Technology

DKSH

Performance Verification Certificate

Job No. LSPR2208846

Equipment :	AA SPECTROMETER	**Customer :**	Environment & Laboratory Co.,Ltd.
Manufacturer :	GBC Scientific	**Location :**	Laboratory
Model Type :	SavantAA	**Verification Date :**	10 October 2022
Serial No. :	A8631		

Result of Verification

Test Description	Tolerance		Reading		Result
1. EHT	< 350	V	253	V	PASS
Photometric Noise	-		-		
2. Wavelength Accuracy , Cu 324.7 nm	± 0.20	nm	324.80	nm	PASS
3. Wavelength Accuracy , Cs 852.10 nm	± 0.20	nm	852.17	nm	PASS
4. Slit Width 0.2 nm	± 0.02	nm	0.22	nm	PASS
5. Slit Width 0.5 nm	± 0.05	nm	0.52	nm	PASS
6. Slit Width 1.0 nm	± 0.10	nm	1.05	nm	PASS
7. Standard Gauze Screen 0.49 Abs	± 0.02	Abs	0.489	Abs	PASS
BC mode with gauze			0.0007	Abs	
BC mode without gauze			0.0009	Abs	
* Difference between With gauze and without gauze	< 0.02	Abs	-0.0002	Abs	PASS
8. ABS Reading 5ppm,Cu	> 0.7	Abs	0.884	Abs	PASS
9. %RSD	< 0.5	%	0.19	%	PASS

We hereby certify that instrument complies with GBC factory speccifications

***Your satisfaction is our promise* @ SPCRT**

[redacted]

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Delivering Growth – in Asia and Beyond.

Job No. LSPR2208846
☐ Service contract Basic Plan
☐ Service contract Performance Plan

DKSH
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PREVENTIVE MAINTENANCE AND PERFORMANCE VERIFICATION REPORT

ATOMIC ABSORPTION SPECTROPHOTOMETER (AAS)

Issued Date: 10/10/22

Customer :	บริษัท เอ็นไวรอนเม้นท์ แอนด์ แลบอราตอรี่ จำกัด	Manufactuer :	GBC Scientific Equipment Pty Ltd.
Address :	53/3 หมู่ 3 ถนนเรวดี ตำบลตลาดขวัญ อำเภอเมืองนนทบุรี จังหวัดนนทบุรี 11000	Model :	SavantAA
		Serial No :	A8631
Contract :	[redacted]	Location :	Laboratory

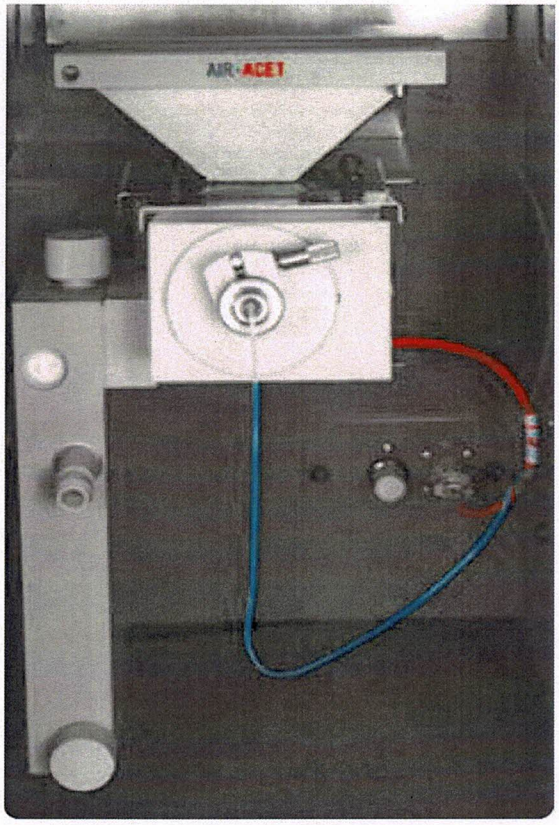
Power on switch and initial status

Instrument Ready สถานะเครื่องพร้อมใช้งาน

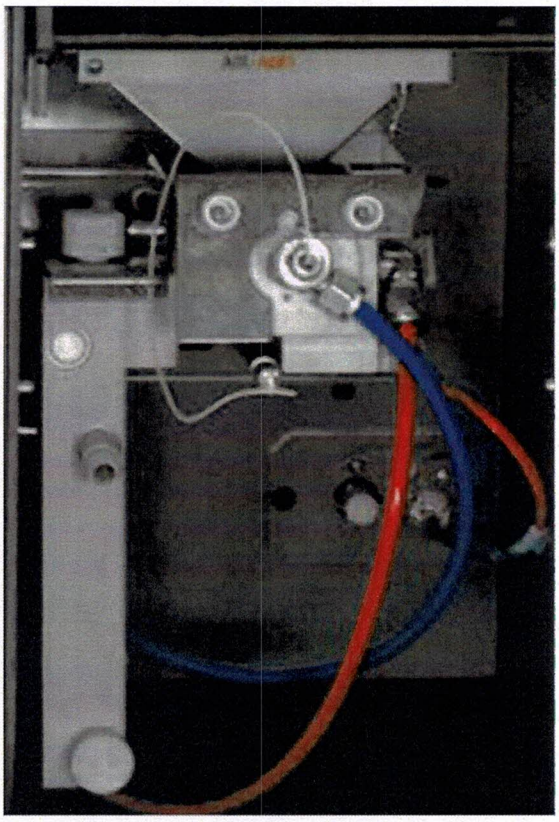
Preventive Maintenance	Pass	Fail	Remarks
Electrical Voltage			
- **Main voltage** (power supply check 220V ±10V).	☑	☐	236.5 VAC
- **Power indicator light** (Replace if faulty).	☑	☐	N/A
- **Power core** (Clean or replace as appropriate).	☑	☐	N/A
- **Fan** (Clean or replace filter element as appropriate).	☑	☐	N/A
Environment			
- **Temperature** (10 to 35 deg.C)	☑	☐	25.2 C
- **Humidity** (8 to 80%).	☑	☐	55%
- **Air Quality (No Dust)**	☑	☐	N/A
- No corrosive vapours present from laboratory sample preparation or external sources.	☑	☐	N/A
Optics			
- **Windows lens** (Clean or replace as appropriate).	☑	☐	Clean
- **Light Source** (Check operation. Replace if required).	☑	☐	Ready
- **D2 Lamp** (Check operation. Replace if required).	☑	☐	Ready
Gas system			
- **General** (Tube and Fitting /Check for leaks).	☑	☐	Ready
- **Air Zero** (Inlet pressure range 300-400 kPa).	☑	☐	4 Bar
- **Acetylene** (Inlet pressure range 55-96 kPa).	☑	☐	0.9 Bar
- **Nitrous oxide** (Inlet pressure range 300-400 kPa).	☐	☐	
Computer			
- **Operating system**	☑	☐	Windows 10
- **Software Version**	☑	☐	SavantAA3.11
- **Verify that all computer links and installed software operate correctly**	☑	☐	Ready

Spray Chamber Type

☐ ABR Spray Chamber



☑ Standard Spray Chamber



Preventive Maintenance	Pass	Fail	Remark
Flame system			
- **Burner head** (Clean the jaws using GBC Burner Cleaning Card).	☑	☐	Ready
- **Burner mount** (Check for wear. Replace the burner retaining plate if required).	☑	☐	Ready
- **Spray chamber** (Visually inspect the bead for cracks, pitting or solid deposits. Check or replace O-ring kit).	☑	☐	Ready
- **Safety interlocks**			
➢ Burner (Check for Interlocks connector)	☑	☐	Ready
➢ Spray chamber (Check for Interlocks connector)	☑	☐	Ready
- **Pressure relief bung.** (Check or replace O-ring)	☑	☐	Ready
- **Nebulizer** (Clean and check operation).	☑	☐	Ready
- **Gas connections** (Check for leaks).	☑	☐	Ready
- **Capillary tube** (Check bends and clog).	☑	☐	Ready
- **Liquid trap** (Drain / clean and replace O-ring kit).	☑	☐	Ready

Gas Flow Optimisation	Pass	Fail	Remark
- **Bleed gas lines** (Relieve pressure in the spray chamber).	☑	☐	Ready
- **Ignitor** (Ignite the flame several times to check ignition reliability. Replace the glow plug if required).	☑	☐	Ready
- **Extinguish** (Check operation).	☑	☐	Ready
- **Horizontal movement** (Check operation for STD. Spray Chamber).	☑	☐	Ready
- **Vertical movement** (Check operation for STD. Spray Chamber).	☑	☐	Ready
- **Burner Adjuster** (Check operation for ABR Spray Chamber)			
➢ Burner Angle (°C)	☐	☐	
➢ Angle Zero (mm)	☐	☐	
➢ Workhead Height (mm)	☐	☐	
➢ Workhead Centre (mm)	☐	☐	

Note:

Signature	
Customer ..... (.....)	Date :
Service Engineer [redacted]	Maintenance Date : 10/Oct/2022

Performance Verification	Specification	Actual Value	Pass	Failed	Remarks
1. **Wavelength accuracy** (optic calibration check).	Cu 324.75 nm ±0.2 nm	324.80 nm	☑	☐	N/A
	Cs 852.10 nm ±0.2 nm	852.17 nm	☑	☐	N/A
2. **Slit width accuracy** (0.2 nm ,0.5 nm,1.0 nm)	0.2 nm ±0.02 nm	0.22 nm	☑	☐	N/A
	0.5 nm ±0.05 nm	0.52 nm	☑	☐	N/A
	1.0 nm ±0.10 nm	1.05 nm	☑	☐	N/A
3. **EHT**	<350V	253 V	☑	☐	N/A
4. **Absorbance accuracy** (absorbance calibration check). ➢ Gauze 0.49 A.U.	Reading ±10% of calibrated value.	0.4891 Abs.	☑	☐	N/A
5. **Background correction** (optics alignment check). difference between measurement with and without 0.49 A.U. gauze for 10 samples.	SavantAA <1% SensAA/XplorAA <2%	BC on with gauze: 0.0007 Abs. BC on without gauze: 0.0009 Abs.	☑	☐	N/A
6. **Sensitivity /noise flame test** (aqueous Cu solution test under air-acetylene flame).	Cu 5 ppm >0.7 A.U.	0.8839 Abs.	☑	☐	N/A
	<0.5% RSD	0.19 %	☑	☐	N/A

Note:

Signature	
Customer ..... ( )	Date :
Service Engineer [redacted]	Maintenance Date : 10/Oct/2022

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

NSC-TISI-TIS17025
CALIBRATION 0008

Cert. No.: 22TM1185

Certificate of Calibration

Equipment :	Autoclave
Manufacturer :	Rexall
Model :	LS-2D
Serial No. :	04131
ID No. :	AUT-01
Submitted by :	Environment & Laboratory Co.,Ltd. 40 Soi Liangmueangnonthaburi 13, Talad Kwan, Mueang, Nonthaburi 11000
Location :	Room No. 205
Received Order :	14 July 2022
Calibration Date :	15 July 2022
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %

[redacted]

Issue Date : 27 July 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.

A 0043527

Equipment : Autoclave

Condition As-Received : Used Item

Reference : 2207-0250OC-7

Cert. No.: 22TM1185

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT03 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	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44073381	22LM78/1	12 May 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.
4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**

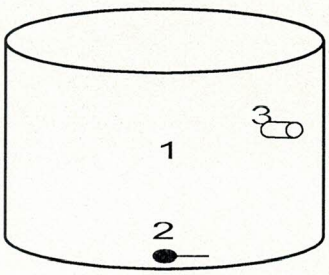
(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)

It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directry concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	27	68	224
Finished of Calibration	28	63	223

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	20-01TC-01
2 =	Temperature sensor	20-01TC-02
3 =	Exhaust port	20-01TC-03

[redacted]

a 1119214

Equipment : Autoclave

Condition As-Received : Used Item

Reference : 2207-0250OC-7

Cert. No.: 22TM1185

Result of Calibration :- (*) Without Adjustment

Operating parameter Set : Temperature = 120 °C

Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (kg/cm²)	Uncertainty (± °C)	Coverage Factor *k*
120	-	1	121.644	0.82	1.2	1.2	2
		2	121.524				
		3	121.570				

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

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

UUC* : Unit Under Calibration

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

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

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[redacted]

a 1119213

PerkinElmer

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Avio 200

Customer :	Environment & Laboratory	**Date Tested:**	September 9, 2022
		Recommendation Recertification	
Address :	40 Soi Liangmueangnon 13	**Period**	12 Months
	Talad Kwan, Mueang	**Recertification Due:**	September 9, 2023
	Nonthaburi 11000	**Date Last Certified:**	January 14, 2021
User Name:	[redacted]	**Visit Number:**	1 of 1
Phone:		**PerkinElmer Phone:**	02-719-6420 ext 206
E - Mail :		**PerkinElmer Fax:**	02-318-5597

CONFIGURATION TESTED

MODEL	SERIAL NUMBER	SOFTWARE
Avio 200	079S16062402	

TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
IPV Method		

TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Multielement Standard	N069-1579	Jun 30,2023
Instrument Cal. STD4	N930-0221	Nov 30, 2023

CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
2 % HNO3		
10 % HNO3		

PerkinElmer Ltd. 290 Soi 17 Rama 9 Road, Khwang Bangkapi, Khet Huay Kwang, Bangkok 10310, Thailand

PerkinElmer

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Avio 200

SERIAL NUMBER: 079S16062402 **DATE TESTED:** September 9, 2022

1. MECHANICAL CHECKS

A. Inspect and clean all fans and filters.	OK
B. Inspect and replace as necessary, all torch components including the RF coil.	OK
C. Inspect all tubing for sign of clacking or leaking.	OK
D. Adjust water and gas pressure regulator settings.	OK
E. Inspect and leak check pneumatics drawers.	OK
F. Clean the exterior of the instrument.	OK

2. OPTICAL CHECKS

A. Inspect and clean all optical components.	OK
B. As reqiured, check and replace all purgebfilters.	OK
C. Recheck optical alignment.	OK

3. COOLING SYSTEM CHECKS

A. Perform preventive maintenance on chiller.	OK
B. Flush out the chiller every year.	OK

4. PERFORMANCE CHECKS

A. Torch View Alignment.	OK
B. Wavelength Calibration.	OK

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PerkinElmer

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Avio 200

SERIAL NUMBER: 079S16062402 **DATE TESTED:** September 9, 2022

PARAMETER			SPECIFICATION		FINAL VALUE	
Spectral Resolution : UV						
	As	**193.696 nm**	≤ 0.009	nm	0.00765	nm
	Ni	**231.604 nm**	≤ 0.011	nm	0.00885	nm
	Ni	**341.476 nm**	≤ 0.015	nm	0.01268	nm
Spectral Resolution : VIS						
	Ba	**455.403 nm**	≤ 0.020	nm	0.01519	nm
Precision						
	Zn	**206.200 nm**	% RSD	≤ 1.0 %	0.58	%
	Mg	**280.271 nm**	% RSD	≤ 1.0 %	0.17	%
	Mg	**285.213 nm**	% RSD	≤ 1.0 %	0.18	%
	Ba	**455.403 nm**	% RSD	≤ 1.0 %	0.22	%
Detection Limits : Axial						
	Tl	**190.801 nm**	3(sd)		0.25	ppb
	As	**193.696 nm**	3(sd)		1.92	ppb
	Se	**196.026 nm**	3(sd)		0.99	
	Pb	**220.353 nm**	3(sd)		1.24	ppb
Detection Limits : Radial						
	As	**193.696 nm**	3(sd)		1.12	ppb
	Zn	**213.857 nm**	3(sd)		0.06	ppb
	Mn	**257.610 nm**	3(sd)		0.00	ppb
	La	**379.478 nm**	3(sd)		0.09	ppb
	Ba	**455.403 nm**	3(sd)		0.01	ppb
	Ba	**493.408 nm**	3(sd)		0.01	ppb
BEC : Axial (IB X 1000)/(IS-IB)						
	Mn	**257.610 nm**	≤ 30 ppb		4.50	ppb
BEC : Radial (IB X 1000)/(IS-IB)						
	Mn	**257.610 nm**	≤ 30 ppb		5.91	ppb

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PerkinElmer

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Avio 200

SERIAL NUMBER: **079S16062402** **DATE TESTED:** **September 9, 2022**

Remarks :

Commissioning follow as commissioning performance sheets.

This is to certify that the above tests have been perfomed and the configuration tested

- [x] meets
- [ ] does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale, including warranty terms.

Service Department PerkinElmer Ltd.

Customer Service Engineer: [redacted]

PerkinElmer Ltd. 290 Soi 17 Rama 9 Road, Khwang Bangkapi, Khet Huay Kwang, Bangkok 10310, Thailand

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TEL. 0-2717-3000-27 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Cert. No.: 22TM1184

Certificate of Calibration

Equipment :	Incubator
Manufacturer :	Memmert
Model :	BM 500
Serial No. :	D593.0342
ID No. :	CHI-002
Submitted by :	Environment & Laboratory Co.,Ltd. 40 Soi Liangmueangnonthaburi 13, Talad Kwan, Mueang, Nonthaburi 11000
Location :	Room No. 204
Received Order :	14 July 2022
Calibration Date :	15 July 2022
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %

[redacted]

Issue Date : 27 July 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.

A 0043524

Equipment : Incubator

Condition As-Received : Used Item

Reference : 2207-0250OC-4

Cert. No.: 22TM1184

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 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	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44073381	22LM78/1	12 May 2023

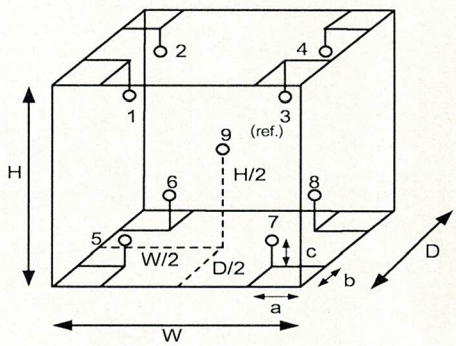
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	23	22
REL.Humid. (%)	67	66
AC Supply (Volt)	223	224



Position :	Ref. Std. ID No.:
1	1RTD-2/1
2	1RTD-2/2
3	22-01RTD-03
4	1RTD-2/4
5	1RTD-2/5
6	1RTD-2/6
7	1RTD-2/7
8	1RTD-2/8
9 (ref.)	1RTD-2/9

Probe Installation Details :

a = 5.0 cm
b = 5.0 cm
c = 5.0 cm

Dimension of Chamber :

D = 0.40 m
W = 0.56 m
H = 0.48 m
Capacity = 0.11 m^3

[redacted]

a 1119006

Equipment : Incubator

Condition As-Received : Used Item

Reference : 2207-0250OC-4

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Cert. No.: 22TM1184

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (±°C)	Coverage Factor *k*
35.0	35.0	35.0	0.035	0.55	0.63	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
35.0	35.100	34.653	35.131	34.871	35.067	34.888	35.092	35.235	35.170

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

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

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

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

UUC* : Unit Under Calibration

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

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

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[redacted]

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NSC-TISI-TIS17025
CALIBRATION 0008

Cert.No.: 22CHO415
Page.: 1 of 3

Certificate of Calibration

Equipment :	Spectrophotometer
Manufacturer :	Hach
Model :	DR 3900
Serial No. :	1988383
ID No. :	-
Condition As-Received:	Used Item
Received Date :	14 July 2022
Calibration Date :	14 July 2022
Reference :	2207-0250OC-11
Submitted by :	Environment & Laboratory Co.,Ltd. 40 Soi Liangmueangnonthaburi 13 Talad Kwan, Mueang, Nonthaburi 11000
Calibration Place :	Room No. 304
Ambient Temperature :	(27.5 - 27.2) °C (On-Site)
Relative Humidity :	(53.2 - 53.8) % (On-Site)
Calibration Procedure :	In - house method : CP-OCH4 based on ASTM E 275-01

[redacted]

Issue Date : 27 July 2022

The Uncertainties are for a confidence probability of approximately 95%

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A 0043531

Condition of calibration result

1. Reference Standard Material :

Material	Serial No.	Certificate No.	Due date
1. Absorbance Standard set	8331	86623	08 Sep 2022
2. Wavelength Standard set	14536	89302	19 Jan 2023
3. Wavelength Standard set	14537	89303	19 Jan 2023

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 at :
   - National Physical Laboratory (NPL), The United Kingdom of Great Britain and Northern Ireland
   - National Institute of Standards and Technology (NIST), The United States of America
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
537.00	536	0.59	2.00
638.00	638	0.66	2.00
747.61	748	0.59	2.00
807.04	807	0.59	2.00

[redacted]

a 1119206

Calibration Results : **without adjustment**

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (±Abs)	Coverage Factor *k*
420.0	Zero	0.000	0.0028	2.00
	0.5723	0.571	0.0034	2.00
	0.7522	0.750	0.0031	2.00
	1.0907	1.089	0.0033	2.00
440.0	Zero	0.000	0.0028	2.00
	0.5616	0.560	0.0034	2.00
	0.7345	0.732	0.0032	2.00
	1.0646	1.063	0.0034	2.00
465.0	Zero	0.000	0.0028	2.00
	0.5118	0.513	0.0034	2.00
	0.6773	0.678	0.0031	2.00
	0.9809	0.983	0.0034	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5228	0.522	0.0030	2.00
	0.6861	0.684	0.0030	2.00
	0.9941	0.992	0.0031	2.00
590.0	Zero	0.000	0.0028	2.00
	0.5546	0.552	0.0029	2.00
	0.7159	0.714	0.0032	2.00
	1.0369	1.032	0.0030	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5401	0.538	0.0029	2.00
	0.6835	0.681	0.0030	2.00
	0.9889	0.987	0.0031	2.00

Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer

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

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

NSC-TISI-TIS17025
CALIBRATION 0008

Cert. No.: 22TM1183

Certificate of Calibration

Equipment :	Water Bath
Manufacturer :	Memmert
Model :	WB22
Serial No. :	I505.0053
ID No. :	WAB-01
Submitted by :	Environment & Laboratory Co.,Ltd. 40 Soi Liangmueangnonthaburi 13, Talad Kwan, Mueang, Nonthaburi 11000
Location :	Room No. 303
Received Order :	14 July 2022
Calibration Date :	14 - 15 July 2022
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %

[redacted]

Issue Date : 27 July 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 0043523

Equipment : Water Bath

Condition As-Received : Used Item

Reference : 2207-0250OC-3

Cert. No.: 22TM1183

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

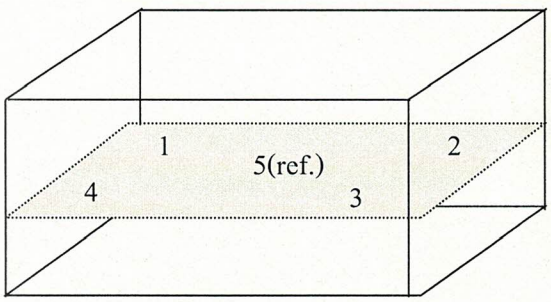
Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44073381	22LM78/1	12 May 2023

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 of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	31	45	219
Finished of Calibration	30	52	218



Front

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

[redacted]

a 1119008

Equipment : Water Bath

Condition As-Received : Used Item

Reference : 2207-0250OC-3

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Cert. No.: 22TM1183

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.514	44.511	44.517	44.498	44.519
60.0	60.0	60.0	60.015	60.009	60.009	59.982	59.991

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor *k*
44.5	0.047	0.028	0.15	2
60.0	0.073	0.035	0.15	2

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

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

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

UUC* : Unit Under Calibration

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

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

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บริษัท เอ็นไวร์ เซอร์วิส จำกัด
42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นไวร์ เซอร์วิส จำกัด ENVIR SERVICE CO., LTD.
42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 08 July 2022

Instruments Information

Analyzer Type: Methane-NMHC Analyzer	**Manufacturer** Thermo Environmental
Model: 55C	**S/N:** 0909235264

Calibration System

Calibrator Unit	*Standard Gas*
Dilutor Model Dasibi	**Mrteane** 181.0 PPM
S/N: 705	**Propane** 180.7 PPM
ZERO AIR Genearator API Model 701	**Cylinder** EB0123130
S/N: 1924	**Expire Date:** 3 Oct, 2027

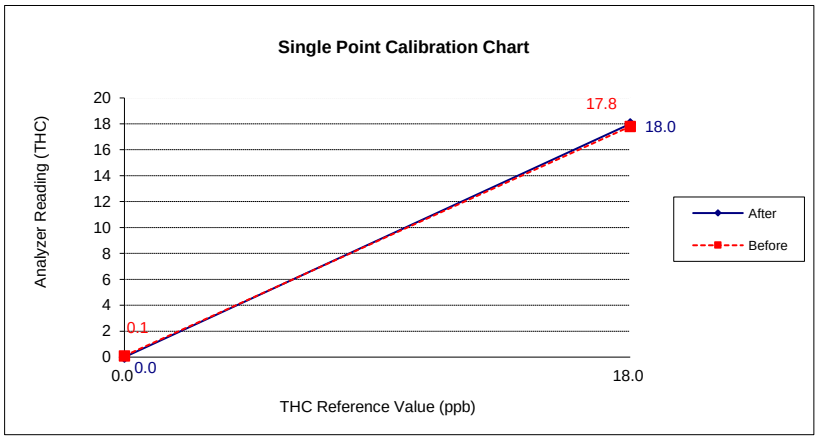
Environment: Temperature 25 ˚C Humidity: 51 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (ppm)	Reading Value (ppm)	Expected Value (ppm)	Drift%
NH4	0.1	0.0	0.1	17.8	18.0	-1.1
NMHC	0.1	0.0	0.1	17.8	18.0	-1.1

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (ppm)	Reading Value (ppm)	Expected Value (ppm)	Drift%
NH4	0.0	0.0	0.0	18.0	18.0	0.0
NMHC	0.0	0.0	0.0	18.0	18.0	0.0



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