

ภาคผนวก ช

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์

CERTIFICATE OF CALIBRATION

Certificate No.: C0-1908005/22 Page 1 of total 4 pages

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

Equipment
pH Meter
Manufacturer
METTLER TOLEDO
Model
SevenCompact S220
Serial No.
B327527211
ID No.
WWL 0068
Description
Range : 0 - 14 pH, Resolution : 0.01 pH

Environmental Conditions
Ambient Temperature: (20 ± 2) °C
Relative Humidity: (50 ± 10) %
Atmospheric Pressure:
Jayhawks Laboratory (CL&GL)
Calibration Location
19 August 2022
Received Date
19 August 2022
Calibration Date

Date of Issue
22 August 2022

Checked by
() (Krisyos K.) () (Sakda Y.)
() (Patiphan K.) () (Onapa P.)
() (Pongsak H.) () (Nithong K.)
() (Kanung C.) () (Nonthachai K.)
() (Pramong P.) () (Noppol P.)

Approved by
(Signature)
Representative of Managing Director
(Dr. Ekachai Putitwong)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of the Thai Heart Calibration Co., Ltd.

FE-169

REV.02 02/24/21

Certificate No.: C0-1908005/22

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	081020	Jan. 22, 2023	NIMT
	7.01	020221	Jan. 18, 2023	
	10.00	091020	Feb. 7, 2023	

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Documenting Process Calibrator	753	3101007	10-0804001/22	Apr. 7, 2023	THC
Digital Thermometer with Sensor	1523 / 5622	1709138 / 4605984-005	10-1006004/22	Jun. 9, 2023	

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	Nominal Value	UUC Reading	Uncertainty
(mV)	(pH)	pH	(± mV)
177.48	4.00	4.01	0.060
0.00	7.00	7.00	0.060
-177.48	10.00	10.01	0.060

UUC : Unit Under Calibration

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

Calibrated by

Kitipong

REV.02 02/24/21

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Certificate No.: C0-1908005/22

Page 3 of total 4 pages

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	185.9	0.013
7.01	7.01	9.3	0.013
10.00	10.01	-164.9	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%.

Certificate No.: C0-1908005/22

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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	10-1011001/21	Nov. 10, 2022	THC
Platinum Resistance Thermometer	5626	4854	C0A30047	Oct. 22, 2023	FLUKE
Liquid Bath	XORTS-40A	XO111019	10-0306002/21	Jun. 3, 2023	THC

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

- THC, Thai Heart Calibration Co., Ltd.
- FLUKE, Fluke Corporation, U.S.A.

Measurement Results:

(X) Without Adjustment

Dimension of probe : Diameter 4 mm. Sensor Type : RTD (PT100)

Immersion Depth (mm.)	Standard Reading ($^{\circ}\text{C}$)	UUC Reading ($^{\circ}\text{C}$)	Correction ($^{\circ}\text{C}$)	Uncertainty ($\pm ^{\circ}\text{C}$)
120	22.00	22.0	0.00	0.060
120	25.00	25.0	0.00	0.060
120	28.00	28.0	0.00	0.060

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 -

CERTIFICATE OF CALIBRATION

Certificate No.: C0-2007006/22 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.
WWL 0136
Description
-

Environmental Conditions
Ambient Temperature: (20 ± 2) °C
Relative Humidity: (50 ± 10) %
Atmospheric Pressure: -

Calibration Location
Jayhawks Laboratory (CL&GL)
Received Date
20 July 2022
Calibration Date
20 July 2022

Date of Issue
21 July 2022

Checked by

Approved by


Act as Technical Manager

Representative of Managing Director

(Dr. Ekachai Putirirwong)

() (Krisyos K.) () (Sakda Y.)
() (Paiphon K.) () (Omnapa P.)
() (Pongsak H.) () (Nitiphong K.)
() (Kanung C.) () (Nonthachai K.)
() (Pramong P.) () (Noppol P.)

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FE-169

REV.02 02/24/21

Certificate No.: C0-2007006/22

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 :

Material	Batch Value	Lot Number	Due Date	Traceability
Conductivity Standard Solution	151.1 µS/cm 1.421 mS/cm	S211008031 S220112015	Jan. 18, 2023 May 16, 2023	SCP Science

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

Measurement Results:

Conductivity Standard Solution	Measured Value	Correction	Uncertainty (±)
151.1 µS/cm	150.9 µS/cm	0.2 µS/cm	1.5 µS/cm
1.421 mS/cm	1.423 mS/cm	-0.002 mS/cm	0.0052 mS/cm

Note : Adjustment points: 151.1µS/cm 1.421mS/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

K'itipong

REV.02 02/24/21

FE-169



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CALIBRATION LABORATORY

AUTOMATION SERVICE CO.,LTD.



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CALIBRATION LABORATORY

AUTOMATION SERVICE CO.,LTD.

SV 201003/2023

Cert. No. WAC-065
Page 1 of 2

CERTIFICATE OF CALIBRATION

Instrument : DO Meter
Model : DO-31P
Serial No. : 780065
Manufacturer : TOA-DKK
Measuring Range : 0.00 ~ 20.00 mg/l

Machine : -
Location : -

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

Date Of Received : 05 / 01 / 2023
Date Of Calibration : 05 / 01 / 2023

Ambient Condition : Temperature 25 °C
Humidity 50 % RH

Calibrated By : P. Yooyen
(Ms. Phanee Yooyen)
Technician

Approved By : Prasit Efor
(Mr. Nipon Phungsomsak)
Technical Manager

Date Of Issue : 09 / 01 / 2023

This Certificate may not be reproduced other than in full, except with the prior written approval of the head of the industrial instruments calibration center.

Instrument : DO Meter
Model : DO-31P
Serial No. : 780065

Cert. No. WAC-065
Page 2 of 2

Calibrate Procedure

- ☐ This instrument was calibrated by comparison with standard solution (PH/ORP)
- ☐ This instrument was calibrated by comparison with scattering plate value (Turbidity)
- ☐ This instrument was calibrated by comparison with conductivity (Conductivity)
- ☒ This instrument was calibrated by comparison with Sodium sulfite anhydrous (DO)

Condition of this result of calibration

1). Reference Standard Solution

Standard	Lot No	Batch	Cert. No.	Due Date
Sodium Sulfite Power	1.06657.0500	K54224057	-	30 Sep 2023

2). Traceability This certification is traceable to

- ☒ Merck KGaA 64271 Darmstadt
- ☐ DKK Corporation

Result Of Calibration

Standard Solution (mg/l) at 24.1°C	Before Adjust		After Adjust	
	Indicator	Error	Indicator	Error
Zero	0.00	+ 0.05	0.00	-
Span	8.25	- 1.12	8.25	-

DO Electrode No. OE270AA(5) S/N 111F0029

Calibrated By : P. Yooyen
(Ms. Phanee Yooyen)
Technician

Certificate No.: MC 2207678

The Reference Standard :

Description	Certificate No.	Serial No.	Due date
Data Acquisition/Switch Unit	MC 2114432	MY44096104	20 December 2022
With Thermocouple Type " T " ID. No.2/1 to 2/9			

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

- Master Calibration Co., Ltd.

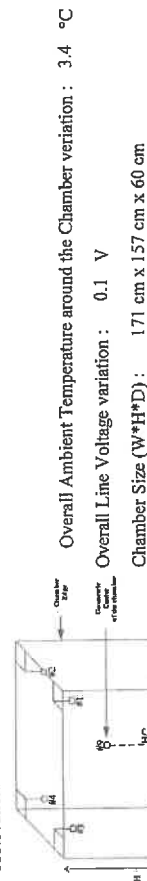
I. Calibration Procedure:

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.



Checked by : **Thanagorn**



**TEMPERATURE
CONTROLLER ENCLOSURES**

Certificate No.: MC 2207678

Page 1 of 3

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

Reference Job No. : 22-1601 **Received Date** : 12 July 2022

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 certificate number (MC 2207678) has been attached to the case.

Method : In-House calibration procedure MWI-T-033 this method is reference to TLAS G-20 "Temperature Controlled Enclosures".

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

Environmental Conditions : Ambient Temperature : (25.8 to 27.5) °C

Relative Humidity : (48.8 to 52.2) %

Date of Calibration : 12 July 2022 **Date of Issue** : 19 July 2022

Checked by : **Thanagorn** **Approved by :** **Aittipong**
Thanagorn Limchaicharoen Aittipong Kanjanawasit
(Calibration Supervisor) (Technical Manager)

The uncertainties are for a confidence probability of approximately 95%

This certificate is issued in accordance with the conditions of accreditation granted by the National Standardization Council of Thailand-Office of the National Standardization Council that 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 except with the prior written approval of Master Calibration Co.,Ltd.

Certificate No.: MC 2207678

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	
2.5	3.5	3.6	3.7	3.5	3.6	3.4	3.4	3.3	3.4	1.1

Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
2.0	2.5	1.5	0.6	3.1

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

This report will certify of the calibrated equipment only.

End of Certificate

Checked by :

Thanagorn

Certificate of Calibration

TEMPERATURE CONTROLLER ENCLOSURES



Certificate No.: MC 2303684

Page 1 of 3



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

Reference Job No. : 23-0729 Received Date : 23 March 2023
Description : Oven
Manufacturer : Memmert Model : UF260
Serial No. : BG20.0814 ID. No. : WWL0212
Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2303684) has been attached to the case.
Method : In-House calibration procedure MWL-T-033 this method is reference to TLAS G-20 "Temperature Controlled Enclosures".

Location of Calibration : Water Analysis Center Co., Ltd. ; Laboratory.
Environmental Conditions : Ambient Temperature : (27.1 to 29.3) °C
Relative Humidity : (38.0 to 72.2) %

Date of Calibration : 23 March 2023 Date of Issue : 24 March 2023

Checked by :

Thanagorn
Thanagorn Linchacharoen
(Calibration Supervisor)

Approved by :

Aittipong
Aittipong Karjanwasit
(Technical Manager)

The uncertainties are for a confidence probability of approximately 95%

This certificate is issued in accordance with the conditions of accreditation granted by the National Standardization Council of Thailand-Office of the National Standardization Council that has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the

Certificate No.: MC 2303684

Page 2 of 3

The Reference Standard :

Description	Certificate No.	Serial No.	Due date
Data Acquisition/Switch Unit With Thermocouple Type "T" ID. No.17/1 to 17/9	MC 2303173	MY41010916	9 March 2024

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.

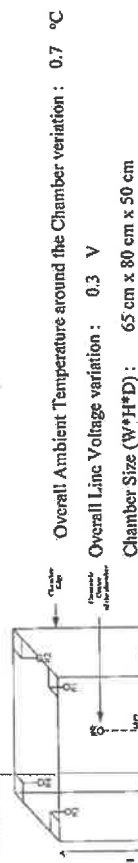


Figure 1 : Sensor Installation Location

Certificate No.: MC 2303684

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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	
104	103.7	103.9	103.6	103.8	103.7	104.2	104.1	104.2	104.3	0.58
180	179.4	179.8	179.4	179.7	179.4	179.9	179.8	180.2	180.0	1.3

Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104	104	0.32	0.84	1.2
180	180	0.4	0.9	1.3

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

This report will certify of the calibrated equipment only.

End of Certificate



Certificate of Calibration



Equipment: Balance
Model: BL 210S
Serial No. (or ID.): 16808131 (WWL 0022)
Manufacturer: Sartorius
Condition: In condition

Certificate No.: C01223710
Issued Date: 07 December 2022
Job No.: KSPR2215481
Page: 1 of 2

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 25 °C ± 0.9 °C
Humidity 48 %RH ± 4.9 %RH

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

Calibration By: Mr. Pradit Sitboot
Calibration Date: 07 December 2022
The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02221864

Signature

(Mr. Pradit Sitboot)

Person in charge

Signature

(Mr. Rungrod Jentitirakulchai)

Authorized signatory

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

DKSH Technology Limited
1201, The Gateway Center
2503, The Gateway Center
2503, The Gateway Center



Certificate No.: C01223710 Page: 2 of 2

Calibration Results:

Without Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

Nominal Test Value	Reference Points (g)				
	A	B	C	D	E
-	0.0001	0.0001	0.0001	-0.0002	-0.0001

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00007
200	0.00007

Error of Indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.00001	1.0000	0.0000	0.00012	2.08
2	2.00001	2.0000	0.0000	0.00012	2.08
5	5.00003	5.0000	0.0000	0.00012	2.07
10	10.00002	10.0000	0.0000	0.00013	2.07
20	20.00001	20.0000	0.0000	0.00013	2.08
50	50.00003	50.0000	0.0000	0.00014	2.04
70	70.00004	70.0001	0.0001	0.00017	2.02
100	100.00002	100.0001	0.0001	0.00018	2.01
120	120.00003	120.0001	0.0001	0.00022	2.01
150	150.00005	150.0003	0.0003	0.00024	2.00
200	200.00006	200.0004	0.0003	0.00030	2.00

The End of Certificate

DKSH Technology Limited
1201, The Gateway Center
2503, The Gateway Center
2503, The Gateway Center

PREVENTATIVE MAINTENANCE (PM) CHECK LIST

FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: 240F3 AA x 19418250004

Customer: Water Analysis Center Co., Ltd.

Date: 27 Apr 2023

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

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 = 99% (should be $\leq 64\%$ or $\leq 380V$)

Flame, Check D2 lamp is work

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

Mechanism

- ☒ 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 = 0.0000 Abs (should be ≤ 0.00050 Abs)

☒ Flame, Test high solids nebulizer setting use

-Air/facet Cu 5 ppm = 0.85 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 : Dr. Sirin

Customer : บริษัท ไทยยูนิค จำกัด

(Signature)

(Signature)



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาวิทย์ แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
80-82 Prachathipat Rd., Bangkokphrom, Pranakorn, Bangkok 10200
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thauai@thaiunique.com, Website : www.thaiunique.com

PREVENTATIVE MAINTENANCE (PM) CHECK LIST

FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: 840 z AA & M918230004

Customer: Walter Analysis Center Co., Ltd.

Date: 26 Apr 2023

Safety

- ☐ Flame, Inspect/replace o-ring nebulizer, spray chamber and burner N/A
- ☐ Flame, Clean nebulizer, spray chamber and burner N/A
- ☐ Flame, Check liquid trap interlock, burner interlock, pressure relief bung N/A
- ☒ interlock and shield interlock
- ☒ Furnace, Clean work head, electrode and shroud
- ☒ Furnace, Clean PSD and PSD tray
- ☒ Furnace, Check water pressure
- ☒ 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 = 324.7 nm
- ☒ Check that PMT % Gain the copper at 324.8 nm, 4 mA, 0.5 nm slit width, Gain = 4.9% (should be $\leq 64\%$ or $\leq 380V$)
- ☐ Flame, Check D2 lamp is work N/A



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาวิทย์ แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
80-82 Prachathipat Rd., Bangkokphrom, Pranakorn, Bangkok 10200
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thauai@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**

**Option for Graphite Zeeman only

Mechanisms

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

Analytical performance

- ☒ Clear the sample compartment
- ☐ Flame, Check uptake rate form 7.2-10.6 mL per minute = mL/min N/A
- ☒ Test Photometric noise, STDV = 0.0002 Abs (should be ≤ 0.00050 Abs)
- ☐ Flame, Test high solids nebulizer setting use N/A
- ☐ -Air/acet Cu 5 ppm = Abs, and Precision (%RSD) = % (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 = 0.49 Abs, and Precision (%RSD) = 1.7 % (should be ≥ 0.15 Abs and $\leq 4.0\%$ RSD)

SIGN :

Engineer :

Singya Nuchavan
Singya Nuchavan

Customer :

Walter Analysis Center Co., Ltd.
(บริษัท วอลเตอร์ แอนาไลซิส เซ็นเตอร์ จำกัด)

BSC Certification Test Report

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Certificate No. : M01075/22
Customer Name : LABORATORY WATER ANALYSIS CENTER COMPANY LIMITED
Customer Address : 1/94 Moo 5 T.Kanharu, A.U-Thui,
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 : 23/09/2022
Due Date : 23/09/2023 **or after HEPA filters are replaced or unit is moved**

Test by : Mr. Piyapong Pusua

Approved by : 
(Mr. Kridsada Thinhuaotai)
Authorized Signatory

Issued Date : 26/09/2022

This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).

This certificate may not be reproduced other than in full except with the prior written approval of the Megafil Company Limited.

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Certificate No. : M01075/22

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	100mm

Measurement Data.

0.36	0.42	0.43	0.41
0.40	0.34	0.34	0.33

Average velocity 0.38 m/s (75 FPM.) **Velocity range** 0.25-0.50 m/s (49-98 FPM.)

Uniformity(EN: +/-20%avg.) 0.30 - 0.46 m/s (60 - 90 FPM.)

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

Downflow volume (Q) 802 CFM.

Result Summary ☒ Pass ☐ Fail

Equipment used : Thermo Anemometer **Model** 425 **S/N :** 02623979 **Calibration date :** 14/07/2022

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2. Inflow velocity test.

Select method. : ☐ DIM ☒ Exhaust velocity. ☐ MFC's Specifications

0.53	0.47	0.48	0.50	0.51
0.57	0.46	0.52	0.53	0.50
0.54	0.57	0.55	0.52	0.53
0.53	0.51	0.57	0.54	0.51
0.51	0.48	0.53	0.55	0.56

Average Inflow velocity 0.44 m/s (86 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) 344 CFM

Result Summary ☒ Pass ☐ Fail

Adjustments Required ☐ Fan Speed ☐ Damper

Equipment used : Thermo Anemometer Model 425 S/N : 02623979 Calibration date : 14/07/2022

3. HEPA filter leak test.

Measurement Data

HEPA Filter	PAO Upstream Conc.(calculated)	Specification	Measured leak penetration
Supply HEPA Filter	18 µg/L	<0.003%	<0.003%
Exhaust HEPA Filter	18 µg/L	<0.003%	<0.003%

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Leak location

Supply HEPA Filter

Back



Exhaust HEPA Filter

Back



Result Summary ☒ Pass ☐ Fail

Equipment used : Aerosol Photometer Model 2I S/N : 26468 Calibration date 14/07/2022

Equipment used : Smoke Generator Model TDA-6D S/N : 26530

4. Airflow smoke patterns test

Measurement Information

- 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
- 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.
- 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.
- 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.

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Result Summary

Downflow Pattern test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming
View screen retention test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming
Work opening edge retention test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming
Sash/window seal test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming

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

ระบบ Site installation ไม่มีการตรวจสอบ เนื่องจากผู้ไม่พึงประสงค์

6. Illumination Test (Lighting) : Option

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

Lux

620	965	938	561
867	1446	1492	768

Remark :

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7. Ultraviolet Lamp Test (UV) : Option

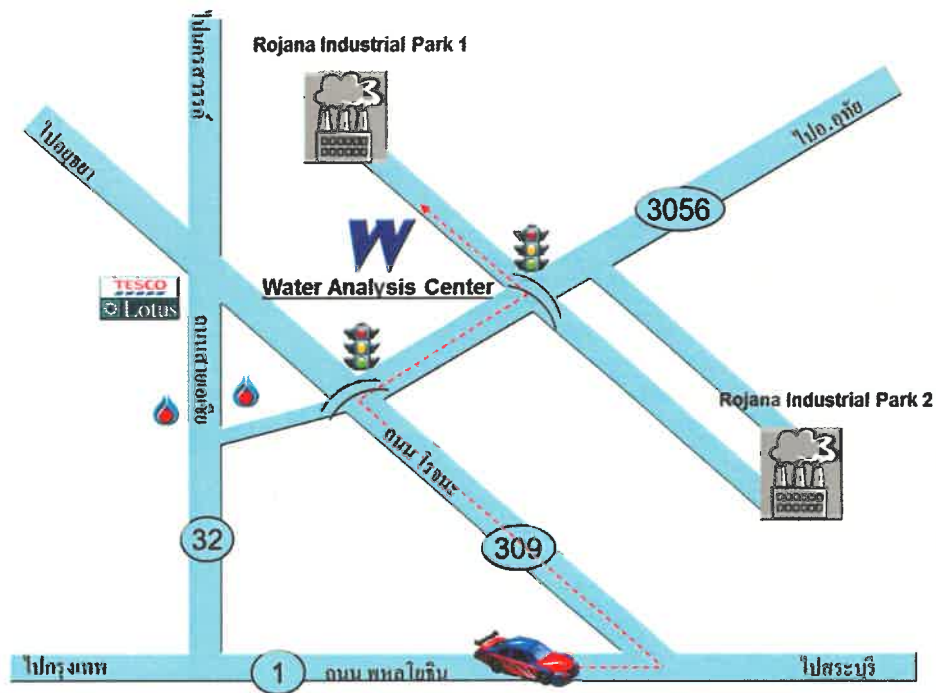
Ultraviolet radiation where UV Lamp are fitted, the intensity of radiation at a wavelength of 254 nm. Shall be not less than 400 mW/m² when measures at work floor surface.

mW/m²

720	1510	1540	760
470	980	990	450

Remark :

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บริษัท ศูนย์วิเคราะห์น้ำ จำกัด

1/94 หมู่ที่ 5 ต.คานหาม อ.อุทัย จ.พระนครศรีอยุธยา 13210

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