000	0.00015
100	100.0000	100.0000	0.0000	0.00019
200	200.0000	199.9999	-0.0001	0.00030

End of Report.



# Metrological Center

## SCI ECO Services Company Limited

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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. T231303

Page 1 of 3

## Certificate of Calibration

Equipment : Liquid Bath ( Water )

Manufacturer : MEMMERT

Model : WNB29

Serial No. : L611.0135

Customer Code : BKK\_EN0148

ID No. : T6455A4

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

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

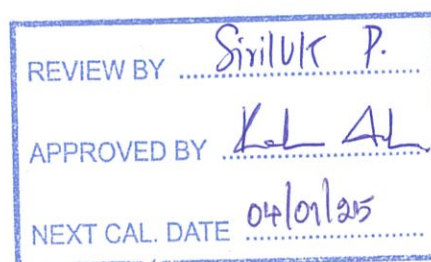
Customer Location : ORGANIC PREPARATION LAB

Date of Receipt : 27 June 2023

Calibrated By : Sujjar Naknakred ( Site Calibration Manager )

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

Date of Issue : 11 JUL 2023



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

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

Certificate No. T231303

Page 2 of 3

## Calibration Report

**Equipment** : Liquid Bath ( Water )  
**Date of Calibration** : 4 July 2023  
**Environment** : Temperature : 22.2-22.5 °C  
Line Voltage : 221.6-224.8 V  
Relative Humidity : 55 - 65 %RH

### Condition of this results of calibration :

1. This equipment was calibrated by insert five resistance thermometer detectors into its water bath , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T36 ( based on ASTM E715-80 ( Reapproved 2001 ) ).

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

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 OHM	M18 (CH1,CH6-CH7,CH9-CH10)	T230545	10 April 2024
DATA LOGGER	34970A	T149	T230545	10 April 2024

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant 3 Hour 45 Minute At 60 °C

5. Adjustment :

( X ) without adjustment

( ) after adjustment

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

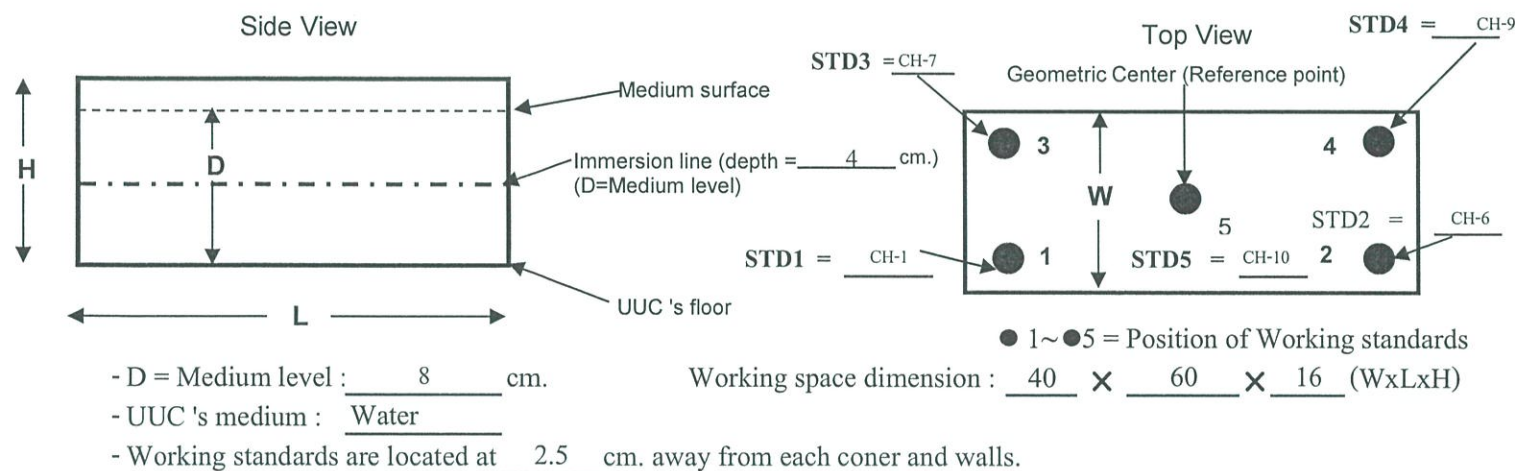




Certificate No. T231303

Page 3 of 3

## Calibration Report



### Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)				
	CH-1	CH-6	CH-7	CH-9	CH-10
60	60.03	60.06	60.24	60.11	60.18
85	84.79	84.83	85.42	85.05	85.20
95	93.71	93.83	94.62	94.15	94.42

Liquid Bath ( Water )			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (±°C)	Uncertainty (±°C)	Coverage Factor <i>k</i>
	Min , Max	Average					
61.0	60.9 , 61.1	61.0	60.12	0.13	0.19	0.29	2.04
86.0	85.8 , 86.2	86.0	85.06	0.19	0.47	0.44	2.17
95.0	94.6 , 95	94.9	94.15	0.32	0.65	0.55	2.13

\* 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 



# Metrological Center

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. T222502

Page 1 of 4

## Certificate of Calibration

Equipment : Chamber ( Oven )

Manufacturer : Memmert

Model : UF 450

Serial No. : B7170531

Customer Code : BKK\_EN0273

ID No. : T8042A4

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Oven Room

Date of Receipt : 23 November 2022

Calibrated By : Sujjar Naknakred ( Site Calibration Manager )

Approved By :  /Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 09 DEC 2022

REVIEW BY	Sinluk P.
APPROVED BY	KL AL
NEXT CAL. DATE	29/05/24

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

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



Certificate No. T222502

Page 2 of 4

## Calibration Report

**Equipment** : Chamber ( Oven )  
**Date of Calibration** : 29 November 2022  
**Environment** : Temperature : 29.1-29.6 °C  
Line Voltage : 221.3-223.2 V  
Relative Humidity : 55 - 65 %RH

### Condition of this results of calibration :

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

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	27-(CH1-10)	T210004	30 December 2022
TC	TYPE T	TN261-TN270	T210010	30 December 2022
DATA LOGGER	34970A	T149	T210004	30 December 2022

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant 1 Hour 49 Minute At 104 °C  
Fresh Air Damper ☒ Open ☐ Min ☐ Medium ☒ Max  
☐ Close  
☐ Not Available

5. Adjustment :

( ) without adjustment

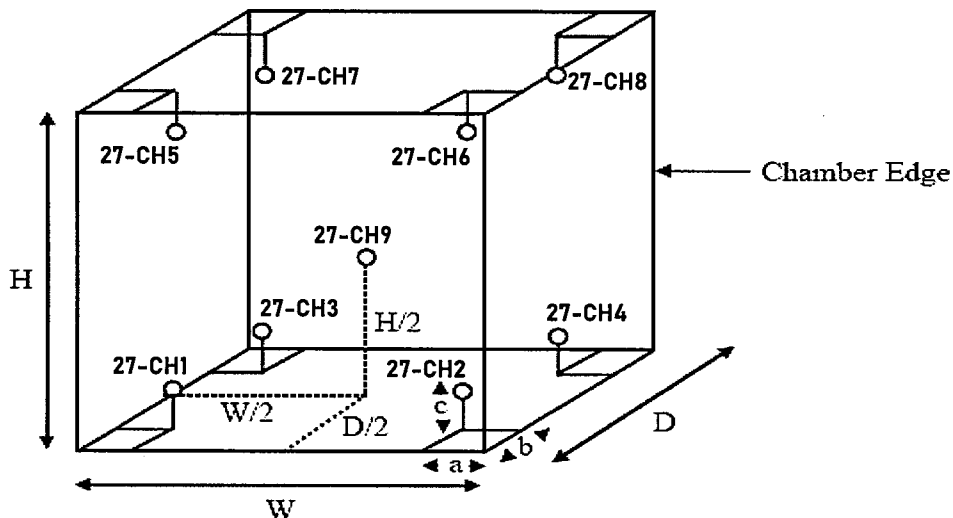
( X ) after adjustment

Approved By. Bm Loi

Certificate No. T222502

Page 3 of 4

## Calibration Report



**Remark :**

Internal Dimensions of Chamber : W (Width) = 104 cm. , H (Height) = 72 cm. and D (Depth) = 60 cm.

Size of Installed Standard sensor number 27-CH1 to number 27-CH8 : a = 5 cm. ,b = 5 cm. and c = 5 cm.

Size of Installed Standard sensor number 27-CH9 : W/2 = 104 cm./2 , H/2 = 72 cm./2 and D/2 = 60cm./2

**Measurement Results**

Average Standard Reading at each position ( °C )									
Calibration Point	27-CH1	27-CH2	27-CH3	27-CH4	27-CH5	27-CH6	27-CH7	27-CH8	27-CH9
104	104.07	103.60	103.45	104.02	104.47	103.57	104.59	103.78	104.18


Chamber ( Oven )			Temperature Distribution				
Setting ( °C )	Reading ( °C )		Average ( °C )	Stability ( ± °C )	Uniformity ( °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
	Min , Max	Average					
104.0	-	104.0	103.97	0.07	0.70	0.42	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.

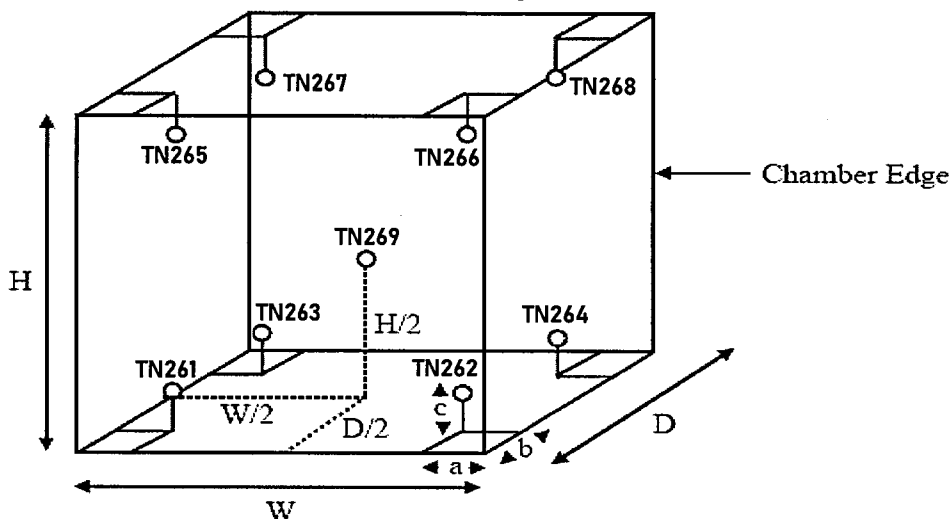
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By. 

Certificate No. T222502

Page 4 of 4

## Calibration Report



**Remark :**

Internal Dimensions of Chamber : W (Width) = 104 cm. , H (Height) = 72 cm. and D (Depth) = 60 cm.

Size of Installed Standard sensor number TN261 to number TN268 : a = 5 cm. ,b = 5 cm. and c = 5 cm.

Size of Installed Standard sensor number TN269 : W/2 = 104 cm./2 , H/2 = 72 cm./2 and D/2 = 60cm./2

**Measurement Results**

Calibration Point	Average Standard Reading at each position ( ° C )								
	TN261	TN262	TN263	TN264	TN265	TN266	TN267	TN268	TN269
180	179.14	179.17	179.65	179.26	180.41	179.64	181.18	180.99	180.36

Chamber ( Oven )			Temperature Distribution				
Setting ( ° C )	Reading ( ° C )		Average ( ° C )	Stability ( ± ° C )	Uniformity ( ° C )	Uncertainty ( ± ° C )	Coverage Factor <i>k</i>
	Min , Max	Average					
180.0	-	180.0	179.98	0.38	1.78	1.10	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 % .

Approved By. 



**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)**  
**CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES**

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

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

**Cert.No.:** 22TW178

**Page.:** 1 of 2

## Certificate of Testing

**Equipment :** DO Meter  
**Manufacturer :** YSI  
**Model :** 5100  
**Serial No. :** 15L103204  
**ID No. :** BKK\_EN0205  
**Received Date :** 02 August 2022  
**Test Date :** 03 August 2022  
**Reference :** 2208-0060DSC-1

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

**Laboratory Condition :** Temperature (  $25 \pm 5$  ) °C  
Humidity (  $50 \pm 20$  ) %  
**Test Procedure :** In - house method : CP-CH9  
by Comparison Technique with Azide Modification Method

**Tested by :** Walalak Sirithean

**Approved by :**

*Malee*

Approved Signatory

- ( ☒ ) Malee Butkruea  
( ☐ ) Saithip Meangmai  
( ☐ ) Warakorn Lerngagtrakul

**Issue Date :** 4 August 2022

REVIEW BY	<i>Siriluk P.</i>
APPROVED BY	<i>KL AL</i>
NEXT CAL. DATE	<i>03/02/24</i>



Cert.No.: 22TW178

Page.: 2 of 2

**Condition of this result of calibration**

1. Reference Standard Instruments :

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

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Burette	-	130BU10	21CG1389	25 Mar 2023
2) Balance	1126143764	140RC004	21MM430	21 Sep 2022

2. Standard Material :-

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

**Result :** Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 17A100064

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.06	8.07	0.0045

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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*Maler .*

a 1119718



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22LM107

Page.: 1 of 2

## Certificate of Calibration

**Equipment :** DO Meter with Sensor

**Manufacturer :** YSI

**Model :** 5100

**Serial No. :** 15L103204

**ID No. :** BKK\_EN0205

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

**Location :** TPA On Site Calibration Laboratory

**Received Order :** 2 August 2022

**Calibrated Date :** 4 August 2022

**Ambient Temperature :** ( 26 ± 10 ) °C

**Relative Humidity :** ( 50 ± 30 ) %

**AC Line Voltage :** ( 220 ± 22 ) V

**Calibrated by :** Man Pattanapongpaiboon

**Approved by :**

*Malee*

Approved Signatory

- ( ) Pornthippa Tameyakul  
(✓) Malee Butkruea  
( ) Suwit Imjai

**Issue Date :** 9 August 2022

**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.

A 0044131



Equipment : DO Meter with Sensor  
Condition As-Received : Used Item  
Reference : 2208-0060DSC-2

Cert. No.: 22LM107

Page.: 2 of 2

**Procedure Used :-**

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

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Digital Thermometer	1502A	A52847	21I1144	20 Oct 2022

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.

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

**Function :** Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 18C100772

<u>Calibration Point</u> ( °C )	<u>Immersion Depth</u> ( mm )	<u>Standard Temperature</u> ( °C )	<u>UUC* Reading</u> ( °C )	<u>Error</u> ( °C )	<u>Uncertainty</u> ( ± °C )	<u>Coverage Factor</u> <i>k</i>
20.00	60	20.002	19.93	-0.072	0.15	2.00

**UUC\* :** Unit Under Calibration

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

-o0o-

*Mah.*

**a 1120698**



# Metrological Center

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. T230683

Page 1 of 4

## Certificate of Calibration

**Equipment** : Chamber ( Incubator )

**Manufacturer** : MEMMERT

**Model** : ICP 750

**Serial No.** : F818.0075

**Customer Code** : BKK\_EN0305

**ID No.** : T9571A4

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

**Customer Location** : Wet Chemistry Lab 2

**Date of Receipt** : 30 March 2023

**Calibrated By** : Sujjar Naknakred ( Site Calibration Manager )

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

**Date of Issue** : 10 APR 2023

REVIEW BY	Sinluk P.
APPROVED BY	KL AL
NEXT CAL. DATE	05/04/24

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

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



Certificate No. T230683

Page 2 of 4

## Calibration Report

**Equipment** : Chamber ( Incubator )  
**Date of Calibration** : 5 April 2023 ( Finished Time 4:30 PM )  
**Environment** : Temperature 22.9-28.6 °C  
Line Voltage 221.7-225.5 V

### Condition of this results of test. :

1. This instrument was calibrated by insert 12 standard resistance thermometer into its chamber and test according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001 ) and AS2853-1986. )

All data show below were final values and the initial data may be obtained upon request.

The temperature scale used was based on ITS - 90.

### 2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	37-(CH1-10)	T222493	28 November 2023
RTD	100 ohm	36-(CH1-10)	T222493	28 November 2023
DATA LOGGER	34970A	T193	T222493	28 November 2023

### 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

UUC Description :

Time Constant 2 Hour 24 Minute At 20 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

### 5. Result of test :

( ) without adjustment

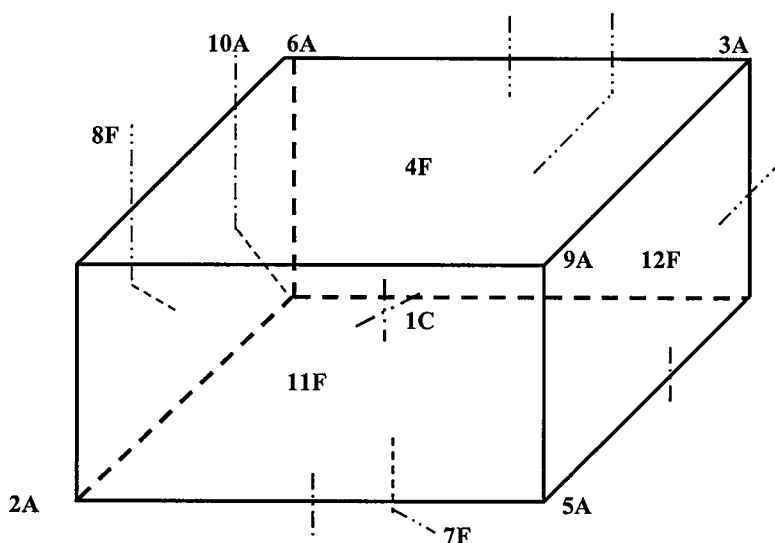
( X ) after adjustment

Approved By. 

Certificate No T230683

## Calibration Report

Page 3 of 4



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

1C	=	37CH1
2A	=	37CH2
3A	=	37CH3
4F	=	37CH4
5A	=	37CH5
6A	=	37CH6
7F	=	37CH7
8F	=	37CH8
9A	=	37CH9
10A	=	37CH10

11F	=	36CH1
12F	=	36CH2

Approved By. 

Certificate No. T230683

## Calibration Report

Page 4 of 4

### Measurement Results

Average Standard Reading at each position (°C)										
Calibration Point	37CH1	37CH2	37CH3	37CH4	37CH5	37CH6	37CH7	37CH8	37CH9	37CH10
20.0	20.32	20.28	20.17	20.22	20.22	20.04	20.17	19.74	20.31	19.93
	36CH1	36CH2								
	20.14	20.20								
Calibration Point	37CH1	37CH2	37CH3	37CH4	37CH5	37CH6	37CH7	37CH8	37CH9	37CH10
25	25.28	25.15	25.13	25.13	25.20	25.02	25.11	24.79	25.20	25.26
	36CH1	36CH2								
	25.13	24.94								

Chamber ( Incubator )			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min , Max	Average					
20.0	19.9 , 20.1	20.0	20.02	0.09	0.54	0.38	2.00
25.0	24.9 , 25.1	25.0	25.03	0.03	0.51	0.38	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 % .

Approved By 



# 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

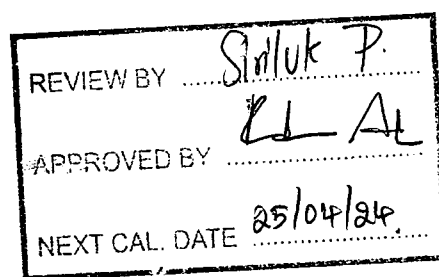
E-Mail : calibrate@scg.co.th

Certificate No. T230760

Page 1 of 5

## Certificate of Calibration

**Equipment** : HOT BLOCK  
**Manufacturer** : Environmental Express  
**Model** : B3000- 240  
**Serial No.** : 2017CODW116  
**Customer Code** : BKK\_EN0222  
**ID No.** : T6769A4  
**Customer** : ALS Laboratory Group (Thailand) Co.,Ltd.



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

**Customer Location** : Wet Chemistry Lab2

**Date of Receipt** : 21 April 2023

**Calibrated By** : Watcharasak Puttarat (Technician )

**Approved By** :  / Sujjar Naknakred (Site Calibration Manager)

**Date of Issue** : 12 MAY 2023

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. T230760

Page 2 of 5

## Calibration Report

Equipment : HOT BLOCK  
Date of Calibration : 25 April 2023  
Environment : Temperature : 22.9-24.4 °C  
Line Voltage : 222.7-227.8 V  
Relative Humidity : 55 - 65 %RH

### Condition of this results of calibration :

1. This equipment was calibrated by insert 20 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001) and AS2853-1986 ).

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

### 2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN121-TN130	T222122	5 October 2023
TC	TYPE T	TN131-TN140	T222122	5 October 2023
DATA LOGGER	34970A	T150	T222122	5 October 2023

### 3. This certificate is traceable to :

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

### 4. Condition of calibrated item : good

#### Equipment Description :

Time Constant 1 Hour 32 Minute At 150 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

### 5. Adjustment :

( X ) without adjustment

( ) after adjustment

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



**SCG**  
CEMENT-BUILDING MATERIALS

# 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

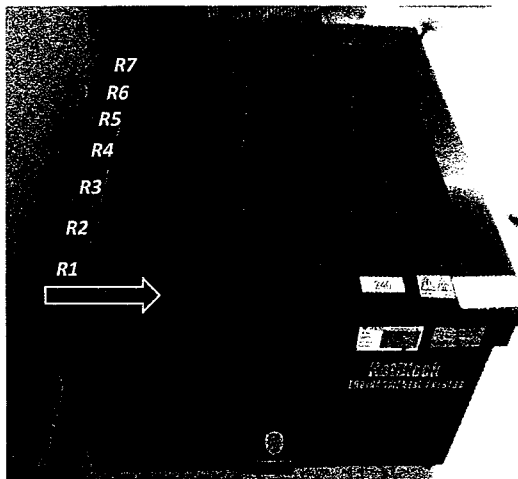
Website : www.scieco.co.th

E-Mail : calibrate@scg.co.th

Certificate No. T230760

Page 3 of 5


## Calibration Report



Row	Hole							
R7	H49	H50	H51	H52	H53	H54	H55	H56
R6	H41	H42	H43	H44	H45	H46	H47	H48
R5	H33	H34	H35	H36	H37	H38	H39	H40
R4	H25	H26	H27	H28	H29	H30	H31	H32
R3	H17	H18	H19	H20	H21	H22	H23	H24
R2	H9	H10	H11	H12	H13	H14	H15	H16
R1	H1	H2	H3	H4	H5	H6	H7	H8

H: STANDARD THERMOCOUPLE TYPE T

H1	=	TN121	H9	=	TN129	H17	=	TN137	H25	=	TN125	H33	=	TN133	H41	=	TN121	H49	=	TN129
H2	=	TN122	H10	=	TN130	H18	=	TN138	H26	=	TN126	H34	=	TN134	H42	=	TN122	H50	=	TN130
H3	=	TN123	H11	=	TN131	H19	=	TN139	H27	=	TN127	H35	=	TN135	H43	=	TN123	H51	=	TN131
H4	=	TN124	H12	=	TN132	H20	=	TN140	H28	=	TN128	H36	=	TN136	H44	=	TN124	H52	=	TN132
H5	=	TN125	H13	=	TN133	H21	=	TN121	H29	=	TN129	H37	=	TN137	H45	=	TN125	H53	=	TN133
H6	=	TN126	H14	=	TN134	H22	=	TN122	H30	=	TN130	H38	=	TN138	H46	=	TN126	H54	=	TN134
H7	=	TN127	H15	=	TN135	H23	=	TN123	H31	=	TN131	H39	=	TN139	H47	=	TN127	H55	=	TN135
H8	=	TN128	H16	=	TN136	H24	=	TN124	H32	=	TN132	H40	=	TN140	H48	=	TN128	H56	=	TN136

Approved By. 



**SCG**  
CEMENT-BUILDING MATERIALS

# 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. T230760

Page 4 of 5

## Calibration Report

### Measurement Results

			Average Standard Reading at each position ( ° C )									
Calibration Point			TN121	TN122	TN123	TN124	TN125	TN126	TN127	TN128	TN129	TN130
Point	Setting	Max	149.31	149.49	149.73	148.49	149.26	149.81	149.42	148.86	148.78	149.19
150	150.0	Min	149.14	149.31	149.54	148.36	149.08	149.65	149.22	148.65	149.07	149.07
		Average	149.23	149.40	149.64	148.43	149.16	149.73	149.33	148.76	148.71	149.13
			TN131	TN132	TN133	TN134	TN135	TN136	TN137	TN138	TN139	TN140
		Max	149.90	150.18	150.18	149.16	148.89	149.72	149.28	149.50	150.01	149.32
		Min	149.78	150.06	149.69	149.03	148.76	149.49	149.12	149.37	149.90	149.23
		Average	149.84	150.12	149.76	149.09	148.81	149.62	149.19	149.43	149.95	149.27
			TN121	TN122	TN123	TN124	TN125	TN136	TN127	TN128	TN129	TN130
		Max	149.88	149.14	149.20	150.02	148.75	149.57	149.21	149.18	150.13	148.91
		Min	149.67	148.94	148.98	149.83	148.58	149.43	149.06	149.01	149.91	148.72
		Average	149.78	149.05	149.11	149.94	148.67	149.51	149.13	149.10	150.03	148.83
			TN131	TN132	TN133	TN134	TN135	TN136	TN137	TN138	TN139	TN140
		Max	149.42	149.52	149.13	148.94	148.84	150.16	149.42	149.54	149.66	150.08
		Min	149.27	149.36	148.99	148.81	148.70	149.99	149.27	149.39	149.52	149.97
		Average	149.36	149.45	149.06	148.88	148.76	150.08	149.36	149.48	149.60	150.03
			TN121	TN122	TN123	TN124	TN125	TN126	TN127	TN128	TN129	TN130
		Max	149.21	149.16	149.50	148.68	148.58	149.81	149.06	150.40	148.46	149.24
		Min	149.03	148.93	149.27	148.48	148.42	149.62	148.78	150.26	148.14	149.04
		Average	149.12	149.04	149.39	148.57	148.51	149.72	148.93	150.33	148.29	149.14
			TN131	TN132	TN133	TN134	TN135	TN136				
		Max	148.79	148.23	149.03	149.09	148.46	149.25				
		Min	148.49	147.98	148.88	148.94	148.29	149.12				
		Average	148.61	148.06	148.94	149.02	148.35	149.19				

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



# 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](http://www.scieco.co.th)

E-Mail : [calibrate@scg.co.th](mailto:calibrate@scg.co.th)

Certificate No. T230760

Page 5 of 5

## Calibration Report

### Measurement Results

HOT BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability ( $\pm$ °C)	Uncertainty ( $\pm$ °C)
	Min , Max	Average		
150.0	150 , 150.1	150.0	0.20	0.82

The calibration result apply only the above calibrated item.

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

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

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



# Certificate of Calibration

Number of Page(s) 1 of 3

**Certificate No.** BSCC-UV-307/22  
**Equipment** UV/Vis Spectrophotometer  
**Model** UV-1800  
**Manufacturer** Shimadzu  
**Serial No.** A11454908533CD  
**ID No.** BKK\_EN0018  
**Date of receipt** 16 September 2022  
**Date of calibration** 16 September 2022  
**Date of issue** 23 September 2022

REVIEW BY *Shiruk P.*  
APPROVED BY *Kw An*  
16/9/23  
NEXT CAL. DATE *23/9/22*

**Customer name** ALS Laboratory Group (Thailand) Co., Ltd.

**Address** 104 Soi Phatthanakan 40, Phatthanakan Road, Phatthanakan, Suan Luang, Bangkok 10250

**Temperature** (22.1-23.3) °C (On site)

**Humidity** (58.8-63.2) %RH (On site)

**Equipment condition** Good Operation

**Calibration Location** Organic Prep

**Calibration Procedure** In-house method WI-UV-702-01 based on ASTM E275-01

**Traceability** Wavelength Accuracy is traceable to certificate No. 95917 and 95918  
Photometric Accuracy is traceable to certificate No. 95924 and 95937  
Stray Light is traceable to certificate No. 95908  
The above certificate are traceable to SI unit through Starna Scientific Ltd.  
(UKAS accredited calibration laboratory NO. 0659)

**Calibrated by** Mr.Waruth Janphung

Approved by



**Mr.Kanchit Choothep**  
Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
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# Certificate of Calibration

Certificate No.

BSCC-UV-307/22

Number of Page(s)

2 of 3

## Calibration Results:

### 1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty ( $\pm$ nm)
241.70	241.65	-0.05	0.18
334.02	333.92	-0.10	0.18
418.53	418.46	-0.07	0.18
572.99	572.96	-0.03	0.18
879.41	879.17	-0.24	0.18

### 2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ( $\pm$ A)
235	0.0000	0.0000	0.0000	0.0075
	0.7467	0.7461	-0.0006	0.0075
257	0.0000	0.0000	0.0000	0.0075
	0.8662	0.8647	-0.0015	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2904	0.2911	0.0007	0.0075
350	0.0000	0.0000	0.0000	0.0075
	0.6429	0.6426	-0.0003	0.0075

\*CNR = Customer not request

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# Certificate of Calibration

Certificate No. **BSCC-UV-307/22**

Number of Page(s)

3 of 3

## Calibration Results:

### 3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (+A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5783	0.5777	-0.0006	0.0042
	0.7628	0.7635	0.0007	0.0046
	1.0206	1.0230	0.0024	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5621	0.5618	-0.0003	0.0042
	0.7455	0.7460	0.0005	0.0048
	0.9985	1.0005	0.0020	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5227	0.5219	-0.0008	0.0042
	0.6880	0.6884	0.0004	0.0051
	0.9487	0.9503	0.0016	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5207	0.5199	-0.0008	0.0042
	0.6973	0.6971	-0.0002	0.0049
	0.9959	0.9964	0.0005	0.0042
590.0	0.0000	0.0000	0.0000	0.0042
	0.5544	0.5534	-0.0010	0.0042
	0.7253	0.7242	-0.0011	0.0050
	1.0942	1.0943	0.0001	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5616	0.5606	-0.0010	0.0042
	0.6927	0.6921	-0.0006	0.0053
	1.0881	1.0885	0.0004	0.0042

\*CNR = Customer not request

### 4. Stray Light\*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)		
	Wavelength (nm)	Transmission (%T)	Absorbance (A)
200.96±0.11nm	200.30	0.9505	2.0229

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

\*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

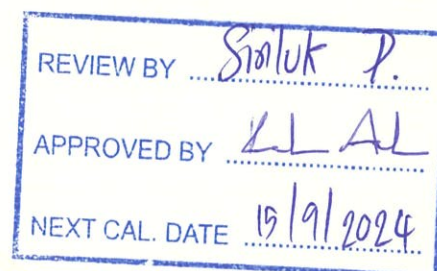
**\*\*\*End of Certificate\*\*\***

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# Certificate of Calibration

Number of Page(s) 1 of 3

**Certificate No.** BSCC-UV-367/23  
**Equipment** UV/Vis Spectrophotometer  
**Model** UV-1800  
**Manufacturer** Shimadzu  
**Serial No.** A11454908533CD  
**ID No.** BKK\_EN0018  
**Date of receipt** 15 September 2023  
**Date of calibration** 15 September 2023  
**Date of issue** 22 September 2023



**Customer name** ALS Laboratory Group (Thailand) Co., Ltd.

**Address** 104 Soi Phattanakan 40, Phattanakan Road, Phattanakan, Suan Luang, Bangkok 10250

**Temperature** (23.4 - 24.7) °C (On site)  
**Humidity** (55.5 - 61.2) %RH (On site)

**Equipment condition** Good Operation

**Calibration Location** Organic Prep

**Calibration Procedure** In-house method WI-UV-702-01 based on ASTM E275-01

**Traceability** Wavelength Accuracy is traceable to certificate No. 95917 and 95918  
Photometric Accuracy is traceable to certificate No. 95937 and 95924  
Stray Light is traceable to certificate No. 95908  
The above certificate are traceable to SI unit through Starna Scientific Ltd.  
(UKAS accredited calibration laboratory NO. 0659)

**Calibrated by** Mr.Wanchana Janloey

Approved by



**Mr.Kanchit Choothep**  
Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
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# Certificate of Calibration

Certificate No.

BSCC-UV-367/23

Number of Page(s)

2 of 3

## Calibration Results:

### 1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty ( $\pm$ nm)
241.70	241.67	-0.03	0.18
334.02	334.03	0.01	0.18
418.53	418.59	0.06	0.18
572.99	573.14	0.15	0.18
879.41	879.21	-0.20	0.18

### 2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ( $\pm$ A)
235	0.0000	0.0000	0.0000	0.0075
	0.7467	0.7460	-0.0007	0.0075
257	0.0000	0.0000	0.0000	0.0075
	0.8662	0.8646	-0.0016	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2904	0.2908	0.0004	0.0075
350	0.0000	0.0001	0.0001	0.0075
	0.6429	0.6415	-0.0014	0.0075

\*CNR = Customer not request

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# Certificate of Calibration

Certificate No. **BSCC-UV-367/23**

Number of Page(s)

3 of 3

## Calibration Results:

### 3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ( $\pm A$ )
420.0	0.0000	0.0000	0.0000	0.0042
	0.5783	0.5793	0.0010	0.0042
	0.7628	0.7624	-0.0004	0.0042
	1.0206	1.0216	0.0010	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5621	0.5625	0.0004	0.0042
	0.7455	0.7452	-0.0003	0.0042
	0.9985	0.9989	0.0004	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5227	0.5229	0.0002	0.0042
	0.6880	0.6873	-0.0007	0.0042
	0.9487	0.9486	-0.0001	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5207	0.5211	0.0004	0.0042
	0.6973	0.6960	-0.0013	0.0042
	0.9959	0.9944	-0.0015	0.0042
590.0	0.0000	0.0000	0.0000	0.0042
	0.5544	0.5538	-0.0006	0.0042
	0.7253	0.7236	-0.0017	0.0042
	1.0942	1.0925	-0.0017	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5616	0.5612	-0.0004	0.0042
	0.6927	0.6909	-0.0018	0.0042
	1.0881	1.0866	-0.0015	0.0042

\*CNR = Customer not request

### 4. Stray Light\*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)		
	Wavelength (nm)	Transmission (%T)	Absorbance (A)
200.96 $\pm$ 0.11nm	200.55	0.9770	2.0104

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

\*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

**\*\*\*End of Certificate\*\*\***

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## Agilent Technologies

Agilent Technologies (Thailand) Limited  
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968 RAMA 4 ROAD, SILOM, BANGRAK  
Bangkok 10500 Thailand

Tel. +662 637 6363  
Fax: +662 632 4334  
Email: [ccc-smt@agilent.com](mailto:ccc-smt@agilent.com)  
Website: [www.agilent.com/chem](http://www.agilent.com/chem)

### Customer Contact:

ALS Laboratory Group (Thailand) Co  
Ltd  
Head Office  
104 Phatthanakan 40 Phatthanakan Rd  
Khwaeng Phatthanakan Khet Suan  
TAX ID : 0105540004859  
[bounced-imchom.chanattagarn@alsglobal.com](mailto:bounced-imchom.chanattagarn@alsglobal.com)  
227158760519

### Invoice To:

ALS Laboratory Group (Thailand) Co  
Ltd  
Head Office  
104 Phatthanakan 40 Phatthanakan Rd  
Khwaeng Phatthanakan Khet Suan

### Delivery Site:

ALS Laboratory Group (Thailand) Co  
Ltd  
Head Office  
104 Phatthanakan 40 Phatthanakan Rd  
Khwaeng Phatthanakan Khet Suan

### Location:

Room  
Bldg  
Lab  
Dept

## SERVICE REPORT

<b>Customer Purchase Order Number:</b>	<b>Customer Number:</b> 70371013
<b>Service Request:</b>	<b>Service Request Date:</b>
<b>Service Order:</b> 6006068207	<b>Service Confirmation:</b> 6904837529

REVIEW BY	Anchalee K.
APPROVED BY	Santana N.
NEXT CAL. DATE	06/10/2024

### Direct Inquiries to:

Contact Name: Customer Contact Center  
Contact E-mail: [ccc-smt@agilent.com](mailto:ccc-smt@agilent.com)  
Contact Telephone: +662 637 6363  
Contact Fax: +662 632 4334

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U Chu Liang Bldg. 22/F Unit A,D  
968 Rama 4 Road, Silom, Bangrak,  
Bangkok 10500 Thailand  
Tax ID : 0105542068218

Citibank N.A. Bangkok Branch  
399 Interchange 21 Building, Sukhumvit Road, Klongtoey Nau  
Sub-district, Wattana District, Bangkok 10110 Thailand  
Acc. No: 012-4452-007,  
THB:Krung Thai Bank PCL  
Siam Square Br.,416/1-2 Rama I Rd.,Pathumwan, BKK 10330  
Thailand

ORIGINAL

**Service Confirmation Number:** 6904837529

**Service Confirmation Date:** 06.04.2023

**Service Instrument:**

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-IM-7900	ICPMS 7900 System			
G8410A	SPS 4 Autosampler	AU15430722	ICP MS 7900	SYS-IM-7900
G8411A	ISIS 3 for Agilent 7850/7900/8900	JP15510227	ICP MS 7900	SYS-IM-7900
G3292A	PSC 6106T Chiller	2U15A1948	ICP MS 7900	SYS-IM-7900
G8403A	Agilent 7900 ICP-MS	JP15471169	ICP MS 7900	SYS-IM-7900

**Service Items:**

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	EOQ	Enterprise Operational Qualification	1.00	Agreement Entitlement - 100 % covered	06.04.2023	06.04.2023
1010	5185-5850	ICP-MS Checkout Solutions	1.00	Agreement Entitlement - 100 % covered		

**Additional Information:**



**Service Confirmation Number:** 6904837529

**Service Confirmation Date:** 06.04.2023

**Service Information:**

**Problem Description:**

WU-S-OQ-ICP MS 7900-5001143313

**Service Provided:**

Test OQ control of instrument ICPMS = BKK\_EL0043. After done all instrument test all Pass.

**Service Overview Code:**

Reason Code: Scheduled Service

Diagnosis Code: Scheduled Service

Resolution Code: Scheduled Service

**Reported Hours:**

6.0

**Travel Hours:**

1.0

**Customer Field Service  
Representative Name:**

Panthep Kurasathain

**Customer Field Service  
Representative Signature:**



**Date:**

06 Apr 2023

**Customer Name:**

Anchalee Khamjan

**Customer Signature:**



**Date:**

06 Apr 2023

**Additional Comments:**



# Metrological Center

## SCI ECO Services Company Limited

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

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

Website : www.scieco.co.th

E-Mail : calibrate@scg.co.th

Certificate No. T220730

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 : 30 March 2022

Calibrated By : Watcharapon Sangtong (Technician )

Approved By :  / Sujjar Naknakred ( Site Calibration Manager )

Date of Issue : 12 APR 2022

REVIEW BY	Tattaporn C.
APPROVED BY	Santun.
NEXT CAL. DATE	7/10/23

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

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

Certificate No. T220730

Page 2 of 6

## Calibration Report

**Equipment** : HEATING BLOCK  
**Date of Calibration** : 7 April 2022  
**Environment** : Temperature : 21.8-23.1 °C  
Line Voltage : 221.6-226.3 V  
Relative Humidity : 55 - 65 %RH

### Condition of this results of calibration :

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

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

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN221-TN230	T210008	08 June 2022
TC	TYPE T	TN231-TN240	T210008	08 June 2022
DATA LOGGER	34970A	T149	T210008	08 June 2022

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 25 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.Kaengkhoi, Saraburi 18110

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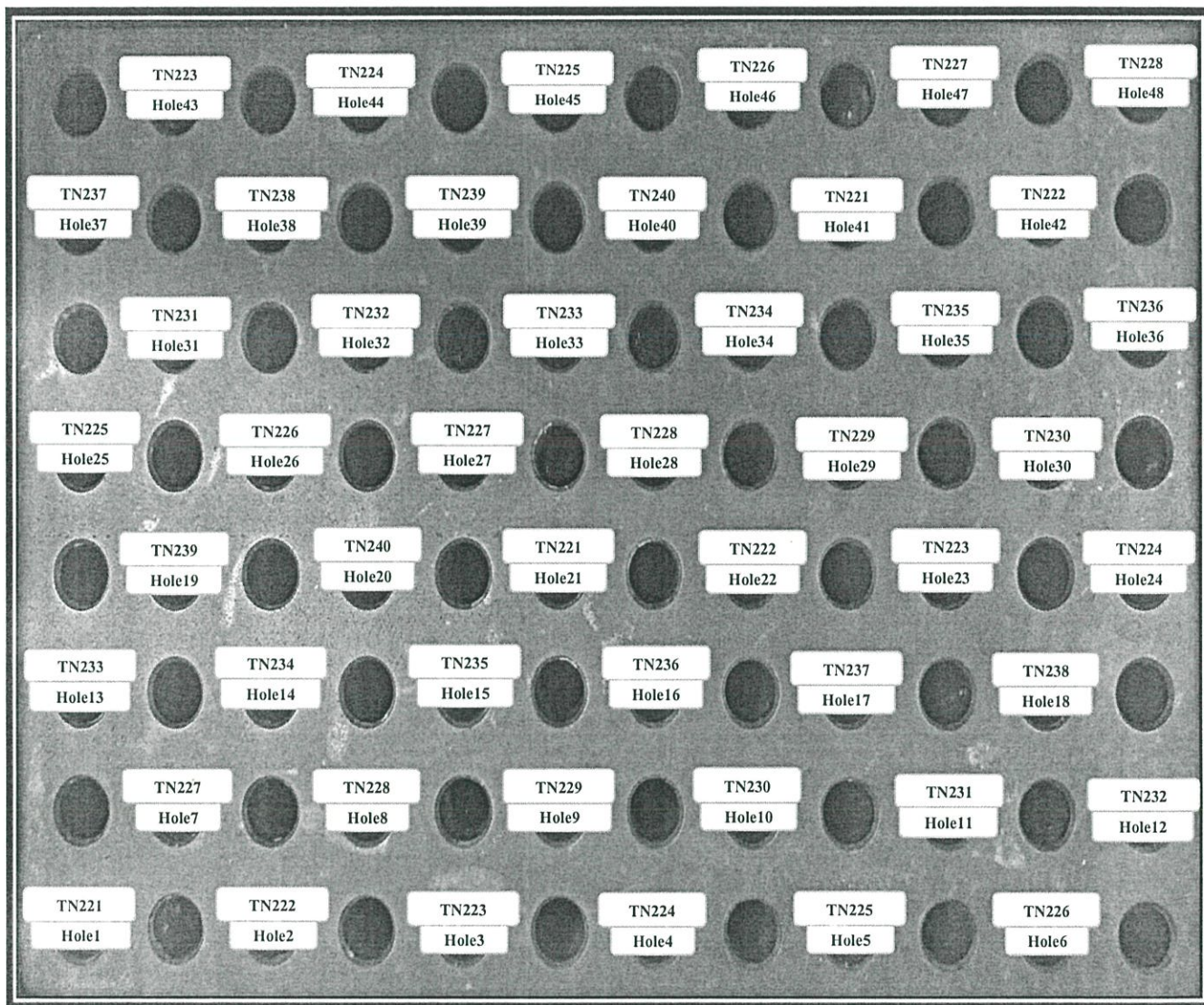
Website : [www.scieco.co.th](http://www.scieco.co.th)

E-Mail : [calibrate@scg.co.th](mailto:calibrate@scg.co.th)

Certificate No. T220730

Page 3 of 6

## Calibration Report



FRONT CONTROL

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



## Calibration Report

### Measurement Results

Calibration Point		Average Standard Reading at each position ( ° C )					
<b>R1 Hole1-Hole6</b>		<b>TN221</b>	<b>TN222</b>	<b>TN223</b>	<b>TN224</b>	<b>TN225</b>	<b>TN226</b>
CAL POINT	Max	93.60	93.82	94.05	94.20	94.36	94.26
95	Min	93.07	93.26	93.51	93.66	93.82	93.71
	Average	93.33	93.54	93.78	93.93	94.09	93.98
<b>R2 Hole7-Hole12</b>		<b>TN227</b>	<b>TN228</b>	<b>TN229</b>	<b>TN230</b>	<b>TN231</b>	<b>TN232</b>
	Max	94.59	94.79	94.63	94.55	94.82	95.00
	Min	94.05	94.25	94.08	93.97	94.26	94.44
	Average	94.32	94.52	94.36	94.26	94.54	94.72
<b>R3 Hole13-Hole18</b>		<b>TN233</b>	<b>TN234</b>	<b>TN235</b>	<b>TN236</b>	<b>TN237</b>	<b>TN238</b>
	Max	95.03	94.54	94.78	94.84	95.06	94.73
	Min	94.46	93.98	94.20	94.28	94.49	94.18
	Average	94.74	94.26	94.49	94.56	94.78	94.45
<b>R4 Hole19-Hole24</b>		<b>TN239</b>	<b>TN240</b>	<b>TN221</b>	<b>TN222</b>	<b>TN223</b>	<b>TN224</b>
	Max	94.89	94.82	95.73	95.85	95.73	96.10
	Min	94.33	94.26	95.51	95.62	95.51	95.85
	Average	94.61	94.54	95.62	95.73	95.62	95.97
<b>R5 Hole25-Hole30</b>		<b>TN225</b>	<b>TN226</b>	<b>TN227</b>	<b>TN228</b>	<b>TN229</b>	<b>TN230</b>
	Max	96.28	96.39	96.37	96.54	96.19	96.04
	Min	96.01	96.10	96.02	96.20	95.89	95.71
	Average	96.15	96.24	96.20	96.37	96.04	95.88
<b>R6 Hole31-Hole36</b>		<b>TN231</b>	<b>TN232</b>	<b>TN233</b>	<b>TN234</b>	<b>TN235</b>	<b>TN236</b>
	Max	96.84	96.97	97.03	96.48	96.33	95.76
	Min	96.53	96.65	96.71	96.08	95.98	95.43
	Average	96.68	96.81	96.87	96.28	96.16	95.60
<b>R7 Hole37-Hole42</b>		<b>TN237</b>	<b>TN238</b>	<b>TN239</b>	<b>TN240</b>	<b>TN221</b>	<b>TN222</b>
	Max	96.46	96.15	96.19	96.06	96.95	97.09
	Min	96.13	95.84	95.85	95.72	96.64	96.78
	Average	96.30	95.99	96.02	95.89	96.80	96.93
<b>R8 Hole43-Hole48</b>		<b>TN223</b>	<b>TN224</b>	<b>TN225</b>	<b>TN226</b>	<b>TN227</b>	<b>TN228</b>
	Max	96.91	96.58	96.13	96.19	96.34	96.19
	Min	96.55	96.21	95.80	95.87	96.03	95.88
	Average	96.73	96.40	95.96	96.03	96.18	96.03

Approved By.



## Calibration Report

### Measurement Results

Calibration Point		Average Standard Reading at each position (°C)					
<b>R1 Hole1-Hole6</b>		<b>TN221</b>	<b>TN222</b>	<b>TN223</b>	<b>TN224</b>	<b>TN225</b>	<b>TN226</b>
CAL POINT	Max	104.47	104.65	104.79	105.31	105.47	105.46
105	Min	104.15	104.27	104.45	104.98	105.14	105.20
	Average	104.31	104.46	104.62	105.15	105.31	105.33
<b>R2 Hole7-Hole12</b>		<b>TN227</b>	<b>TN228</b>	<b>TN229</b>	<b>TN230</b>	<b>TN231</b>	<b>TN232</b>
	Max	105.55	105.73	105.65	105.84	105.97	106.07
	Min	105.28	105.43	105.35	105.52	105.68	105.83
	Average	105.42	105.58	105.50	105.68	105.82	105.95
<b>R3 Hole13-Hole18</b>		<b>TN233</b>	<b>TN234</b>	<b>TN235</b>	<b>TN236</b>	<b>TN237</b>	<b>TN238</b>
	Max	106.14	106.06	105.81	106.05	105.81	105.87
	Min	105.85	105.81	105.55	105.80	105.53	105.64
	Average	106.00	105.94	105.68	105.92	105.67	105.75
<b>R4 Hole19-Hole24</b>		<b>TN239</b>	<b>TN240</b>	<b>TN221</b>	<b>TN222</b>	<b>TN223</b>	<b>TN224</b>
	Max	105.86	105.60	104.44	104.51	104.28	104.78
	Min	105.61	105.37	104.27	104.35	104.12	104.61
	Average	105.74	105.48	104.35	104.43	104.20	104.69
<b>R5 Hole25-Hole30</b>		<b>TN225</b>	<b>TN226</b>	<b>TN227</b>	<b>TN228</b>	<b>TN229</b>	<b>TN230</b>
	Max	104.94	104.93	104.97	105.08	104.68	104.69
	Min	104.77	104.75	104.76	104.90	104.51	104.49
	Average	104.85	104.84	104.86	104.99	104.60	104.59
<b>R6 Hole31-Hole36</b>		<b>TN231</b>	<b>TN232</b>	<b>TN233</b>	<b>TN234</b>	<b>TN235</b>	<b>TN236</b>
	Max	105.44	105.45	105.61	104.95	104.84	104.42
	Min	105.27	105.27	105.44	104.76	104.66	104.25
	Average	105.36	105.36	105.53	104.86	104.75	104.33
<b>R7 Hole37-Hole42</b>		<b>TN237</b>	<b>TN238</b>	<b>TN239</b>	<b>TN240</b>	<b>TN221</b>	<b>TN222</b>
	Max	105.17	104.70	104.59	104.51	105.22	105.53
	Min	105.00	104.53	104.41	104.35	105.04	105.37
	Average	105.08	104.62	104.50	104.43	105.13	105.45
<b>R8 Hole43-Hole48</b>		<b>TN223</b>	<b>TN224</b>	<b>TN225</b>	<b>TN226</b>	<b>TN227</b>	<b>TN228</b>
	Max	105.61	105.45	105.10	104.77	104.87	105.02
	Min	105.44	105.28	104.92	104.60	104.70	104.85
	Average	105.53	105.37	105.01	104.69	104.79	104.93

Approved By.





Certificate No. T220730

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## Calibration Report

### Measurement Results:

HEATING BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability ( $\pm$ °C)	Uncertainty ( $\pm$ °C)
	Min , Max	Average		
100.0	100.0 , 100.4	100.1	0.29	0.83
105.0	105.0 , 105.4	105.1	0.20	0.79

\* 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. 

Certificate No. T231676

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**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 : 13 September 2023****Calibrated By : Sanee Musikawan ( Site Calibration Manager )****Approved By :  / Sujjar Naknakred ( Site Calibration Manager )****Date of Issue : 26 SEP 2023**

REVIEW BY	Tattaporn C.
APPROVED BY	Saenit N.
NEXT CAL. DATE	22/03/25

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

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



Certificate No. T231676

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## Calibration Report

**Equipment** : HEATING BLOCK  
**Date of Calibration** : 22 September 2023  
**Environment** : Temperature : 21.8-23.1 °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 20 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	TN21-TN30	T230014	17 January 2024
TC	TYPE T	TN31-TN40	T230014	17 January 2024
DATA LOGGER	34970A	T151	T230014	17 January 2024

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

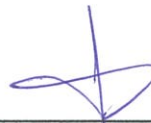
Time Constant 2 Hour 20 Minute At 95 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

5. Adjustment :

( ) without adjustment

( X ) after adjustment

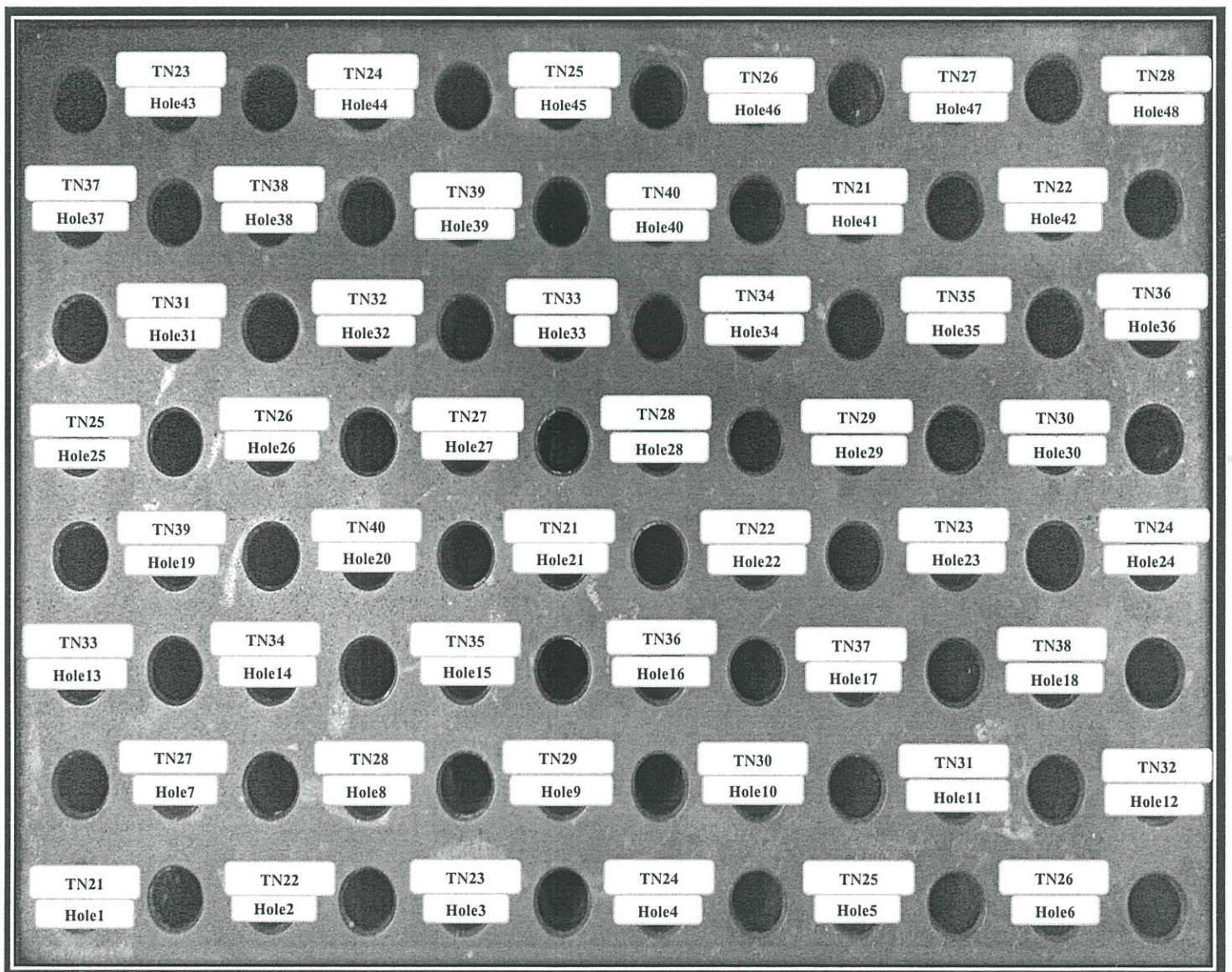
Approved By \_\_\_\_\_



Certificate No. T231676

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## Calibration Report



FRONT CONTROL

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





Certificate No T231676

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## Calibration Report

### Measurement Results

Calibration Point		Average Standard Reading at each position ( ° C )					
<b>R1 Hole1-Hole6</b>		<b>TN21</b>	<b>TN22</b>	<b>TN23</b>	<b>TN24</b>	<b>TN25</b>	<b>TN26</b>
CAL POINT	Max	95.01	94.41	95.20	95.41	94.51	95.17
95	Min	94.57	93.95	94.75	94.92	94.00	94.72
	Average	94.79	94.18	94.98	95.17	94.26	94.95
<b>R2 Hole7-Hole12</b>		<b>TN27</b>	<b>TN28</b>	<b>TN29</b>	<b>TN30</b>	<b>TN31</b>	<b>TN32</b>
	Max	95.36	95.43	95.19	95.16	95.35	94.97
	Min	94.94	94.95	94.72	94.71	94.90	94.57
	Average	95.15	95.19	94.96	94.94	95.13	94.77
<b>R3 Hole13-Hole18</b>		<b>TN33</b>	<b>TN34</b>	<b>TN35</b>	<b>TN36</b>	<b>TN37</b>	<b>TN38</b>
	Max	95.37	95.50	95.22	95.21	95.33	95.31
	Min	94.99	95.09	94.78	94.82	94.88	94.96
	Average	95.18	95.30	95.00	95.02	95.11	95.13
<b>R4 Hole19-Hole24</b>		<b>TN39</b>	<b>TN40</b>	<b>TN21</b>	<b>TN22</b>	<b>TN23</b>	<b>TN24</b>
	Max	95.59	94.42	94.52	94.24	94.63	94.67
	Min	95.21	94.06	94.13	93.88	94.28	94.27
	Average	95.40	94.24	94.33	94.06	94.45	94.47
<b>R5 Hole25-Hole30</b>		<b>TN25</b>	<b>TN26</b>	<b>TN27</b>	<b>TN28</b>	<b>TN29</b>	<b>TN30</b>
	Max	95.19	95.38	92.93	95.30	95.14	95.03
	Min	94.83	95.03	92.56	94.95	94.79	94.70
	Average	95.01	95.20	92.75	95.12	94.96	94.87
<b>R6 Hole31-Hole36</b>		<b>TN31</b>	<b>TN32</b>	<b>TN33</b>	<b>TN34</b>	<b>TN35</b>	<b>TN36</b>
	Max	94.63	94.90	94.77	94.31	94.24	93.87
	Min	94.24	94.55	94.44	93.98	93.92	93.56
	Average	94.43	94.72	94.60	94.14	94.08	93.71
<b>R7 Hole37-Hole42</b>		<b>TN37</b>	<b>TN38</b>	<b>TN39</b>	<b>TN40</b>	<b>TN21</b>	<b>TN22</b>
	Max	94.30	94.44	94.04	93.81	94.89	95.35
	Min	93.95	94.05	93.67	93.48	94.39	94.90
	Average	94.13	94.24	93.86	93.65	94.64	95.12
<b>R8 Hole43-Hole48</b>		<b>TN23</b>	<b>TN24</b>	<b>TN25</b>	<b>TN26</b>	<b>TN27</b>	<b>TN28</b>
	Max	95.99	95.63	95.28	95.29	95.45	94.87
	Min	95.57	95.15	94.82	94.84	94.99	94.48
	Average	95.78	95.39	95.05	95.07	95.22	94.68

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



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## Calibration Report

### Measurement Results

Calibration Point		Average Standard Reading at each position ( ° C )					
<b>R1 Hole1-Hole6</b>		<b>TN21</b>	<b>TN22</b>	<b>TN23</b>	<b>TN24</b>	<b>TN25</b>	<b>TN26</b>
CAL POINT	Max	105.23	104.32	105.43	105.25	104.44	105.27
105	Min	104.94	103.95	105.15	105.04	104.11	104.96
	Average	105.09	104.13	105.29	105.15	104.28	105.12
<b>R2 Hole7-Hole12</b>		<b>TN27</b>	<b>TN28</b>	<b>TN29</b>	<b>TN30</b>	<b>TN31</b>	<b>TN32</b>
	Max	105.30	105.12	105.18	105.22	105.12	105.16
	Min	105.11	104.92	104.96	105.00	104.92	104.97
	Average	105.20	105.02	105.07	105.11	105.02	105.06
<b>R3 Hole13-Hole18</b>		<b>TN33</b>	<b>TN34</b>	<b>TN35</b>	<b>TN36</b>	<b>TN37</b>	<b>TN38</b>
	Max	105.37	105.63	105.02	104.80	104.69	105.19
	Min	105.17	105.37	104.75	104.59	104.50	105.00
	Average	105.27	105.50	104.88	104.69	104.60	105.09
<b>R4 Hole19-Hole24</b>		<b>TN39</b>	<b>TN40</b>	<b>TN21</b>	<b>TN22</b>	<b>TN23</b>	<b>TN24</b>
	Max	105.31	104.43	106.41	104.71	105.63	105.82
	Min	105.08	104.22	106.15	104.41	105.37	105.56
	Average	105.19	104.33	106.28	104.56	105.50	105.69
<b>R5 Hole25-Hole30</b>		<b>TN25</b>	<b>TN26</b>	<b>TN27</b>	<b>TN28</b>	<b>TN29</b>	<b>TN30</b>
	Max	104.95	106.26	103.34	105.78	105.59	105.87
	Min	104.67	105.96	103.08	105.56	105.36	105.68
	Average	104.81	106.11	103.21	105.67	105.48	105.77
<b>R6 Hole31-Hole36</b>		<b>TN31</b>	<b>TN32</b>	<b>TN33</b>	<b>TN34</b>	<b>TN35</b>	<b>TN36</b>
	Max	104.75	104.86	104.80	105.20	104.50	104.39
	Min	104.54	104.63	104.59	105.00	104.32	104.18
	Average	104.65	104.75	104.69	105.10	104.41	104.28
<b>R7 Hole37-Hole42</b>		<b>TN37</b>	<b>TN38</b>	<b>TN39</b>	<b>TN40</b>	<b>TN21</b>	<b>TN22</b>
	Max	104.30	104.90	104.85	104.65	104.88	104.85
	Min	104.09	104.72	104.66	104.49	104.63	104.52
	Average	104.19	104.81	104.75	104.57	104.76	104.68
<b>R8 Hole43-Hole48</b>		<b>TN23</b>	<b>TN24</b>	<b>TN25</b>	<b>TN26</b>	<b>TN27</b>	<b>TN28</b>
	Max	105.71	105.85	105.39	105.61	105.42	105.19
	Min	105.45	105.61	105.14	105.27	105.18	104.94
	Average	105.58	105.73	105.27	105.44	105.30	105.07

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





Certificate No. T231676

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## Calibration Report

### Measurement Results:

HEATING BLOCK			Temperature Distribution	
Setting ( °C )	Reading ( °C )		Stability ( ± °C )	Uncertainty ( ± °C )
	Min , Max	Average		
100.0	100.3 , 100.5	100.4	0.26	0.81
107.0	107.0 , 107.1	107.1	0.19	0.78

\* 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. \_\_\_\_\_