

# เอกสารแนบ 6

เอกสารสอบเทียบเครื่องมือ  
ที่ใช้ในการวิเคราะห์

## CERTIFICATE OF CALIBRATION

Certificate No.: C0-1908005/22

Page 1 of total 4 pages

Customer

WATER ANALYSIS CENTER CO., LTD.  
30/5 Soi Vipavadee 60, Vipavadee Rangsit Road,  
Kwaeng Taladbangkhen, Khet Laksi, 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: -

Calibration Location

Jayhawks Laboratory (CL&GL)

Received Date

19 August 2022

Calibration Date

19 August 2022

Date of Issue

22 August 2022

Checked by

( ) (Kris) ( ) (Omnapa P.)  
( ) (Patiphan K.) ( ) (Nitiaphong K.)  
( ) (Pongsak H.) ( ) (Nonthachai K.)  
( ) (Kanung C.) ( ) (Noppol P.)  
( ) (Pramong P.) ( ) (Noppol P.)

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

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     | (± mV)      |
| 177.48           | 4.00          | 4.01        | 177.4  | 0.060       |
| 0.00             | 7.00          | 7.00        | 0.0    | 0.060       |
| -177.48          | 10.00         | 10.01       | -177.4 | 0.060       |

UUC : Unit Under Calibration

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

Certificate No.: C0-1908005/22

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Measurement Results (Cont.):

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

| pH Standard Solution<br>(pH) | Measured Value |        | Uncertainty<br>(± 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       | COA30047      | 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  
**Serial No.** 2657889  
**Description** -

**Model** CON 2700  
**ID No.** WWL 0136

**Environmental Conditions** Ambient Temperature:  $(20 \pm 2) ^\circ\text{C}$   
Relative Humidity:  $(50 \pm 10) \%$   
Atmospheric Pressure: -

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

**Date of Issue** 21 July 2022

( ) (Patiphan K.) ( ) (Ommapa P.)  
( ) (Pongsak H.) ( ) (Nitiphong K.)  
( ) (Kanung C.) ( ) (Nonthachai K.)  
( ) (Pramong P.) ( ) (Noppol P.)

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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 $\mu\text{S/cm}$ | S211008031 | Jan. 18, 2023 | SCP Science  |
|                                | 1.421 $\text{mS/cm}$   | S220112015 | May 16, 2023  |              |

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 ( $\pm$ ) |
|--------------------------------|------------------------|-----------------------|-----------------------|
| 151.1 $\mu\text{S/cm}$         | 150.9 $\mu\text{S/cm}$ | 0.2 $\mu\text{S/cm}$  | 1.5 $\mu\text{S/cm}$  |
| 1.421 $\text{mS/cm}$           | 1.423 $\text{mS/cm}$   | -0.002 $\text{mS/cm}$ | 0.0052 $\text{mS/cm}$ |

Note : Adjustment points: 151.1  $\mu\text{S/cm}$  1.421  $\text{mS/cm}$

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 -



SV 201003/2023

Cert. No. WAC-065  
Page 1 of 2

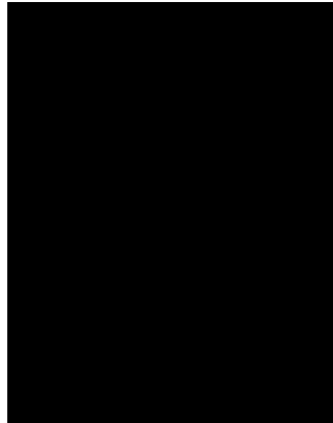
## CERTIFICATE OF CALIBRATION

Instrument : DO Meter  
Model : DO-31P  
Serial No. : 780065  
Manufacturer : TOA-DKK  
Measuring Range : 0.00 ~ 20.00 mg/l  
Customer : Water Analysis Center Co.,Ltd.  
1/94 Moo.5 T.Kanham, A.U.-Thai  
Ayutthaya 13210 Thailand  
Machine : -  
Location : -

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

Ambient Condition : Temperature 25 °C  
Humidity 50 % RH

Calibrated By :



Approved By :

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

- ☒ Merek KGaA 64271 Darmstadt
- ☐ DKK Corporation

### Result Of Calibration

| Standard Solution |      | Before Adjust |        | After Adjust |       |
|-------------------|------|---------------|--------|--------------|-------|
| (mg/l) at 24.1°C  |      | Indicator     | Error  | Indicator    | Error |
| Zero              | 0.00 | 0.05          | + 0.05 | 0.00         | -     |
| Span              | 8.25 | 7.13          | - 1.12 | 8.25         | -     |

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

Calibrated By

Technician

Certificate No.: MC 2207678

Page 2 of 3

**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.

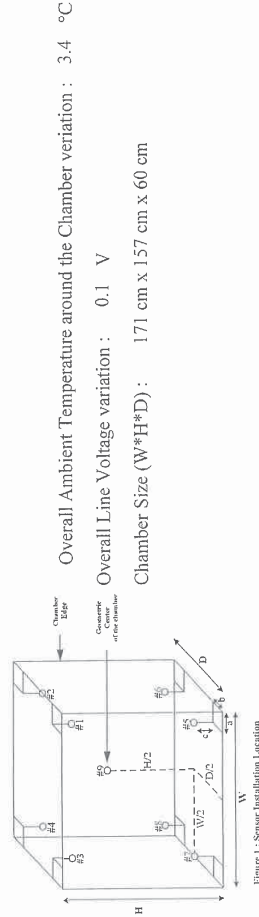
**1. Calibration Procedure:**

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.



**Checked by :**



[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]



**TEMPERATURE  
CONTROLLER ENCLOSURES**

Certificate No.: MC 2207678

Page 1 of 3



|                          |   |               |              |
|--------------------------|---|---------------|--------------|
| Customer                 | Water Analysis Center Co., Ltd.   | Received Date | 12 July 2022 |
| Reference Job No.        | 22-1601   |               |              |
| 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 :**



( 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.

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]



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 : **Thamjorn**

# 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.Kantiam, A.U-Thai, Ayuthaya 13210.

Reference Job No. : 23-0729 Received Date : 23 March 2023

Description : Oven

Manufacturer : Memmert Model : UF260

Serial No. : B620.0814 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 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 : ( 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 :

(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

Certificate No.: MC 2303684

Page 2 of 3

**The Reference Standard :**

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

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

- Master Calibration Co., Ltd.

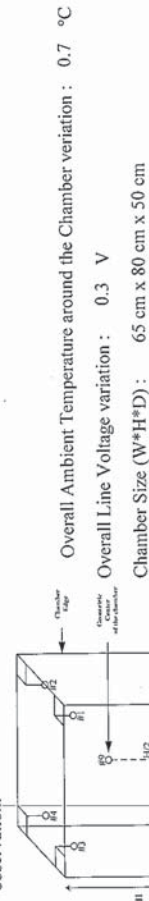
**1. Calibration Procedure:**

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.



Overall Ambient Temperature around the Chamber variation : 0.7 °C  
Overall Line Voltage variation : 0.3 V  
Chamber Size (W\*H\*D) : 65 cm x 80 cm x 50 cm

Certificate No.: MC 2303684

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 |                   |
| 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.): 15808131 (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. (น้ำหลวงจิ่ง)  
1/94 Moo 5, Rojana Industrial Park, Rojana Road,  
Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

**Calibration By:** Mr. Pradi Siriboot  
**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

### Person in charge

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

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

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

DKSH Technology Limited  
2533 หมู่บ้านสหกรณ์ ถนนพหลโยธิน เขตจตุจักร กรุงเทพฯ 10200

### Authorized signatory

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

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

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

DKSH Technology Limited  
2533 หมู่บ้านสหกรณ์ ถนนพหลโยธิน เขตจตุจักร กรุงเทพฯ 10200



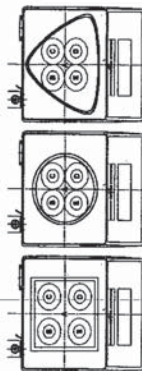
Certificate No.: C01223710

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         | 2.06 |
| 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



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาปิติ 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 : thauunique@thaiunique.com, Website : www.thaiunique.com

PREVENTATIVE MAINTENANCE (PM) CHECK LIST

FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: 240F3 AA & MY18230004

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
- ☐ 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 = 39% (should be  $\leq 64\%$  or  $\leq 380V$ )
- ☒ Flame, Check D2 lamp is work



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80-82 ถนนประชาปิติ 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 : thauunique@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 = 0.0000 Abs (should be  $\leq 0.00050$  Abs)
- ☒ Flame, Test high solids nebulizer setting use
  - Air/acet 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 Precision (%RSD) = \_\_\_\_\_ % (should be  $\geq 0.15$  Abs and  $\leq 4.0\%$  RSD)

SIGN :  
Engineer



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาปไทย์ แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200  
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PREVENTATIVE MAINTENANCE (PM) CHECK LIST

FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: 240Z AA & M918230004

Customer: Water 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 lead, 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 SpectraAA
- ☒ 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



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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  $\leq 0.00050$  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  $\geq 0.15$  Abs and  $\leq 4.0\%$  RSD)

SIGN :

Engineer :



## BSC Certification Test Report

Page 1 of 6

**Certificate No. :** M01075/22

**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 :** 23/09/2022

**Due Date :** 23/09/2023 **or after HEPA filters are replaced or unit is moved**

**Test by :** Mr. Piyapong Pusta

**Approved by :**

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.

Page 2 of 6

**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        |
|-------------|-----------------|-------------------------|------------------------|---------------------|
| 2           | 8               | 1/4,3/4                 | 1/8,3/8                | Above sash<br>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

Certificate No. : M01075/22

## 2. Inflow velocity test.

Select method. : ☐ DIM ☒ Exhaust velocity. ☐ MFG'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  $\geq 0.40$  m/s (  $\geq 79$  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 $\mu\text{g/L}$             | <0.003%       | <0.003%                   |
| Exhaust HEPA Filter | 18 $\mu\text{g/L}$             | <0.003%       | <0.003%                   |

Certificate No. : M01075/22

## Leak location

Supply HEPA Filter

Back



Exhaust HEPA Filter

Back



Result Summary ☒ Pass ☐ Fail

Equipment used : Aerosol Photometer Model 21 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.

Certificate No. : M01075/22

**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 เนื่องจากตู้ไม่มีฟังก์ชันนี้

**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 :**

Certificate No. : M01075/22

**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/m<sup>2</sup> when measures at work floor surface.

mW/m<sup>2</sup>

|     |      |      |     |
|-----|------|------|-----|
| 720 | 1510 | 1540 | 760 |
| 470 | 980  | 990  | 450 |

**Remark :**

-o0o-