# 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 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** **Approved by**

Act as Technical Manager — Representative of Managing Director

( ) ( Krisyosl K. ) ( ) ( Sakda Y. ) ( Dr. Ekachai Puttitwong )
( ) ( Patiphan K. ) (✓) ( Onnapa P. )
( ) ( Pongsak H. ) ( ) ( Nitiphong K. )
( ) ( Kanung C. ) ( ) ( Nonthachai K. )
( ) ( 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 | I0-0804001/22 | Apr. 7, 2023 | THC |
| Digital Thermometer with Sensor | 1523 / 5622 | 1709138 / 4605984-005 | I0-1006004/22 | 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)

Calibrated by Kittipong

Measurement Results (Cont.):

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

| pH Standard Solution | Measured Value | | Uncertainty |
|---|---|---|---|
| ( pH ) | ( pH ) | ( mV ) | ( ± pH ) |
| 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 ± 0.2°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%.



THC Calibration Services
ilac-MRA ANAB ACCREDITED CALIBRATION LABORATORY AC-2695



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 | I0-1011001/21 | Nov. 10, 2022 | THC |
| Platinum Resistance Thermometer | 5626 | 4854 | C0A30047 | Oct. 22, 2023 | FLUKE |
| Liquid Bath | XORTS-40A | XO111019 | I0-0306002/21 | 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 Comporation, U.S.A.

Measurement Results: ( X ) Without Adjustment

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

| Immersion Depth (mm.) | Standard Reading (°C) | UUC Reading (°C) | Correction (°C) | Uncertainty (± °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 -

THC Calibration Services

# 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

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

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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 | 151.1 µS/cm | S211008031 | Jan. 18, 2023 | SCP Science |
| | 1.421 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 ( ± ) |
|---|---|---|---|
| 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 Kittipong

SV 201003/2023



# 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 (for)
( 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.



AUTOMATION SERVICE CO.,LTD.
CALIBRATION LABORATORY

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



**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 | + 0.05 | 0.00 | - |
| Span | 8.25 | 7.13 | - 1.12 | 8.25 | - |

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

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

Automation Service Co.,Ltd. 929/92-1 Soi Pattanakarn30, Pattanakarn Rd. Suanluang, Suanluang, Bangkok 10250
Tel. 02-319-9994 ext. 721-725 | E-mail: sale@automation.co.th, service@automation.co.th | www.automation.co.th

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MASTER CALIBRATION CO.,LTD.

# Master Calibration Co.,Ltd.

547 Soi Ratchadanivat, Kwaeng Samsennok, Khet Huaykwang, Bangkok 10310
Tel. : (02) 274 2978-9, (02) 2742987-8 Fax : (02) 274 2518, (02) 274 2989
Website : www.mastercalibration.com E-mail : calibrate@mastercalibration.com

## TEMPERATURE CONTROLLER ENCLOSURES

ilac-MRA
NSC-TISI-TIS 17025
CALIBRATION 0183

**Certificate No.: MC 2207678**



| | | | |
|---|---|---|---|
| Customer | : Water Analysis Center Co., Ltd.<br>1/94 Moo 5, T.Kantham, 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<br>Relative Humidity : ( 48.8 to 52.2 ) % | | |
| Date of Calibration | : 12 July 2022 | Date of Issue | : 19 July 2022 |

**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 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.



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**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 Carlibration 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 eigh 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 minmum measured temperatures throughout observation.

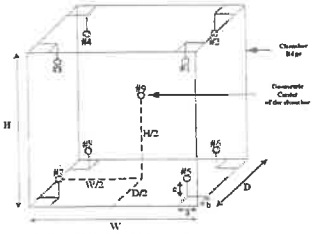

Figure 1 : Sensor Installation Location

Overall Ambient Temperature around the Chamber veriation : 3.4 °C
Overall Line Voltage variation : 0.1 V
Chamber Size (W*H*D) : 171 cm x 157 cm x 60 cm

**Checked by :** Thanagorn

**Certificate No.: MC 2207678**



**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





# Master Calibration Co.,Ltd.

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## Certificate of Calibration

## TEMPERATURE CONTROLLER ENCLOSURES

ilac-MRA
NSC-TISI-TIS 17025 CALIBRATION 0183

**Certificate No.: MC 2203933**



| | | | |
|---|---|---|---|
| Customer | : Water Analysis Center Co., Ltd.<br>1/94 Moo 5, T.Kantham, A.U-Thai, Ayutthaya 13210. | | |
| Reference Job No. | : 22-0740 | Received Date | : 24 March 2022 |
| 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 2203933 ) 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 : ( 30.5 to 32.6 ) °C<br>Relative Humidity : ( 56.2 to 61.2 ) % | | |
| Date of Calibration | : 24 March 2022 | Date of Issue | : 28 March 2022 |

**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 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.

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Website : www.mastercalibration.com E-mail : calibrate@mastercalibration.com



**The Reference Standard :**

| Description | Certificate No. | Serial No. | Due date |
|---|---|---|---|
| Data Acquisition/Switch Unit | MC 2106035 | 93000641 | 8 August 2022 |

With Thermocouple Type " T " ID. No.30/1 to 30/9

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

- Master Carlibration 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 eigh 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 minmum measured temperatures throughout observation.

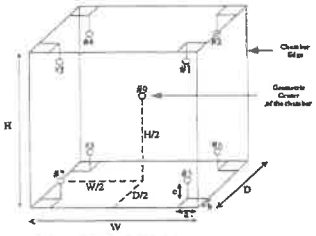

Figure 1 : Sensor Installation Location

Overall Ambient Temperature around the Chamber veriation : 1.1 °C

Overall Line Voltage variation : 0.2 V

Chamber Size (W*H*D) : 65 cm x 80 cm x 50 cm

Checked by : Thanagorn



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Website : www.mastercalibration.com E-mail : calibrate@mastercalibration.com



**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 | |
| 104.0 | 103.9 | 103.9 | 103.9 | 104.1 | 104.3 | 104.2 | 104.2 | 104.1 | 104.0 | 0.67 |
| 180.0 | 179.3 | 179.3 | 179.3 | 179.5 | 180.1 | .180.3 | 180.5 | 180.4 | 180.1 | 0.99 |

**Chamber Characterization Result**

| Controller Temperature (°C) | Indicating Temperature (°C) | Temperature Stability (±°C) | Temperature Uniformity (°C) | Overall Variation (°C) |
|---|---|---|---|---|
| 104.0 | 104.0 | 0.27 | 0.45 | 0.92 |
| 180.0 | 180.0 | 0.29 | 1.00 | 1.65 |

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

NSC-TLSI-TIS 17025 Calibration 0007

# Certificate of Calibration

| | | | |
|---|---|---|---|
| **Equipment:** | Balance | Certificate No.: | C01221685 |
| **Model:** | BL210S | Issued Date: | 08 June 2022 |
| **Serial No. (or ID.):** | 15808131 (WWL 0022) | Job No.: | KSPR2206906 |
| **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 27 °C ± 0.5 °C
Humidity 42 %RH ± 4.7 %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. Preecha Phooarsai

**Calibration Date:** 08 June 2022

**The Method used:** In-house method, SPCC-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 SPC RT Co., Ltd. Certificate No. C02220794

(Mr. Preecha Phooarsai)
Person in charge

บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd.

(Mr. Rungrod Jenkittrakulchai)
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.

บริษัท เอสพีซี อาร์ที จำกัด
SPC RT CO., LTD.
สาขาที่ 00003 1194 ซอยวิชิตรมนตรีลิล 57 ถนนสุขุมวิท 101/1 แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10250
Branch 00003 1194 Soi Wachirathonsethlil 57, Sukhumvit 101/1 Road, Bangchak, Phrakhanong, Bangkok 10250 Thailand
Tel: 0 2185 4333 Ext. 3300-3308 Fax: 0 2185 4424 E-mail: info.spcc@spc-rt.com Website: www.spc-rt.com

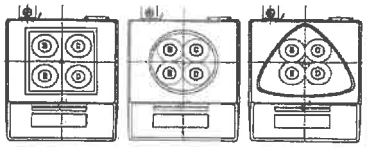




## Calibration Results:

**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** 100 (g)

| Reference Points (g) | | | | |
|---|---|---|---|---|
| A | B | C | D | E |
| - | 0.0001 | 0.0001 | -0.0002 | -0.0002 |

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

| Nominal test value (g) | Standard Deviation |
|---|---|
| 20 | 0.00004 |
| 200 | 0.00004 |

**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 | 0.99998 | 1.0000 | 0.0000 | 0.000097 | 2.02 |
| 2 | 1.99999 | 2.0000 | 0.0000 | 0.000098 | 2.02 |
| 5 | 5.00000 | 5.0000 | 0.0000 | 0.000099 | 2.02 |
| 10 | 10.00002 | 10.0000 | 0.0000 | 0.00010 | 2.02 |
| 20 | 19.99995 | 20.0000 | 0.0000 | 0.00011 | 2.01 |
| 50 | 50.00002 | 50.0000 | 0.0000 | 0.00012 | 2.01 |
| 70 | 69.99997 | 70.0000 | 0.0000 | 0.00015 | 2.00 |
| 100 | 100.00007 | 100.0001 | 0.0000 | 0.00017 | 2.00 |
| 120 | 120.00002 | 120.0000 | 0.0000 | 0.00020 | 2.00 |
| 150 | 150.00009 | 150.0002 | 0.0001 | 0.00023 | 2.00 |
| 200 | 199.99993 | 200.0003 | 0.0004 | 0.00029 | 2.00 |

**The End of Certificate**

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SPC RT CO., LTD.
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# BSC Certification Test Report



**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 Pusua

**Approved by :**

(Mr.Kridsada Thinhuatoei)
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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**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. ☐ 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** ≥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**

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.

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**Result Summary**

| | | |
|---|---|---|
| **Downflow Pattern test** | ☑ **Accept** | ☐ **Non-Conforming** |
| **View screen retention test** | ☑ **Accept** | ☐ **Non-Conforming** |
| **Work opening edge retention test** | ☑ **Accept** | ☐ **Non-Conforming** |
| **Sash/window seal test** | ☑ **Accept** | ☐ **Non-Conforming** |

**5. Site installation**

| | | | |
|---|---|---|---|
| **Sash Alarm.** | ☐ **Pass** | ☐ **Fail** | ☑ **N/A** |
| **Interlock System.** | ☐ **Pass** | ☐ **Fail** | ☑ **N/A** |
| **Exhaust System Performance** | ☐ **Pass** | ☐ **Fail** | ☑ **N/A** |

**Remark / Recommendation**

ระบบ Site installation ไม่มีการตรวจสอบ เนื่องจากตู้ไม่มีฟังก์ชั่นนี้

**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**

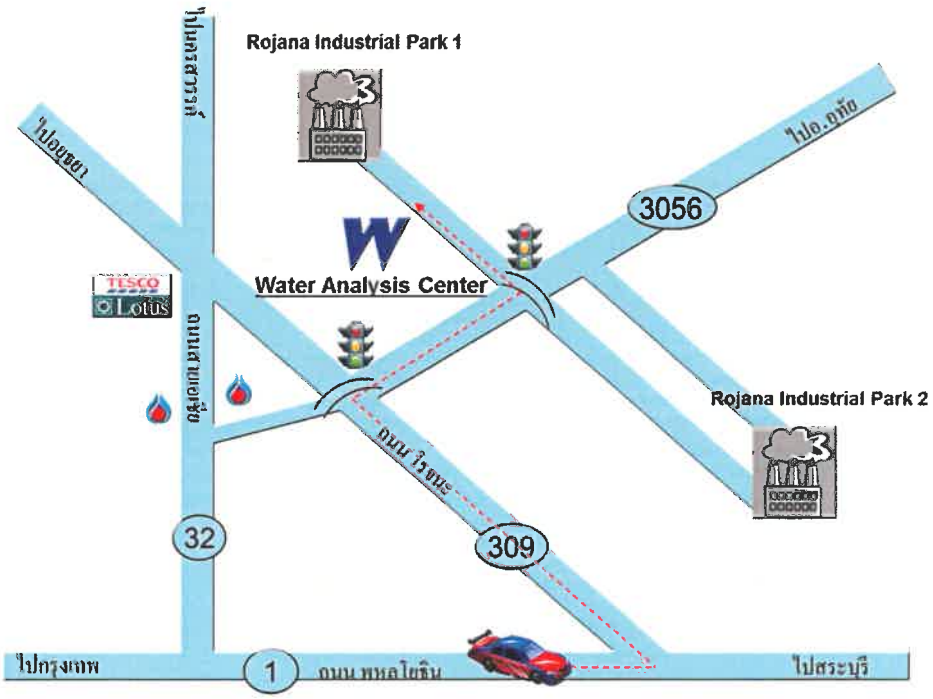
Ultraviolet radiation where UV Lamp are fitted, the intensity of radiation at a wavelength of 254 nm. Shall be not less than 400 mW/m2 when measures at work floor surface.

$mW/m^2$

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

**Remark :**

-o0o-





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