



THAI HEART CALIBRATION CO., LTD.

2299/12-13 Moo 4, Thepharak, Muang, Samut Prakan 10270
Tel. 0-2394-2162, 0-2757-8435, 0-2757-8496 Fax. 0-2757-8507



CERTIFICATE OF CALIBRATION

Certificate No.: C0-2108010/20

Page 1 of total 4 pages

Customer WATER ANALYSIS CENTER CO., LTD.
30/5 Soi Viphavadee 60, Viphavadee Rangsit Road,
Kwaeng Taladbangkhen, Khet Laksi, Bangkok 10210

Equipment pH Meter
Manufacturer METTLER TOLEDO **Model** SevenCompact
Serial No. B327527211 **ID No.** WWL0068
Description Range : 0 - 14 pH, Resolution : 0.01 pH

Environmental Conditions Ambient Temperature: $(23 \pm 3) ^\circ\text{C}$
Relative Humidity: $(50 \pm 15) \%$
Atmospheric Pressure: -

Calibration Location Chemical Laboratory

Received Date 21 August 2020

Calibration Date 21 August 2020

Date of Issue 25 August 2020

Checked by

Act as Technical Manager

Approved by

Representative of Managing Director

() (Krisyosl K.) () (Sakda Y.)
() (Patiphan K.) () (Onnapa P.)
() (Pongsak H.) () (Nitiphong K.)
() (Kanung C.) () (Nonthachai K.)
() (Pramong P.) () (Noppol P.)

(Dr. Ekachai Puttitwong)

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Tel. 0-2394-2162, 0-2757-8435, 0-2757-8496 Fax.: 0-2757-8507
Website : www.thaiheartcal.com E-mail : service@thaiheartcal.com

Certificate No.: C0-2108010/20

Page 2 of total 4 pages

Reference Method:

- The calibration method used was CP-178 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard:

Type	pH Value	Lot No.	Due Date	Traceability
pH Standard Solution	4.01	180619	Dec. 24, 2020	NIMT
	7.00	020719	Dec. 28, 2020	
	10.02	190619	Nov. 21, 2020	

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Documenting Process Calibrator	753	3101007	I0-0904001/20	Apr. 8, 2021	THC
Digital Thermometer with Sensor	1523 / 5622	1709138 / 4605984-005	I0-0409003/19	Sep. 3, 2020	

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- NIMT, National Institute of Metrology (Thailand).
- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:

1. Function Simulated pH Meter

Standard Applied (mV)	Nominal Value (pH)	UUC Reading		Uncertainty (± mV)
		pH	mV	
177.48	4.00	4.01	177.3	0.060
0.00	7.00	7.00	-0.1	0.060
-177.48	10.00	10.01	-177.5	0.060

UUC : Unit Under Calibration

Note : Adjust Curve to simulate pH (4,7,10)

Calibrated by Onnapa



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Measurement Results (Cont.):

2. Calibration of pH Electrode (Serial No.: 3322791)

pH Standard Solution (pH)	Measured Value		Uncertainty (± pH)
	(pH)	(mV)	
4.01	4.01	182.2	0.013
7.00	7.00	5.4	0.013
10.02	10.00	-163.7	0.013

Note : Adjust Curve to Buffer Solution pH (4,7,10)

Temperature stability of micro bath : $25 \pm 0.2^{\circ}\text{C}$

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.



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Certificate No.: C0-2108010/20

Page 4 of total 4 pages

Reference Method:

- The calibration method used was CP-096 based on an in-house method.
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Thermometer Readout	1529-R	B7C853	19E4568	Nov. 28, 2020	TPA
Semi-Standard Platinum Resistance Thermometer	5628	2166	TT-0063-17	Oct. 19, 2020	NIMT
Liquid Bath	XORTS-40A	XO111019	IO-0506003/19	Jun. 7, 2021	THC

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- TPA, Technology Promotion Association (Thailand-Japan).
- NIMT, National Institute of Metrology (Thailand).
- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:

(X) Without Adjustment

Dimension of probe : Diameter 5 mm. Sensor Type : RTD (PT100)

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (\pm °C)
140	22.00	22.0	0.00	0.058
140	25.00	25.0	0.00	0.058
140	28.00	28.0	0.00	0.058

UUC : Unit Under Calibration

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

Calibrated by

Chalerm

Certificate of Calibration

Equipment:	TURBIDIMETER	Certificate No.:	C08200146
Model:	2100N	Issued Date:	03 July 2020
Serial No. (or ID.):	030500003311 (WWL 0019)	Job No.:	KSPR2008902
Manufacturer:	HACH	Page:	1 of 2
Condition:	In Condition		

Customer: Water Analysis Center Co., Ltd.
1/94 Moo 5, Rojana Industrial Park, Rojana Road,
Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

Environment Condition: Temperature 23 °C ± 2 °C
Humidity 50 %RH ± 15 %RH

Calibration Place: Environment Laboratory, SPC RT Co., Ltd.
1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd.,
Bangchak, Prakhonong, Bangkok 10260 Thailand

Calibration By: Miss. Ailham A-ma
Calibration Date: 03 July 2020
The Method used: In house method, SPCC-WI-23, base on Hach Manufacturer Method 8195
Traceability: This certificate is traceable to Primary standard Fromazin and StablCal accepted by
United States Environmental Protection Agency (EPA) through Hach Company
Certificate No. A0080 , A0076 , A0077 , A0077 , A0076



(Miss Ailham A-ma)

Person in charge

SPC RT

บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd.



(Mr. Dumrong Boonsopon)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of SPC RT Co., Ltd.

Calibration Results:

Before Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.040	0.077	-0.037	0.0007	0.070
20.30	20.5	-0.20	0.03	1.0
203.0	206	-3.0	0.0	10
1024.0	1049	-25.0	1.1	50
4122.0	4170	-48.0	2.1	200

After Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.040	0.066	-0.026	0.0010	0.070
20.30	20.3	0.00	0.05	1.0
203.0	203	0.0	0.0	10
1024.0	1025	-1.0	0.5	50
4122.0	4121	1.0	1.9	200

The End of Certificate



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CERTIFICATE OF CALIBRATION

Certificate No.: CO-2107006/20

Page 1 of total 2 pages

Customer WATER ANALYSIS CENTER CO., LTD.
30/5 Soi Viphavadee 60, Viphavadee Rangsit Road,
Kwaeng Taladbangkhen, Khet Laksi, Bangkok 10210

Equipment	Conductivity Meter		
Manufacturer	EUTECH	Model	CON 2700
Serial No.	2657889	ID No.	WWL0127
Description	-		

Environmental Conditions Ambient Temperature: $(23 \pm 3) ^\circ\text{C}$
Relative Humidity: $(50 \pm 15) \%$
Atmospheric Pressure: -

Calibration Location Chemical Laboratory

Received Date 21 July 2020

Calibration Date 22 July 2020

Date of Issue 22 July 2020

Checked by

Act as Technical Manager

Approved by

Representative of Managing Director

<input type="checkbox"/> (Krisyosl K.)	<input type="checkbox"/> (Sakda Y.)
<input type="checkbox"/> (Patiphan K.)	<input checked="" type="checkbox"/> (Onnapa P.)
<input type="checkbox"/> (Pongsak H.)	<input type="checkbox"/> (Nitiphong K.)
<input type="checkbox"/> (Kanung C.)	<input type="checkbox"/> (Nonthachai K.)
<input type="checkbox"/> (Pramong P.)	<input type="checkbox"/> (Noppol P.)

(Dr. Ekachai Puttitwong)

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Certificate No.: C0-2107006/20

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-177 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard :

Meterial	Batch Value	Lot Number	Due Date	Traceability
Conductivity Standard Solution	145.2 μ S/cm	S190521025	Feb. 1, 2021	SCP Science
	1.424 mS/cm	S200107016	May 6, 2021	

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- SCP Science.

Measurement Results:

Conductivity Standard Solution	Measured Value	Error	Uncertainty (\pm)
145.2 μ S/cm	145.2 μ S/cm	0.0 μ S/cm	0.82 μ S/cm
1.424 mS/cm	1.425 mS/cm	0.001 mS/cm	0.0031 mS/cm

Note : Adjustment points: 145.2 μ S/cm 1.424mS/cm

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

Calibrated by Onnapa

REV.01 08/10/19



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkae Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>

CALIBRATION CERTIFICATE

Certificate No. : AD2012-017-0001

Date Issued : 03-Dec-20

Customer : Water Analysis Center Co.,Ltd. (Head Office)
30/5 Soi Vibhavadeerangsit 60, Vibhavadeerangsit RD., Talard
Bangkhen, Laksi, Bangkok 10210

Equipment	: DO Meter	
	Display	Sensor
Manufacturer	: YSI	YSI
Model	: 5000-115V	5010 BOD Probe
Serial No.	: 14C 100917	13C100067
ID No./Tag No.	: -	-
Date Received	: 02-Dec-20	
Date Calibrated	: 03-Dec-20	
Calibrated by	: Mr. Kittipob Rungruangsarn	

Calibration Method or Calibration Procedure Used

In-house method : CP-77 by direct measurement with standard dissolved oxygen solution at defined temperature.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Technical Manager, Miracle International Technology Company Limited.

Approved by :

(Mr. Tassanai Suksukon)
Technical Manager



Page 1 of 2

Certificate No : AD2012-017-0001

Environment : Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

STD Reading (mg/l)	UUC Reading Before (mg/l)	UUC Reading After (mg/l)	Error (mg/l)	Uncertainty (\pm mg/l)
9.046	9.07	-	0.024	0.013

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0.00 to 60.00 mg/l
Resolution 0.01 mg/l

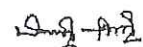
Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L2002-756, L2002-757 for Data Logger (Lutron Temperature & Humid & Baro) Serial No. B014887, Due 28-Feb-21

MIT Certificate No. L2001-629 for Hi Accuracy Thermometer Serial No. 130508834, Due 07-Jan-21

End of Certificate

 Page 2 of 2

TEMPERATURE
CONTROLLER ENCLOSURES



NSC-TISI-TIS 17025
CALIBRATION 0183

Report No. : MC 2008273

Page 1 of 3

Customer : Water Analysis Center Co., Ltd.
1/94 Moo 5, T.Kantham, A.U-Thai, Ayutthaya 13210.

Reference Job No. : 20-1755 Received Date : 14 July 2020

Description : Refrigerator

Manufacturer : SANDENINTERCOOL Model : SEC-1500SBD

Serial No. : SEC1500201A-0708-00304 ID. No. : WWL0038

Marking : Additionally for the purpose of identification by this laboratory a label marked
with this report number (MC 2008273) has been attached to the case.

Method : In-House calibration procedure MWI-T-027 this method is reference to
TLAS G-20 "Temperature Controlled Enclosures".

Location of Calibration : Water Analysis Center Co., Ltd. ; Laboratory.

Environmental Conditions : Ambient Temperature : (25.1 to 26.0) °C
Relative Humidity : (50.0 to 54.0) %

Date of Calibration : 14 July 2020 Date of Issue : 16 July 2020

Checked by : Thanagorn
Thanagorn Limchaicharoen
(Calibration Supervisor)

Approved by : Aittipong
Aittipong Kanjanawasit
(Technical Manager)

The uncertainties are for a confidence probability of approximately 95%

This certificate is issued in accordance with the condition 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 standards laboratory. This certificate may not be reproduced other than in full exact with the prior written approval of the issuing laboratory.

Continuation of Report No. : MC 2008273

Page 2 of 3

The Reference Standard :

Description	Report No.	Serial No.	Due date
Data Acquisition/Switch Unit	MC 2007049	93000641	9 June 2021
With Thermocouple Type "T" ID. No.30/1 to 30/9			

This certificate is traceable to the international system of units maintained at:

- Master Calibration Co., Ltd.

1. Calibration Procedure:

This Instrument was calibration according to TLAS G-20 by comparison with calibrated thermocouple type T under no load condition. The Thermocouples were placed on nine points and located one thermocouple in each of the eight corners of the chamber and was away from the each wall of 5 cm to 10 cm. And placed the ninth thermocouple within 2.5 cm of the geometric center of the chamber.

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. The reference sensor should preferably be located at the geometric center of the chamber.

Temperature Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

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

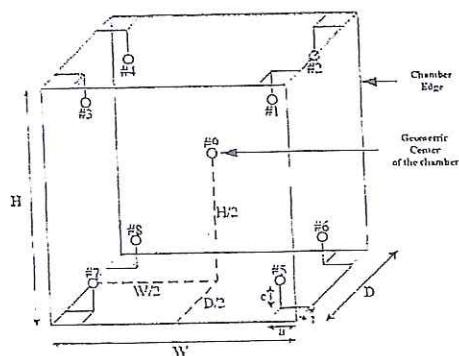


Figure 1 : Sensor Installation Location

Overall Ambient Temperature around the Chamber variation : 2.8 °C

Overall Line Voltage variation : 0.1 V

Chamber Size (W*H*D) : 171 cm x 157 cm x 60 cm

Checked by : *Thanyavorn*

Continuation of Report No. : MC 2008273

Page 3 of 3

2. Result of calibration :

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9	
2.6	3.60	3.47	3.64	3.47	3.39	3.49	3.51	3.54	3.43	0.99

Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
2.0	2.6	1.32	0.62	2.64

3. Uncertainty of Measurement

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

This report will certify of the calibrated equipment only.

End of Calibration Report

Checked by : *Thanagorn*



Inctech Metrological Center Co.Ltd.

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com



Certificate of Calibration

Certificate No. : MT20-6158

Page : 1 of 2

Customer : Water Analysis Center Co.,Ltd.
Address : 1/94 M.5, Rojana Industrial Park, T.Kanharm, Ayutthaya 13210

Description : Hot Air Oven
Manufacturer : Memmert
Model : UM500
Serial No. : b501.0135
Identification No. : WWL0005
Calibration Place : Customer Laboratory

Order No. : 2695/20
Received date : Sep 04, 2020
Calibration date : Sep 04, 2020
Environment Condition :
Temperature : (25+/-10) °C
Humidity : (50+/-30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MT-006* According to comparison with LXI Data Acquisition Switch Unit with sensor. The calibration methods based on DKD-R5-7 guidelines for calibration of climatic chamber edition 07:2009.

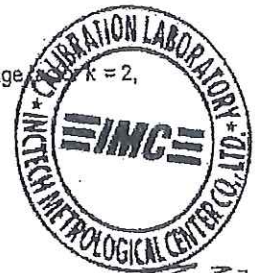
Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49001901	MT19-7350	Dec 10, 2020

This result of calibration was found accurate as shown on date and place of calibration only.

Traceability : This measurement are traceable to the International System of Unit (SI), through National Institute of Metrology Thailand (NIMT)

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage $k = 2$, providing a level of confidence of not less than 95%



Calibrated by : Mr.Jiraphan Sreebannasarn
Issue date : Sep 10, 2020

Approved by : (Mr.Panuwat Phuklan)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of Inctech Metrological Center Co.,Ltd



Incotech Metrological Center Co.Ltd.
 39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
 Saimai, Bangkok 10220, Thailand
 Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com



Calibration Cert. # 3884.01
 ISO/IEC 17025

Certificate No. : MT20-6158

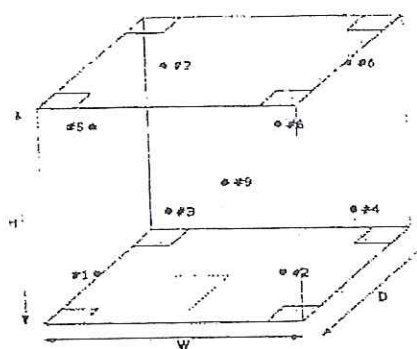
Page : 2 of 2

Function : Temperature measurement
 Calibration point : 104, 178 °C

Result : Without adjustment
 Resolution : 0.1 °C

Calibration point (°C)	Temperature of UUC* at each position (°C)									Uncertainty of measurement (+/- °C)
	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ch.8	Ch.9	
104	104.453	104.460	104.483	104.368	104.371	104.471	104.501	104.300	104.520	0.67
178	180.508	179.957	180.599	180.289	180.321	179.882	180.064	180.392	180.693	0.44

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (+/- °C)	Measured uniformity (°C)	Overall variation (°C)
104.0	104.0	0.54	0.88	1.3
178.0	178.0	0.30	0.97	1.4



- #1 Lower Left Front
- #2 Lower Right Front
- #3 Lower Left Rear
- #4 Lower Right Rear
- #5 Upper Left Front
- #6 Upper Right Front
- #7 Upper Left Rear
- #8 Upper Right Rear
- #9 Geometric Center

Front view

UUC* = Unit under calibration

Uniformity = Maximum and Minimum difference of measured temperature at any probes and the measured temperature at the reference and same time.

Overall Variation = Difference of temperature value between the maximum and minimum any time.

Stability = One half of the maximum difference of measured temperatures at any one probe.



Certificate of Calibration

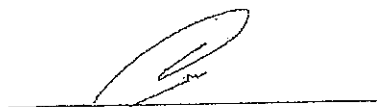
Equipment:	Balance	Certificate No.:	C01201919
Model:	BL1500	Issued Date:	13 June 2020
Serial No. (or ID.):	12503616 (WWL 0011)	Job No.:	KSPR2007477
Manufacturer:	Sartorius	Page:	1 of 2
Condition:	In condition		

Customer: Water Analysis Center Co., Ltd.
1/94 Moo 5, Rojana Industrial Park, Rojana Road,
Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

Environment Condition: Temperature 26 °C \pm 0.6 °C
Humidity 46 %RH \pm 2.4 %RH


Calibration Place: Water Analysis Center Co., Ltd. (ห้องเครื่องชั่ง)
1/94 Moo 5, Rojana Industrial Park, Rojana Road,
Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

Calibration By: Mr. Adinan Ninviboon
Calibration Date: 11 June 2020
The Method used: In house method, SPCC-WI-47, base on UKAS Lab 14
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C02200937


(Mr. Adinan Ninviboon)

Person in charge


บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd.


(Mr. Rungrod Jenkitrakulchai)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

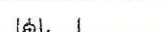


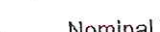
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

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Calibration Results:

Without Adjustment

Eccentric Error: Weight to be 1/4 or 1/3 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value					500	(g)
			Reference Points (g)						
			A	B	C	D	E		
			-	-0.1	-0.1	0.0	0.0		

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.1 (g)

Nominal test value (g)	Standard Deviation
100	0.04
1000	0.05

Departure of indication from nominal value., Readability 0.1 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Correction of Balance (g)	Uncertainty (g)	k
1	1.00	1.0	0.0	0.10	2.03
5	5.00	5.0	0.0	0.10	2.03
10	10.00	10.0	0.0	0.10	2.03
20	20.00	20.0	0.0	0.10	2.03
50	50.00	50.0	0.0	0.10	2.03
100	100.00	100.0	0.0	0.10	2.03
200	200.00	200.0	0.0	0.10	2.03
500	500.00	500.0	0.0	0.10	2.03
1000	1000.00	1000.0	0.0	0.10	2.03
1200	1200.00	1200.0	0.0	0.10	2.03
1500	1500.00	1500.0	0.0	0.10	2.03

The End of Certificate

**Bara Scientific Co., Ltd.**

968 U Chu Liang Building Floor7 Rama4 Road Silom
Bangrak Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

Number of Page(s)

1 of 3

Certificate No.	BSCC-UV-113/20
Equipment	UV/Vis Spectrophotometer
Model	UV-1800
Manufacturer	Shimadzu
Serial No.	A11635405598CD
ID No.	WWL0082
Date of receipt	30 April 2020
Date of calibration	30 April 2020
Date of issue	8 May 2020
Customer name	Water Analysis Center Co., Ltd.
Address	1/94 Moo 5 ,T.Kantham, A.Uthai, Ayutthaya 13210
Temperature	(25.6-26.8) °C (On site)
Humidity	(46.8-56.5) %RH (On site)
Equipment condition	Good Operation
Calibration Location	Laboratory Room Water Analysis Center
Calibration Procedure	In-house method WI-UV-702-01 based on ASTM E275-01
Traceability	Wavelength Accuracy is traceable to certificate No. 79670 and 79671 Photometric Accuracy is traceable to certificate No. 79672 and 79673 Stray Light is traceable to certificate No. 79669 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.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced
except in full, without written approval of the Bara Scientific Co., Ltd.

Certificate of Calibration

Certificate No.

BSCC-UV-113/20

Number of Page(s)

2 of 3

Calibration Results:

1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (\pm nm)
360.89	360.82	-0.07	0.18
418.53	418.71	0.18	0.18
445.82	446.18	0.36	0.18
453.67	453.59	-0.08	0.18
459.99	459.82	-0.17	0.18
638.00	638.10	0.10	0.18
431.22	431.16	-0.06	0.18
513.39	513.46	0.07	0.18
528.90	528.85	-0.05	0.18
572.99	573.65	0.66	0.18
585.25	585.28	0.03	0.18
684.50	684.66	0.16	0.18
741.02	741.09	0.07	0.18
879.25	879.26	0.01	0.18

2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (\pm A)
235	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
257	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
	0.6358	0.6341	-0.0017	0.0075

*CNR = Customer not request

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Certificate of Calibration

Certificate No.

BSCC-UV-113/20

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
	0.5473	0.5483	0.0010	0.0042
	0.7625	0.7637	0.0012	0.0042
	1.0484	1.0500	0.0016	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5369	0.5378	0.0009	0.0042
	0.7446	0.7447	0.0001	0.0042
	1.0235	1.0244	0.0009	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.4873	0.4882	0.0009	0.0042
	0.6868	0.6872	0.0004	0.0042
	0.9433	0.9440	0.0007	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5009	0.5009	0.0000	0.0042
	0.6952	0.6945	-0.0007	0.0042
	0.9568	0.9561	-0.0007	0.0042
590.0	0.0000	0.0000	0.0000	0.0042
	0.5292	0.5289	-0.0003	0.0042
	0.7228	0.7211	-0.0017	0.0042
	0.9993	0.9978	-0.0015	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5140	0.5134	-0.0006	0.0042
	0.6902	0.6886	-0.0016	0.0042
	0.9539	0.9525	-0.0014	0.0042

*CNR = Customer not request

* = Not NSC-ONSC Accredited.

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)		
	Wavelength (nm)	Transmission (%T)	Absorbance (A)
200.97±0.11nm	200.57	0.9798	2.0090

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

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

PREVENTATIVE MAINTENANCE (PM) CHECK LIST
FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: 240FS AA & M918230004

Customer : Water Analysis Center Co., Ltd

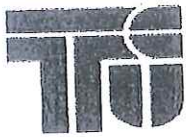
Date: 7 Apr 2021

Safety

- ☒ Flame, Inspect/replace o-ring nebulizer, spray chamber and burner
- ☒ Flame, Clean nebulizer, spray chamber and burner
- ☒ Flame, Check liquid trap interlock, burner interlock, pressure relief bung interlock and shield interlock
- ☐ Furnace, Clean work head, electrode and shroud N/A
- ☐ Furnace, Clean PSD and PSD tray N/A
- ☐ Furnace, Check water pressure N/A
- ☒ Check drain tube
- ☒ Check exhaust system
- ☒ Check gas pressure sensor interlock
- ☒ Check and all gas hoses for SpectrAA
- ☒ Clean computer control

Optics

- ☒ Inspect/Replace that external optics surfaces
- ☒ Check Wavelength Accuracy the copper line at 323.0-326.0 nm = 324.6 nm
- ☒ Check that PMT % Gain the copper at 324.8 nm, 4 mA, 0.5 nm slit width, Gain = 38.1 % (should be $\leq 64\%$ or $\leq 380V$)
- ☒ Flame, Check D2 lamp is work



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80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

Electronics

- ☒ Check power supply voltage
- ☒ Check cables and connectors
- ☒ Check/Clean all boards in the instrument
- ☐ Furnace, Check camera and align** N/A

**Option for Graphite Zeeman only

Mechanisms

- ☒ Flame, Check the burner adjuster
- ☐ Furnace, Check PSD accessories N/A

Analytical performance

- ☒ Clear the sample compartment
- ☒ Flame, Check uptake rate form 7.2-10.6 mL per minute = 10.7 mL/min
- ☒ Test Photometric noise, STDV = 0.0002 Abs (should be ≤ 0.00050 Abs)
- ☒ Flame, Test high solids nebulizer setting use

-Air/acet Cu 5 ppm = 0.76 Abs, and Precision
(%RSD) = 0.5 % (should be > 0.55 Abs and < 0.5 % RSD)

or

-N2O/Acet Cu 5 ppm = _____ Abs, and Precision
(%RSD) = _____ % (should be > 0.3 Abs and < 0.5 % RSD)

- ☐ Furnace, Characteristic mass and sensitivity Cu 25 ppb = _____ Abs, and N/A
Precision (%RSD) = _____ % (should be ≥ 0.15 Abs and ≤ 4.0 % RSD)

SIGN :

Engineer

(Signature)
Suriga Wacharoen

Customer :

Kait

(...ชื่อ... นามสกุล...)

SVD Results Report

VARIAN

Report ID:4 Diagnostic Start Time:4/7/2021 11:21:56 AM Diagnostic End Time:4/7/2021 12:04:17 PM

Customer: Water Analysis Center Co., Ltd.

Service Engineer: Suriya Nacharoen

Address: Uthai.Ayutthaya

Contact Details: Kanitsara

Instrument Configuration

Configuration:

Serial Number: MY18230004	Turret Type: Automatic
Instrument Model: Varian AA140/240/280	Number Of Lamps: 4
Flame Instrument: True	Mono Type: Automatic
Furnace Instrument: True	Gasbox Type: 'Y' Gas Box
Zeeman Present: False	Auto Burner Adjuster: False
Internal Zeeman: False	Mains Frequency: 50
Internal UltrAA: False	Firmware Version: 2.12
Optics Type: Double Beam	Photomultiplier Type: Normal(900nm)
D2 BG Correction Fitted: True	PWB Version: 181
Boot Block Version: 2.02	

EEPROM Data:

Instrument Run Hours: 16347.950	D2 Run Hours: 4626.033
Zero Wavelength Offset: 25.877	D2 Serial Number: not set !
Mono Correction: -0.605	D2 Install Date: 1/1/1970
Flame Hours: 5461.417	D2 Original Intensity: 1.000
	D2 Last Intensity: 400.000

Frequency:

	Averaging Period: 30.0	
	Datapoint Count: 20	
Upper Limit: 51.00	Average Frequency: 50.00	Highest Measured Frequency: 50.00
Lower Limit: 49.00		Lowest Measured Frequency: 50.00

Result: **Passed**

Power Supply:

Averaging Period: 30.0

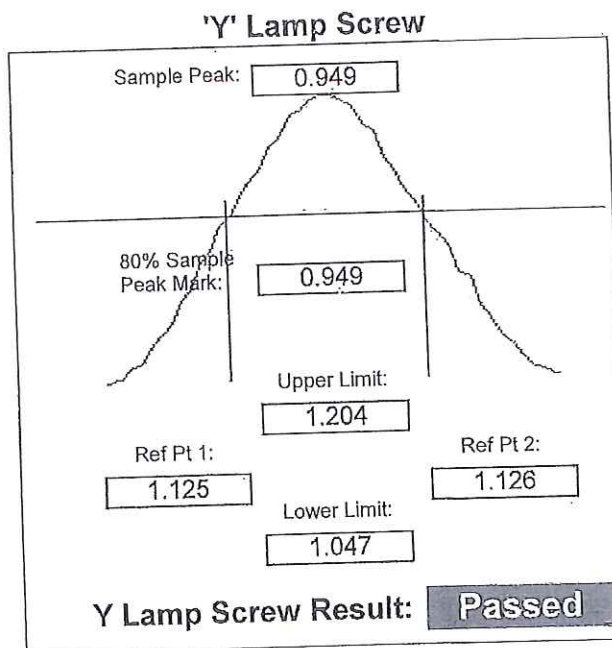
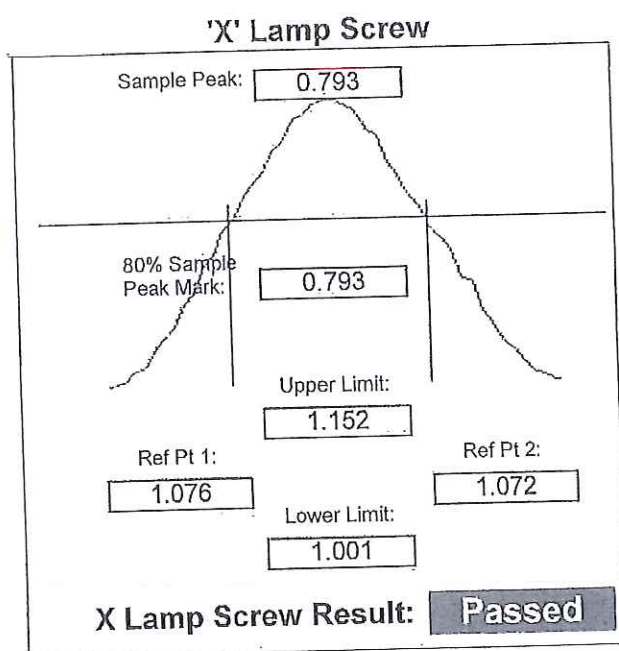
Datapoint Count: 20

	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00 V Rail	10.80	12.10	13.20	Passed
-12.00 V Rail	-13.20	-11.90	-10.80	Passed
5.00 V Rail	4.50	5.00	5.50	Passed
310.00 V Rail	279.00	318.00	341.00	Passed

Beam Balance:

Lamp Type: Copper
Lamp Socket Used: 3

Peak Selected: 324.80
Lamp Alignment: **Performed**



Grating Squareness:

Lamp Element(s): Copper
Lamp Turret Position: 3
Lamp Current(mA): 4.00
Slit Width(nm): 0.5
1st Order Wavelength(nm): 324.80
Lamp Alignment: **Performed**

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.10	0.00	0.10	Passed
First Order	324.45	324.62	325.15	Passed
Second Order	649.23	649.54	649.97	Passed

Wavelength Repeatability:

Lamp Used: Copper
Peak Used(nm): 324.750
Connected to Socket: 3

Lamp Current(mA): 4
Slit Width(nm): 0.2
Slit Height: Normal

Lamp Alignment: **Performed**

Lower Limit(nm) 324.551

324.671 Upper Limit(nm)

(Approach from Zero Order)

(Approach from end)

Sample 1: 324.611

Sample 2: 324.611

Sample 3: 324.611

Sample 4: 324.611

Sample 5: 324.615

Sample 6: 324.611

Sample 7: 324.615

Sample 8: 324.611

Sample 9: 324.615

Sample 10: 324.611

Mean: 324.613

Standard Deviation: 0.002

Result: **Passed**

Wavelength Drive:**Passed**

Slit Drive:**Passed**

Turret Drive:**Passed**

Auto Burner Adjuster Drive:**Untested**

Miscellaneous**Signal Processing Linearity:****Calculate Mode: New Calc Mode**

	Lower Limit	Actual	Upper Limit	Result:
S0	114	258	297	Passed
S1	156	166	191	Passed
S2	271	300	332	Passed
S3	474	516	579	Passed
S4	825	933	1008	Passed
S5	1435	1555	1754	Passed
S6	2498	2802	3053	Passed
S7	4347	4795	5313	Passed

Interlocks:

Burner Fitted:	Working	Flame Detect:	Working
N2O Burner Fitted:	Working	GCU Active:	Working
Flame Shield Closed:	Working	Oxidant Pressure:	Working
Gas Control Fitted:	Untested	Oxidant Changeover:	Working
Pressure Release Bung Fitted:	Working	Ignition:	Working
Liquid Trap Fitted:	Working		

Auto Lamp Recognition:

Lamp 1: 42 - Potassium (K)

Lamp 2: 53 - Sodium (Na)

Lamp 3: 14 - Copper (Cu)

Lamp 4: 37 - Nickel (Ni)

Lamp 5: Not Supported

Lamp 6: Not Supported

Lamp 7: Not Supported

Lamp 8: Not Supported

Result: **Passed**

GTA Temperature Monitoring:

Not Performed

Notes:

C2104SU29 PM 1/2

Signatures:

Water Analysis Center Co., LtdDate

Suriya Nacharoen

Date



บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

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Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com. Website : www.thaiunique.com

PREVENTATIVE MAINTENANCE (PM) CHECK LIST
FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: AA 240 FS & AA0911 M073

Customer : Water Analysis Center Co., Ltd.

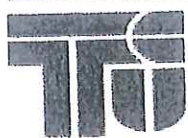
Date: 04 Feb 2021

Safety

- ☒ Flame, Inspect/replace o-ring nebulizer, spray chamber and burner
- ☒ Flame, Clean nebulizer, spray chamber and burner
- ☒ Flame, Check liquid trap interlock, burner interlock, pressure relief bung interlock and shield interlock
- ☐ Furnace, Clean work head, electrode and shroud *N/A*
- ☐ Furnace, Clean PSD and PSD tray *N/A*
- ☐ Furnace, Check water pressure *N/A*
- ☒ Check drain tube
- ☒ Check exhaust system
- ☒ Check gas pressure sensor interlock
- ☒ Check and all gas hoses for SpectrAA
- ☒ Clean computer control

Optics

- ☒ Inspect/Replace that external optics surfaces
- ☒ Check Wavelength Accuracy the copper line at 323.0-326.0 nm = 324.8 nm
- ☒ Check that PMT % Gain the copper at 324.8 nm, 4 mA, 0.5 nm slit width, Gain = 56 % (should be $\leq 64\%$ or $\leq 380V$)
- ☒ Flame, Check D2 lamp is work



บริษัท ไทยยูนิค จำกัด

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80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel, 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

Electronics

- ☒ Check power supply voltage
- ☒ Check cables and connectors
- ☒ Check/Clean all boards in the instrument
- ☐ Furnace, Check camera and align** N/A

**Option for Graphite Zeeman only

Mechanisms

- ☒ Flame, Check the burner adjuster
- ☐ Furnace, Check PSD accessories N/A

Analytical performance

- ☒ Clear the sample compartment
- ☒ Flame, Check uptake rate form 7.2-10.6 mL per minute = 9.8 mL/min
- ☒ Test Photometric noise, STDV = 0.0001 Abs (should be ≤ 0.00050 Abs)
- ☒ Flame, Test high solids nebulizer setting use

-Air/acet Cu 5 ppm = 0.75 Abs, and Precision
(%RSD)= 0.5 % (should be > 0.55 Abs and $< 0.5\%$ RSD)

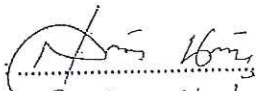
or

-N2O/Acet Cu 5 ppm = _____ Abs, and Precision
(%RSD)= _____ % (should be > 0.3 Abs and $< 0.5\%$ RSD)

- ☐ Furnace, Characteristic mass and sensitivity Cu 25 ppb = _____ Abs, and N/A
Precision (%RSD)= _____ % (should be ≥ 0.15 Abs and $\leq 4.0\%$ RSD)

SIGN :

Engineer


(Suriya Nacharaen...)

Customer :


(Kait...)

SVD Results Report



Report ID: 3 **Diagnostic Start Time:** 05-Dec-20 10:38:29 AM **Diagnostic End Time:** 04-Feb-21 11:58:44 AM
Customer: Water Analysis Center Co., Ltd. **Service Engineer:** Suriya Nacharoen
Address: Prana khron si ayuthaya **Contact Details:** K_Kanitsara

Instrument Configuration

Configuration:

Serial Number: AA0911M073	Turret Type: Automatic
Instrument Model: Varian AA140/240/280	Number Of Lamps: 4
Flame Instrument: True	Mono Type: Automatic
Furnace Instrument: True	Gasbox Type: 'Y' Gas Box
Zeeman Present: False	Auto Burner Adjuster: False
Internal Zeeman: False	Mains Frequency: 50
Internal UltraAA: False	Firmware Version: 2.12
Optics Type: Double Beam	Photomultiplier Type: Normal(900nm)
D2 BG Correction Fitted: True	PWB Version: 181
Boot Block Version: 2.02	

EEPROM Data:

Instrument Run Hours: 20613.650	D2 Run Hours: 2906.000
Zero Wavelength Offset: -18.731	D2 Serial Number: not set !
Mono Correction: -0.370	D2 Install Date: 01-Jan-70
Flame Hours: 4025.000	D2 Original Intensity: 1.000
	D2 Last Intensity: 661.000

Frequency:

Averaging Period: 30.0	
Datapoint Count: 20	
Upper Limit: 51.00	Highest Measured Frequency: 50.00
Average Frequency: 50.00	
Lower Limit: 49.00	Lowest Measured Frequency: 50.00

Result: **Passed**

Power Supply:

Averaging Period: 30.0

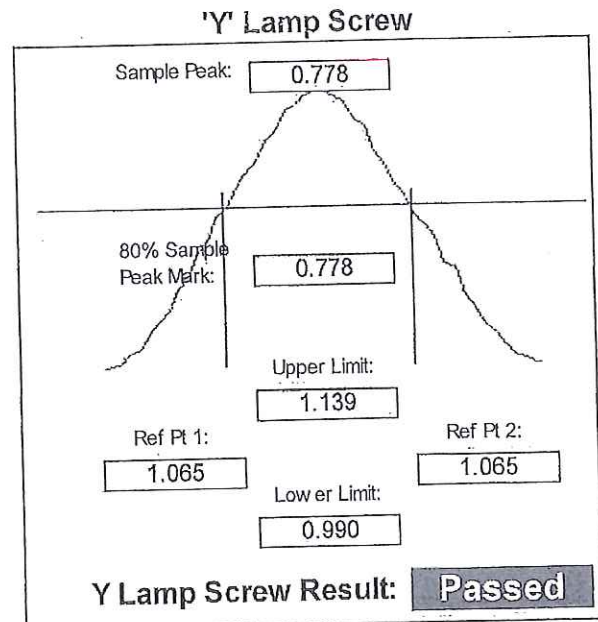
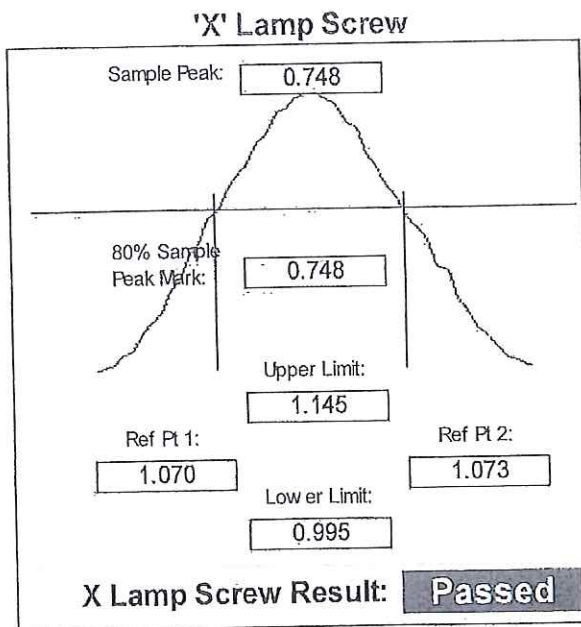
Datapoint Count: 20

	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00V Rail	10.80	12.20	13.20	Passed
-12.00V Rail	-13.20	-12.00	-10.80	Passed
5.00V Rail	4.50	5.10	5.50	Passed
310.00V Rail	279.00	318.00	341.00	Passed

Beam Balance:

Lamp Type: Copper
Lamp Socket Used: 3

Peak Selected: 324.80
Lamp Alignment: **Performed**

**Grating Squareness:**

Lamp Element(s): Copper
Lamp Turret Position: 3
Lamp Current(mA): 4.00
Slit Width(nm): 0.5
1st Order Wavelength(nm): 324.80
Lamp Alignment: **Performed**

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.10	0.00	0.10	Passed
First Order	324.45	324.73	325.15	Passed
Second Order	649.23	649.56	649.97	Passed

Wavelength Repeatability:

Lamp Used: Copper
Peak Used(nm): 324.750
Connected to Socket: 3

Lamp Current(mA): 4
Slit Width(nm): 0.2
Slit Height: Normal

Lamp Alignment: **Performed**

Lower Limit(nm) 324.751 324.871 Upper Limit(nm)

(Approach from Zero Order)

(Approach from end)

Sample 1: 324.811

Sample 2: 324.807

Sample 3: 324.811

Sample 4: 324.811

Sample 5: 324.815

Sample 6: 324.811

Sample 7: 324.815

Sample 8: 324.811

Sample 9: 324.815

Sample 10: 324.815

Mean: 324.812

Standard Deviation: 0.003

Result: **Passed**

Mechanical

Wavelength Drive:

Passed

Slit Drive:

Passed

Turret Drive:

Passed

Auto Burner Adjuster Drive:

Untested

Miscellaneous

Signal Processing Linearity:

Calculate Mode: New Calc Mode

	Lower Limit	Actual	Upper Limit	Result:
S0	114	248	297	Passed
S1	156	165	191	Passed
S2	271	294	332	Passed
S3	474	506	579	Passed
S4	825	908	1008	Passed
S5	1435	1516	1754	Passed
S6	2498	2723	3053	Passed
S7	4347	4681	5313	Passed

Interlocks:

Burner Fitted:	Working	Flame Detect:	Working
N2O Burner Fitted:	Working	GCU Active:	Working
Flame Shield Closed:	Working	Oxidant Pressure:	Working
Gas Control Fitted:	Untested	Oxidant Changeover:	Working
Pressure Release Bung Fitted:	Working	Ignition:	Working
Liquid Trap Fitted:	Working		

Auto Lamp Recognition:

Lamp 1: 50 - Selenium (Se)

Lamp 2: 3 - Arsenic (As)

Lamp 3: 14 - Copper (Cu)

Lamp 4: 42 - Potassium (K)

Lamp 5: Not Supported

Lamp 6: Not Supported

Lamp 7: Not Supported

Lamp 8: Not Supported

Result: **Passed**

GTA Temperature Monitoring:


Not Performed

Notes:

C2102SU11 PM1/2

Signatures:

Water Analysis Center Co., Ltd. Date



Suriya Nacharoen

04 Feb 21

Date

BSC Certification Test Report

Page 1 of 6

Certificate No. : M 0834/20

Customer Name : LABORATORY WATER ANALYSIS CENTER COMPANY LIMITED

Customer Address : 1/94 Moo 5 T.Kanharm, A.U-Thai,
Phra Nakhon Si Ayutthaya 13210

Equipment : Biological Safety Cabinet Class II Type A2

Manufacturer : Microtech

Model : V6-T

Serial No : 0972

ID No. : WWL0084

Were in accordance with ☒ EN 12469 ☐ NSF 49 ☐ Manufacturer's specification

Test Date : 06 October 2020

Due Date : 06 October 2021 or after HEPA filters are replaced or unit is moved

Test by : Mr.Piyapong Phuesuea

Approved by :



(Mr.Kridsada Thinhuatoei)

Authorized Signatory

Issued Date : 13 October 2020

Certificate No. : M 0834/20

Procedure Used :

- : European Standard EN12469 : 2000 has the status of British Standard, Biotechnology Performance criteria for microbiological safety cabinets.
- : NSF International Standard / American National Standard NSF / ANSI 49-2008 Biosafety Cabinet : Design, Construction, Performance and Field Certification.
- : Australian Standard : AS 1807.23-2000 Determination of intensity of radiation from germicidal ultraviolet lamps.
- : Manufacturer's specification

1. Downflow velocity test.

Measurement Information

No. of Rows	No. of Readings	Grid Spacing Front-Back	Grid Spacing Side-Side	Probe height Above sash
2	8	1/4 , 3/4	1/8 , 3/8	100

Measurement Data.

0.33	0.37	0.35	0.34
0.26	0.29	0.31	0.30

Average velocity 0.32 m/s (63 FPM.) (Velocity range 0.25 - 0.50 m/s) (49 -98 FPM.)

Uniformity (EN :+/-20% avg.) 0.26 - 0.38 m/s (51-75 FPM.)

Supply filter dimension 24 x 72 (inch x inch) Supply filter area 10.69 SQ.FT

Downflow volume (Q) 673 CFM

Result Summary



Pass



Fail

Equipment used : Thermo Anemometer Model 425 S/N : 03004786 Calibration date : 20/02/2020

Certificate No. : M 0834/20

2. Inflow velocity test.

Select method. :

☐ DIM

☒ Exhaust velocity.

☐ MFG's Specifications

0.41	0.48	0.50	0.52	0.55
0.51	0.54	0.56	0.58	0.57
0.54	0.56	0.51	0.49	0.50
0.53	0.54	0.58	0.59	0.61
0.59	0.57	0.54	0.58	0.52

Average Inflow velocity 0.45 m/s (89 FPM.) (Velocity range ≥0.40 m/s (≥79 FPM.)

Inflow dimension 8 x 72 (inch x inch) Inflow area 4.00 SQ.FT

Inflow volume(Q) 356 CFM

Result Summary ☒ Pass ☐ Fail ☐ No document acceptance criteria.

Adjustments Required ☐ Fan Speed ☐ Damper

Equipment used : Thermo Anemometer Model 425 S/N : 03004786 Calibration date : 20/02/2020

3. HEPA filter leak test.

Measurement Data

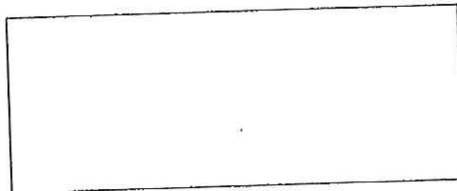
HEPA Filter	PAO Upstream Conc.(calculated)	Specification	Measured leak penetration
Supply HEPA Filter	<u>20</u> µg/l.	< 0.003%	<u>< 0.003%</u>
Exhaust HEPA Filter	<u>20</u> µg/l.	< 0.003%	<u>< 0.003%</u>

Certificate No. : M 0834/20

Leak location

Supply HEPA Filter

Back



Front

Exhaust HEPA Filter

Back



Front

Result Summary



Pass



Fail

Equipment used (1) : Aerosol Photometer **Model** ATI-2H **S/N** 21683 **Calibration date** 20/02/2020

Equipment used (2) : Smoke Generator **Model** TDA-6C **S/N** 21623

4. Airflow smoke patterns test

Measurement Information

1. Downflow Pattern test : Smoke shall be passed from one end of the cabinet to the other, along the centerline of the work surface, at a height of 4 inch (10 cm) above the top of the access opening.
2. View screen retention test : Smoke shall be passed from one end of the cabinet to the other, 1.0 in (2.5 cm) behind the view screen, at a height 6.0 inch (15 cm) above the top of the access opening.
3. Work opening edge retention test : Smoke shall be passed along the entire perimeter of the work opening. Particular attention should be paid to corners and vertical edges.
4. Sash/window seal test : Smoke shall be passed up the inside of the window 2 in (5 cm) from the sides and along the top of the work area.

Certificate No. : M 0834/20

Result Summary

Downflow Pattern test	<input checked="" type="checkbox"/>	Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>	N/A
View screen retention test	<input checked="" type="checkbox"/>	Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>	N/A
Work opening edge retention test	<input checked="" type="checkbox"/>	Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>	N/A
Sash/window seal test	<input checked="" type="checkbox"/>	Pass	<input type="checkbox"/>	Fail	<input type="checkbox"/>	N/A

5. Site installation

Sash Alarm.	<input type="checkbox"/>	Pass	<input type="checkbox"/>	Fail	<input checked="" type="checkbox"/>	N/A
Interlock System.	<input type="checkbox"/>	Pass	<input type="checkbox"/>	Fail	<input checked="" type="checkbox"/>	N/A
Exhaust System Performance	<input type="checkbox"/>	Pass	<input type="checkbox"/>	Fail	<input checked="" type="checkbox"/>	N/A

Remark / Recommendation

รวม Site installation ไม่มีการตรวจสอบ เนื่องจากตู้ไม่มี Function นี้

6. Illumination Test (Lighting) : Option

Lighting should be adequate for safe working within the cabinet. Illumination measured at the work surface.

Lux

662	1065	1060	619
962	1610	1593	843

Remark :

Certificate No. : M 0834/20

7. Ultraviolet Lamp Test (UV) : Option

Ultraviolet radiation where UV Lamp are fitted, the intensity of radiation at a wavelength of 254 nm.

Shall be not less than 400 mW/m² when measures at work floor surface.

mW/m²

850	2270	2340	1020
500	1110	1210	580

Remark :



Ref No. : 0303/16046

CERTIFICATE OF TESTING LABORATORY ACCREDITATION

This is to certify that

*Laboratory of Water Analysis Center Co., Ltd.
1/94 Moo 5, Tambon Kanharm, Amphoe U-Thai,
Changwat Phra Nakhon Si Ayutthaya 13210*

has successfully undergone assessment according to ISO/IEC 17025 : 2017
and under the Bureau of Laboratory Accreditation, Department of Science Service
for the requirements, regulations and criteria for the competence of testing laboratories

Accreditation Number TESTING - 0029

The scope of accreditation is as annexed hereto

Issue date : 7th November 2019

Expired date : 6th November 2022

Signature :

(Mrs. Pochaman Tagheen)

Director of Bureau of Laboratory Accreditation

Bureau of Laboratory Accreditation, Department of Science Service,
Ministry of Higher Education, Science, Research and Innovation

Scope of Testing Laboratory Accreditation

Laboratory Name : Laboratory of Water Analysis Center Co., Ltd.

Address : 1/94 Moo 5, Tambon Kanharm, Amphoe U-Thai,
Changwat Phra Nakhon Si Ayutthaya 13210

Accreditation Number : Testing - 0029

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1	Bottled drinking water	<p>- Chloride 6 mg/dm³ to 1 000 mg/dm³</p> <p>- Total Hardness (Calculated as CaCO₃) 5 mg/dm³ to 2 000 mg/dm³</p> <p>- Total Solids at 103 °C to 105 °C 25 mg/dm³ to 4 000 mg/dm³</p>	<p>In - house method : TM 008 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - Cl⁻ B</p> <p>In - house method : TM 009 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 2340 C</p> <p>In - house method : TM 015 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 2540 B</p>

Initial Issue Date 23rd September 2008

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Bottled drinking water	- Manganese 0.05 mg/dm ³ to 5 mg/dm ³ - Iron 0.10 mg/dm ³ to 5 mg/dm ³	In - house method : TM 040 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3111 B
2	Water	- pH 6.0 to 10.0 - Total Suspended Solids at 103 °C to 105 °C 10 mg/dm ³ to 1 000 mg/dm ³	In - house method : TM 001 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - H ⁺ B In - house method : TM 016 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 D

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Water	<p>- Total Dissolved Solids at 180 °C 25 mg/dm³ to 4 000 mg/dm³</p> <p>- Cadmium 0.05 mg/dm³ to 0.9 mg/dm³</p> <p>- Copper 0.05 mg/dm³ to 5 mg/dm³</p> <p>- Zinc 0.05 mg/dm³ to 5 mg/dm³</p> <p>- Chromium 0.05 mg/dm³ to 5 mg/dm³</p>	<p>In - house method : TM 017 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C</p> <p>In - house method : TM 040 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 3111 B</p>

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Water	- Nickel 0.10 mg/dm^3 to 4 mg/dm^3 - Manganese 0.05 mg/dm^3 to 5 mg/dm^3 - Lead 0.10 mg/dm^3 to 2 mg/dm^3 - Iron 0.10 mg/dm^3 to 5 mg/dm^3 - Water soluble silica (Calculated as SiO_2) 1.1 mg/dm^3 to 26 mg/dm^3	In - house method : TM 040 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3111 B In - house method : TM 030 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500-SiO ₂ C

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Water	<p>- Chloride 6 mg/dm³ to 1 000 mg/dm³</p> <p>- Total Hardness (Calculated as CaCO₃) 5 mg/dm³ to 2 000 mg/dm³</p> <p>- BOD 2 mg/dm³ to 500 mg/dm³</p>	<p>In - house method: TM 008 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 4500-Cl⁻ B</p> <p>In - house method : TM 009 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 2340 C</p> <p>In - house method : TM 041 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B</p>

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Water	<p>- COD 40 mg/dm³ to 200 mg/dm³</p> <p>- Total Kjeldahl Nitrogen 5 mg/dm³ to 200 mg/dm³</p> <p>- Oil and grease 2 mg/dm³ to 100 mg/dm³</p>	<p>In - house method : TM 014 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 5220 C</p> <p>In - house method : TM 023 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 4500-NH₃ C and 4500-N_{org} B</p> <p>In - house method : TM 020 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 5520 D</p>

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Water	- Total Solids at 103 °C to 105 °C 25 mg/dm ³ to 4 000 mg/dm ³ - Selenium 5 µg/dm ³ to 50 µg/dm ³	In - house method : TM 015 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 B In - house method : TM 038 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3114 C
3	Wastewater	- pH 4.0 to 10.0	In - house method : TM 001 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - H ⁺ B

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
3 (cont.)	Wastewater	<p>- Total Suspended Solids at 103 °C to 105 °C 10 mg/dm³ to 1 000 mg/dm³</p> <p>- Total Dissolved Solids at 180 °C 50 mg/dm³ to 4 000 mg/dm³</p> <p>- Cadmium 0.05 mg/dm³ to 0.9 mg/dm³</p> <p>- Copper 0.05 mg/dm³ to 5 mg/dm³</p>	<p>In - house method : TM 016 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D</p> <p>In - house method : TM 017 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C</p> <p>In - house method : TM 040 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 3111 B</p>

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
3 (cont.)	Wastewater	- Zinc 0.05 mg/dm^3 to 5 mg/dm^3 - Chromium 0.05 mg/dm^3 to 5 mg/dm^3 - Nickel 0.10 mg/dm^3 to 4 mg/dm^3 - Manganese 0.05 mg/dm^3 to 5 mg/dm^3 - Lead 0.10 mg/dm^3 to 2 mg/dm^3 - Iron 0.10 mg/dm^3 to 5 mg/dm^3	In - house method : TM 040 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3111 B

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
3 (cont.)	Wastewater	<p>- Total Hardness (Calculated as CaCO_3) 5 mg/dm^3 to $2\,000 \text{ mg/dm}^3$</p> <p>- BOD 4 mg/dm^3 to $7\,000 \text{ mg/dm}^3$</p> <p>- COD 40 mg/dm^3 to $3\,000 \text{ mg/dm}^3$</p>	<p>In - house method : TM 009 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 2340 C</p> <p>In - house method : TM 041 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B</p> <p>In - house method : TM 014 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 5220 C</p>

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
3 (cont.)	Wastewater	<p>- Total Kjeldahl Nitrogen 5 mg/dm³ to 200 mg/dm³</p> <p>- Oil and Grease 2 mg/dm³ to 1 000 mg/dm³</p> <p>- Total Solids at 103 °C to 105 °C 25 mg/dm³ to 4 000 mg/dm³</p>	<p>In - house method : TM 023 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 4500-NH₃ C and 4500-N_{org} B</p> <p>In - house method : TM 020 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 5520 D</p> <p>In - house method : TM 015 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 2540 B</p>

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
3 (cont.)	Wastewater	- Selenium $5 \mu\text{g}/\text{dm}^3$ to $50 \mu\text{g}/\text{dm}^3$	In - house method : TM 038 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3114 C

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
4	Environmental noise	- Sound level Equivalent sound level $L_{eq,T}$ 30 dB (A) to 120 dB (A) Maximum sound level L_{max} 30 dB (A) to 120 dB (A)	In - house method : TM 201 based on ISO 1996-2 : 2007

Issue Date : 7th November 2019

Signature :



(Mrs. Pochaman Tagheen)

Director of Bureau of Laboratory Accreditation

Initial Issue Date 23rd September 2008

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