

ภาคผนวก จ  
เอกสารสอบเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์



รายงานผลการปฏิบัติงาน: พงสาร รุ่งเรืองและทีมวิศวกรทะเลบัวขาว ร้อย และสมาคมการศึกษาราชบัณฑิตยสถาน กรุงเทพมหานคร  
โครงการ Global Centre Joint Hotel Terminal 21 (ระยะดำเนินการ) ระหว่างเดือนกุมภาพันธ์-มิถุนายน พ.ศ. 2566  
บริษัท เอส โอเทค แมเนจเม้นท์ จำกัด

รายการใบรับรองสอบเทียบ/ควบคุม เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับวิเคราะห์คุณภาพสิ่งแวดล้อม

| No.   | Instrument/Equipment                       | Parameter                 | Manufacturer   | Model/Serial No.              | Calibrator  | Certification No. | Date of Calibration | Due date of Calibration* | Remark |
|---|--|---------------------------|----------------|-------------------------------|---|-------------------|---------------------|--------------------------|--------|
| เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์คุณภาพน้ำ |  |                           |                |                               |   |                   |                     |                          |        |
| 1   | pH Meter                                   | pH                        | Mettler-Toledo | Seven Easy S20 / 1231155210   | National Food Institute, Ministry of Industry, Thailand | 2301846-201-01    | 24 Feb 23           | 23 Feb 24                | -      |
| 2   | pH Meter                                   |                           | Mettler-Toledo | Seven Easy S20 / 1230252712   | National Food Institute, Ministry of Industry, Thailand | 2302181-201-01    | 24 Mar 23           | 22 Mar 24                | -      |
| 3   | Analytical Balance (Repeatability 0.01 mg) | Suspended Solid           | Mettler-Toledo | XSR205DU / C210685394         | Technology Promotion Association (Thailand-Japan)       | 23040113          | 26 Apr 23           | 24 Apr 24                | -      |
| 4   | Hot Air Oven                               |                           | Memmert        | UF55 / B21611666              | Technology Promotion Association (Thailand-Japan)       | 22TM1490          | 19 Oct 22           | 18 Oct 23                | -      |
| 5   | Analytical Balance (Repeatability 0.1 mg)  | FM, Oil and Grease        | Mettler-Toledo | XSH204 / C117635043           | National Food Institute, Ministry of Industry, Thailand | 2302287-201-01    | 10 May 23           | 8 May 24                 | -      |
| 6   | BOD Incubator                              | Biochemical Oxygen Demand | Atco           | UC1-1320 / (UAE:WAC.015/2561) | Technology Promotion Association (Thailand-Japan)       | 23TM269           | 15 Feb 23           | 14 Feb 24                | -      |
| 7   | BOD Incubator                              |                           | Atco           | UR 1320 / (UAE:WAC.018/2551)  | Technology Promotion Association (Thailand-Japan)       | 23TM375           | 12 Apr 23           | 10 Apr 24                | -      |
| 8   | Digestor Unit                              | Total Kjeldahl Nitrogen   | FOSS TECATOR   | 2520auto / 91794489           | National Food Institute, Ministry of Industry, Thailand | 2302813-201-01    | 30 Mar 23           | 28 Mar 24                | -      |
| 9   | Distillation Unit (Kjeldahl Method)        |                           | FOSS TECATOR   | K78102 / 91889052             | FOSS South East Asia                                    | 8411              | 29 May 23           | 27 May 24                | -      |
| 10  | Incubator                                  | Coliform Bacteria         | Memmert        | IPP 260 / V615.0181           | Technology Promotion Association (Thailand-Japan)       | 23TM378           | 12 Apr 23           | 10 Apr 24                | -      |
| 11  | Incubator                                  | Standard Plate count      | Binder         | BD 53 / 13-01343              | Technology Promotion Association (Thailand-Japan)       | 23TM192           | 16 Feb 23           | 15 Feb 24                | -      |
| 12  | Water Bath                                 | E.Coli                    | Memmert        | WNE 14 / L416.0606            | Technology Promotion Association (Thailand-Japan)       | 23TM193           | 15 Feb 23           | 14 Feb 24                | -      |
| 13  | Water Bath                                 | Legionella sp.            | Memmert        | WNE 14 / L416.0612            | Technology Promotion Association (Thailand-Japan)       | 23TM194           | 15 Feb 23           | 14 Feb 24                | -      |

รายงานผลการปฏิบัติงานตามทวกรวบรวมทั้งและพื้นที่และหน่วยงานสิ่งแวดล้อม และนางสาววิจิตราพรวงศอนันต์พงษ์สิ่งแวดล้อม  
โครงการ Green+ Point Hotel Terminal 21 (ระยะดำเนินการ) ระหว่างเดือนมกราคม-มิถุนายน พ.ศ. 2566  
บริษัท แอด เอ็ม เอช โฮเทล แอนด์ รีสอร์ท จำกัด

รายการใบรับรองสอบเทียบ/พวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับวิเคราะห์คุณภาพสิ่งแวดล้อม

| No.   | Instrument/Equipment | Parameter                                 | Manufacturer | Model/Serial No.      | Calibrator   | Certification No. | Date of Calibration | Due date of Calibration* | Remark |
|---|----------------------|---|--------------|-----------------------|--|-------------------|---------------------|--------------------------|--------|
| เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์คุณภาพน้ำ |                      |   |              |                       |  |                   |                     |                          |        |
| 14  | Auto Clave           | Coliform Bacteria<br>Standard Plate count | ALP          | CL-40L /<br>808763    | Technology Promotion Association<br>(Thailand-Japan) | 23TM163           | 27 Apr 23           | 25 Apr 24                | -      |
| 15  | Auto Clave           | E.Coli<br>Legionella sp.                  | ALP          | CL-40L /<br>8112010   |  | C11230106         | 9 Jun 23            | 7 Jun 24                 | -      |
| 16  | Analytical Balance   |   | OHAUS        | PX623 /<br>C236755745 | DKSH (Thailand) Ltd                                  | C0123732          | 9 Dec 22            | 8 Dec 23                 | -      |

Due Date of Calibration\* : Based on the annual calibration plan. At least 1 time per year.

## Calibration Certificate

Certificate No.: Z301848-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Prathumong, Bangkok 10250

Page 5 of 5

Equipment: pH Meter  
Manufacturer: Mettler Toledo  
Model: SevenEasy TM 820 pH  
Serial No.: 1231155210  
ID No.: UAE.WAT.0102553  
Order No.: Z301848  
Operation No.: Z301848-001  
Date of Receipt: 17 February 2023  
Date of Calibration: 24 February 2023

Calibrated by: Mr. Manop Boonlong  
Scientist  
Approved: [Signature]  
Specialist, Division of Calibration Laboratory  
Responsible for the Technical Management Team  
Date of Issue: 24 February 2023

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of acceptance granted by the Thai Laboratory Accreditation Scheme which has assessed the performance, capability of the laboratory and its proficiency for recognized national standards and to the state 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 the National Food Institute.

FCS-009 Revision: 01 Date: 20-04-65



## Calibration Report

Certificate No.: Z301848-001-01  
Equipment: pH Meter  
Resolution: 0.01 pH ; 1 mV  
Manufacturer: Mettler Toledo  
Model: SevenEasy TM 820 pH  
Serial No.: 1231155210  
Type: Bench top  
ID No.: UAE.WAT.0102553

Page 2 of 5

Date of Calibration: 24 February 2023  
Location: Chemical Calibration Laboratory, National Food Institute  
Environment Conditions: Ambient Temperature: [ 25.1 ± 1.0 ] °C Relative Humidity: [ 50 ± 5 ] %  
Condition of Equipment: Good Condition  
Condition of this Results of Calibration

1. Calibration Method: In house method: W-TE-022 based on direct measurement by using standard voltage calibrator and certified reference material (CRM)  
2. Reference Standards / Certified Reference Material

| Instrument                                       | Serial ID No. | Manufacturer | Certificate No. | Due Date        |
|--|---------------|--------------|-----------------|-----------------|
| 2.1 DC Voltage Calibrator                        | 279907        | Futek        | Z3011959        | 17 June 2023    |
| 2.2 Digital Thermometer                          | 2738007       | Futek        | OC-680573.6.1   | 30 October 2023 |
| 2.3 Thermodynamic Meter                          | W16V4402118   | EndoPro. d90 | CP42-02890      | 26 April 2023   |
| <b>Certified Reference Material</b>              |               |              |                 |                 |
| 2.4 pH buffer 4.008 (Primary pH buffer Solution) | 833808        | CPAchem      | Phd144.5        | 8 August 2024   |
| 2.5 pH buffer 6.863 (Primary pH buffer Solution) | 833807        | CPAchem      | Phd173.5        | 8 August 2024   |
| 2.6 pH buffer 10.01 (Primary pH buffer Solution) | 833809        | CPAchem      | Phd202.5        | 8 August 2024   |
| 2.7 pH buffer 7.00 (Standard pH buffer Solution) | 833810        | CPAchem      | Phd1073.5       | 8 August 2024   |

3. This calibration is traceable to The International System of Units (SI Unit)  
3.1 Instruments No 2.1 through  
3.2 Instruments No 2.2 through  
3.3 Instruments No 2.3 through  
3.4 Certified Reference Material No. 2.4 to 2.8 traceable to: Primary measurement method: Homed cell using calibrated thermometer, thermometer, and electromotive. The Standard Solution: preparation and certified by CPAchem Ltd. is accepted to ISO 17034 and ISO/IEC 17025  
3.5 Certified Reference Material No 2.7 traceable to: BSM R491 14-21 Lot# 04.36.2022; BSM R491 14-28 Lot# 25.35.2022; BSM R491 16-27 Lot# 04.28.2022; BSM R491 11-28 Lot# 28.25.2021, the Standard Solution preparation and certified by CPAchem Ltd. is accepted to ISO 17034 and ISO/IEC 17025  
4. This certificate was certified only for the instrument as shown on date and place of calibration only.  
5. This result of calibration was found accurate as shown on date and place of calibration only.

FCS-032 Revision: 01 Date: 20-04-65



## Calibration Report

Certificate No.: Z301848-001-01  
Equipment: pH Meter  
Resolution: 0.01 pH ; 1 mV  
Manufacturer: Mettler Toledo  
Model: SevenEasy TM 820 pH  
Serial No.: 1231155210  
Type: Bench top  
ID No.: UAE.WAT.0102553

Date of Calibration: 24 February 2023 Page 3 of 5

Calibration Results:  
1. Calibration of pH Meter (Manual Temperature Compensation at 25 °C)

| Nominal pH | DC Voltage Standard (mV) | Average Indicator Reading |      | Uncertainty (± pH) | Coverage Factor (k) |
|------------|--------------------------|---------------------------|------|--------------------|---------------------|
|            |                          | mV                        | pH   |                    |                     |
| 9          | 416.120                  | 414                       | 9.00 | 0.59               | 2.00                |
| 7          | 298.614                  | 296                       | 7.00 | 0.59               | 2.00                |
| 6          | 177.464                  | 176                       | 6.00 | 0.56               | 2.00                |
| 5          | 58.190                   | 58                        | 5.00 | 0.55               | 2.00                |
| 4          | 0.002                    | 0                         | 4.00 | 0.56               | 2.00                |
| 3          | -58.166                  | -58                       | 3.00 | 0.56               | 2.00                |
| 2          | -177.640                 | -177                      | 2.00 | 0.59               | 2.00                |
| 1          | -295.811                 | -296                      | 1.00 | 0.56               | 2.00                |
| 0          | -414.112                 | -414                      | 0.00 | 0.56               | 2.00                |

2. Calibration of pH Meter with Electrode (Manual Temperature Compensation at 25 °C)

Equipment: pH Electrode Type: Combination Electrode  
Manufacturer: Metrohm Model: InLab Bolt  
Serial No.: 806311 ID No.: NA  
Performance of Electrode system (Three-Point Calibration at pH 4, pH 7 and pH 10)

| Certified Value @25 °C (pH) | Average Indicator Reading |      | Relative Slope (%) | Uncertainty (± pH) | Coverage Factor (k) |
|-----------------------------|---------------------------|------|--------------------|--------------------|---------------------|
|                             | pH                        | mV   |                    |                    |                     |
| 4.005                       | 4.01                      | 186  | -                  | 0.0011             | 2.00                |
| 6.865                       | 6.86                      | 19   | 87.46              | 0.0070             | 2.00                |
| 10.010                      | 10.01                     | -180 | 92.25              | 0.0095             | 2.00                |
| 6.865                       | 6.86                      | 15   | -                  | 0.0062             | 2.00                |

FCS-032 Revision: 01 Date: 20-04-65



## Calibration Report

Certificate No.: Z301848-001-01  
Equipment: Digital Thermometer with RTD  
Resolution: 0.1 °C Model: SevenEasy TM 520 pH  
Serial No.: 1231155210 ID No.: UAE.WAT.0102553  
Manufacturer: Mettler Toledo

Date of Calibration: 24 February 2023 Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute  
Environment Conditions: Ambient Temperature: 25 °C ± 1 °C  
Relative Humidity: 48 % ± 3 %

Condition of this results of Calibration:

- Calibration Method: - In house method: W-TE-025 by comparison with standard thermometer.  
- The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.  
- The temperature scale in use at this laboratory is the International Temperature scale of 1990 (ITS-90).
- Reference Standard (Instrument):

| Instrument                            | Model | Serial No. | Certificate No. | Due Date  | Through |
|---------------------------------------|-------|------------|-----------------|-----------|---------|
| HANDHELD THERMOMETER                  | 1523  | 2138154    | PSL-T 0673/65   | 07-Jun-23 | TLSR    |
| Platinum Resistance Thermometer (PRT) | 5627A | 872332     |                 |           |         |

Support Equipment: - Low Temperature Bath (Macro Bath), Model: 7103, S/N: A39538, A465 A65101.

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated Item: Good
- Result of Calibration: ☒ Without adjustment ☐ After adjustment

FCS-032 Revision: 01 Date: 20-04-65



## Calibration Report

**Certificate No.:** 2301846-001-01  
**Equipment:** Digital Thermometer with RTD  
 Resolution: 0.1 °C Model: SevenEasy TM 520 pH  
 Serial No.: 1291155210 ID No.: UAE.WAT.010/2553  
 Manufacturer: Mettler Toledo

**Date of Calibration:** 24 February 2023 Page 5 of 5

**Calibration point:** 15.0, 25.0 and 35.0 °C

**Calibration result:**

- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.
- Description of probe, model: - S/N: -
- Dimension of probe: Diameter 9 mm., Length 120 mm.,
- Sheath material: Stainless Steel

| UUC* Reading (°C) | Standard Temperature (°C) | Correction Value (°C) | Uncertainty ± (°C) |
|-------------------|---------------------------|-----------------------|--------------------|
| 15.1              | 15.015                    | - 0.1                 | 0.11               |
| 25.0              | 25.014                    | 0.0                   | 0.11               |
| 35.1              | 35.016                    | - 0.1                 | 0.11               |

**Note**

- UUC\* : Unit Under Calibration

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

----- End -----

FCS-012 Revision: 01 Date: 26-04-55



เอกสารไม่ควบคุม

## Calibration Certificate

**Certificate No.:** Z302181-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
**Address:** 2 Sri Udomwut 41, Sukhumvit Road,  
Bangchak, Prachinburi, Bangkok 10260

Page 1 of 4

**Equipment:** pH Meter  
**Manufacturer:** METTLER TOLEDO  
**Model:** SevenEasy pH  
**Serial No.:** 1230525212  
**ID No.:** UAE.WAS.003/2553  
**Order No.:** Z302181  
**Operation No.:** Z302181-001  
**Date of Receipt:** 14 March 2023  
**Date of Calibration:** 24 March 2023

**Calibrated by:** Mr. Phongsak Thongkiet  
**Approved by:** [Signature]  
**Date of issue:** 24 March 2023  
**Responsible for the Technical Management Team**

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its capability to reproduce national standards and to the units of measurement defined at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the National Food Institute.

F-C5-009 Revision: 01 Date: 20-04-65



## Calibration Report

**Certificate No.:** Z302181-009-01  
**Equipment:** pH Meter  
**Resolution:** 0.01 pH : 1 mV  
**Manufacturer:** METTLER TOLEDO  
**Model:** SevenEasy pH  
**Serial No.:** 1230525212  
**ID No.:** UAE.WAS.003/2553  
**Type:** Bench top

**Date of Calibration:** 24 March 2023  
Page 2 of 6

**Location:** Chemical Calibration Laboratory, National Food Institute  
**Environment Condition:** Ambient Temperature: ( 31.4 ± 1.6 ) °C Relative Humidity: ( 52 ± 3 ) %  
**Condition of Equipment:** Good Condition  
**Condition of this Results of Calibration:**

1. Calibration Method: In house method: W-02-025 based on direct measurement by using standard voltage calibrator and certified reference material (CRM).

2. Reference Standards / Certified Reference Material

| Reference  | Serial No.   | Manufacturer | Certificate No. | Due Date          |
|--|--------------|--------------|-----------------|-------------------|
| 2.1 DC Voltage Calibrator                        | 2758017      | Fluke        | 228 1956        | 17 June 2023      |
| 2.2 Digital Thermometer                          | 2758017      | Fluke        | CC-60097-01     | 30 October 2023   |
| 2.3 Thermopile Sensor                            | NPI.87100811 | PONPE        | TE 605565-01    | 21 September 2023 |
| 2.4 pH buffer 4.00A (Primary pH buffer Solution) | 873008       | CPAchem      | PH20 LLS        | 10 February 2025  |
| 2.5 pH buffer 6.86B (Primary pH buffer Solution) | 873008       | CPAchem      | PH21 LLS        | 10 February 2025  |
| 2.6 pH buffer 7.00 (Primary pH buffer Solution)  | 873011       | CPAchem      | PH20 LLS        | 10 February 2025  |
| 2.7 pH buffer 7.00 (Standard pH buffer Solution) | 873012       | CPAchem      | PH20 LLS        | 10 February 2025  |

3. This calibration is traceable to The International System of Units (SI Unit)

|   |              |  |
|---|--------------|--|
| 3.1 Instrument No.2.1                           | through      | NIS-170-18-17025 Laboratory Accreditation of Calibration No.0008   |
| 3.2 Instrument No.2.2                           | through      | NIS-170-18-17025 Laboratory Accreditation of Calibration No.0001   |
| 3.3 Instrument No.2.3                           | through      | NIS-170-18-17025 Laboratory Accreditation of Calibration No.0001   |
| 3.4 Certified Reference Material No. 2.4 to 2.6 | traceable to | Primary measurement method: Human calibration standard thermometer, thermometer, and nanometer. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17024 and ISO/IEC 17025                                  |
| 3.5 Certified Reference Material No.2.7         | traceable to | BMI Part 14-13 Lot N 23 05 2022 BMI Part 14-13 Lot N 02.06.2022 BMI Part 14-13 Lot N 23 05.2022 BMI Part 14-13 Lot N 02.06.2022. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17024 and ISO/IEC 17025 |

4. This certificate was certified only for the instrument was calibrated.

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

F-C5-012 Revision: 01 Date: 20-04-65



## Calibration Report

**Certificate No.:** Z302181-001-01  
**Equipment:** pH Meter  
**Resolution:** 0.01 pH : 1 mV  
**Manufacturer:** METTLER TOLEDO  
**Model:** SevenEasy pH  
**Serial No.:** 1230525212  
**ID No.:** UAE.WAS.003/2553  
**Type:** Bench top

**Date of Calibration:** 24 March 2023  
Page 3 of 6

**Calibration Results:** 1. Calibration of pH Meter (1 Molar Temperature Compensation at 25 °C)

| Handed pH | DC Voltage Standard (mV) | Average Indicator Reading (mV) | pH    | Uncertainty (mV) | Coverage Factor (k=2) |
|-----------|--------------------------|--------------------------------|-------|------------------|-----------------------|
| 0         | 414.120                  | 414                            | 0.00  | 0.38             | 2.80                  |
| 2         | 205.414                  | 206                            | 0.00  | 0.58             | 2.90                  |
| 4         | 177.464                  | 178                            | 4.00  | 0.58             | 3.90                  |
| 6         | 99.162                   | 99                             | 8.00  | 0.58             | 2.60                  |
| 7         | 2.500                    | 0                              | 9.00  | 0.58             | 2.80                  |
| 8         | -86.156                  | -89                            | 8.00  | 0.68             | 2.88                  |
| 10        | -177.482                 | -177                           | 10.00 | 0.58             | 2.68                  |
| 12        | -289.811                 | -286                           | 12.00 | 0.94             | 2.08                  |
| 14        | -414.117                 | -414                           | 14.00 | 0.58             | 2.08                  |

2. Calibration of pH Meter with Electrode (1 Molar Temperature Compensation at 25 °C)

|  |                |         |                    |
|--|----------------|---------|--------------------|
| Equipment:   | pH Electrode   | Type:   | Combined Electrode |
| Manufacturer:  | METTLER TOLEDO | Model:  | InLab Boltz        |
| Serial No.:  | 1110063        | ID No.: | N/A                |
| Performance of Electrode system (Three-Point Calibration at pH 4, 7, 10) |                |         |                    |

Performance of Electrode system (Three-Point Calibration at pH 4, pH 7 and pH 10)

| Certified value (pH 25 °C) | Average Indicator Reading |      | Relative Slope (%) | Uncertainty (± pH) | Coverage Factor (k=2) |
|----------------------------|---------------------------|------|--------------------|--------------------|-----------------------|
|                            | pH                        | mV   |                    |                    |                       |
| 4.00                       | 4.21                      | 167  | -                  | 0.0071             | 2.00                  |
| 6.86                       | 6.86                      | 22   | 97.86              | 0.0079             | 2.00                  |
| 9.00                       | 10.04                     | -160 | 97.86              | 0.0086             | 2.00                  |
| 10.00                      | 9.90                      | -14  | -                  | 0.0093             | 2.00                  |

F-C5-012 Revision: 01 Date: 20-04-65



## Calibration Report

**Certificate No.:** Z302181-001-01  
**Equipment:** Digital Thermometer with RTD (pH Meter)  
**Resolution:** 0.1 °C  
**Model:** SevenEasy pH  
**Serial No.:** 1230525212  
**ID No.:** UAE.WAS.003/2553  
**Manufacturer:** METTLER TOLEDO

**Date of Calibration:** 24 March 2023  
Page 4 of 5

**Location:** Chemical Calibration Laboratory, National Food Institute

**Environment Condition:** Ambient Temperature: 25 °C ± 1 °C  
Relative Humidity: 55 % ± 5 %

**Condition of this Results of Calibration:**

1. Calibration Method: - In house method: W-TE-025 by comparison with standard thermometer.

- The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.

- The temperature scale in use at this laboratory is the International Temperature scale of 1990 (ITS-90).

2. Reference Standard Instrument:

| Instrument                            | Model | Serial No. | Certificate No. | Due Date  | Through                 |
|---------------------------------------|-------|------------|-----------------|-----------|-------------------------|
| HANDHELD THERMOMETER                  | 1521  | A83997     | TE 660339-01    | 10-Dec-23 | NATIONAL FOOD INSTITUTE |
| Platinum Resistance Thermometer (PRT) | 385   | 509281     |                 |           |                         |

Support Equipment: - Low Temperature Bath (USOCAL-5), Model Europa-6 Plus Basic, S/N: 241552/2

3. This certificate is traceable to International System of Units (SI Units).

4. This certificate was certified only for the instrument we calibrated.

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

6. Condition of Calibration Item: Good

7. Result of Calibration: ☒ Without adjustment ☐ After adjustment

F-C5-012 Revision: 01 Date: 20-04-65



## Calibration Report

**Certificate No.:** 2302161-001-01  
**Equipment:** Digital Thermometer with RTD (pH Mode)  
 Resolution: 0.1 °C Model: SevenEasy pH  
 Serial No.: 1230525212 ID No.: UAE.WAS.D03/2553  
 Manufacturer: METTLER TOLEDO

**Date of Calibration:** 24 March 2023 Page 8 of 8

**Calibration points:** 15.0, 25.0 and 30.0 °C

**Calibration result:**

- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.
- Description of probe, model: N/A S/N: N/A
- Dimension of probe: Diameter 3 mm, Length 120 mm,
- Sheath material: N/A

| UUC* Reading (°C) | Standard Temperature (°C) | Correction Value (°C) | Uncertainty ± (°C) |
|-------------------|---------------------------|-----------------------|--------------------|
| 15.2              | 14.999                    | - 0.2                 | 0.12               |
| 25.2              | 24.999                    | + 0.2                 | 0.12               |
| 30.2              | 29.999                    | - 0.2                 | 0.12               |

**Note:**

- UUC\* : Unit Under Calibration

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

~~~~~ End ~~~~~

FCS-012 Revision: 01 Date: 2004/05








TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
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334/4 PATTANAKARN ROAD SOI 15, SUKHUMVIT, SUKHUMVIT BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2716-0168



Cert.No.: 23MM113  
Page: 1 of 3

## Certificate of Calibration

Equipment : Electronic Balance  
Manufacturer : Mettler Toledo  
Model : XSR205  
Serial No. : C21065394  
ID No. : UAE.WAD.010/2565  
Submitted by : United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsak 41, Sukhumvit Road,  
Bangchak, Phlekhong,  
Bangkok 10200  
Location : Balance Room  
Received order : 28 April 2023  
Calibration Date : 28 April 2023  
Ambient Temperature : 15 °C to 40 °C  
Relative Humidity : 30 % to 90 %  
Calibrated by : Men Pattanasongpolboon  
Approved by :   
( ) Ponthipha Tameyakul  
( ) Malee Buktura  
(x) Suwit Imjai

Issue Date : 2 May 2023

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2304-0459OC-2

Cert.No.: 23MM113  
Page: 2 of 3

### Procedure used :-

Calibration were conducted using in-house calibration procedure CP-0801 according to direct measurement method against standard weight.

### Condition of this result of calibration

#### 1. Reference standard instruments:-

| Instruments                 | Model | Serial No. | ID No.  | Test report No. | Due date    |
|-----------------------------|-------|------------|---------|-----------------|-------------|
| 1) Standard Weight Set (E2) | 15884 | 24053      | 70PC007 | MM-0010-22      | 20 Jan 2024 |

2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This result of calibration was made on requested at the point specified by customer.  
4. This certificate is not certified for any commercial transaction.

5. This certification is traceable to the international System of Unit.

Result of calibration ( ) Without Adjustment ( \* ) After Adjustment by Internal Calibration

| Range capacity : | 0 g to 81 g | Resolution | 0.00001 g |
|------------------|-------------|------------|-----------|
| 81 g to 220 g    | Resolution  | 0.0001 g   |           |

#### Before Adjustment :

| Applied Weight | Balance Reading | Correction | Measurement Uncertainty | Coverage Factor |
|----------------|-----------------|------------|-------------------------|-----------------|
| (g)            | (g)             | (g)        | (± mg)                  | (k)             |
| 80             | 79.9992         | +0.00008   | 0.15                    | 2.00            |
| 200            | 199.9995        | +0.0005    | 0.29                    | 2.00            |

#### After Adjustment :

#### 1. Determination of the standard deviation of weighing machine ( n = 10 )

| Applied Weight | Standard Deviation of Reading (g) |
|----------------|-----------------------------------|
| (g)            |                                   |
| 80             | 0.00007                           |
| 200            | 0.00004                           |



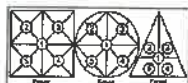
Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2304-0459OC-2

Cert.No.: 23MM113  
Page: 3 of 3

### Result of calibration

#### 2. Effect of off-center loading

A mass of 100 g was placed to various position on the pan.  
The weighing machine reading error obtained is given in the table



Maximum difference between off-center and central loading  
(g)  
0.0001

| Position 1 | Position 2 | Position 3 | Position 4 | Position 5 |
|------------|------------|------------|------------|------------|
| (g)        | (g)        | (g)        | (g)        | (g)        |
| -0.0001    | -0.0001    | 0.0000     | -0.0001    | -0.0001    |

#### 3. Deviation from nominal value

| Applied Weight | Balance Reading | Correction | Measurement Uncertainty | Coverage Factor |
|----------------|-----------------|------------|-------------------------|-----------------|
| (g)            | (g)             | (g)        | (± mg)                  | (k)             |
| Unload         | 0.00000         | 0.00000    | 0.014                   | 2.11            |
| 0.05           | 0.04999         | +0.00001   | 0.015                   | 2.09            |
| 0.1            | 0.09999         | +0.00001   | 0.015                   | 2.07            |
| 1              | 1.00000         | 0.00000    | 0.018                   | 2.04            |
| 5              | 5.00000         | 0.00000    | 0.028                   | 2.00            |
| 20             | 20.00002        | -0.00002   | 0.045                   | 2.00            |
| 50             | 50.00002        | -0.00002   | 0.080                   | 2.00            |
| 80             | 80.00002        | -0.00002   | 0.15                    | 2.00            |
| 100            | 100.0000        | 0.0000     | 0.17                    | 2.00            |
| 150            | 150.0000        | 0.0000     | 0.29                    | 2.00            |
| 200            | 199.9999        | +0.0001    | 0.29                    | 2.00            |

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

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เอกสารไม่ควบคุม





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND) JAPAN  
CORPORATE SERVICES, EQUIPMENT CALIBRATION AND TESTING SERVICES  
2564 PATTANAKARN ROAD SOI 12, SUKHUMVIT 41, BANGKOK 10260, THAILAND  
TEL: 02-2712-4057 FAX: 02-2712-8084



Cert. No.: 22TM1480  
Page: 1 of 3

## Certificate of Calibration

**Equipment:** Hot Air Oven  
**Manufacturer:** Mammoth  
**Model:** UF 65  
**Serial No.:** B218.1655  
**ID No.:** UAE.WAO.Q272559  
**Submitted by:** United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udonouk 41, Sukhumvit Road,  
Bangchak, Phraekhanong,  
Bangkok 10260  
**Location:** Lab Floor 2  
**Received Order:** 19 October 2022  
**Calibration Date:** 19 October 2022  
**Ambient Temperature:**  $(26 \pm 10) ^\circ\text{C}$   
**Relative Humidity:**  $(50 \pm 30) \%$   
**Calibrated by:** Praecha Hlaith  
**Approved by:**  
( ) Pornthippa Tumayukul  
( ) Mabe Bulkruea  
(x) Suwit Injai  
**Issue Date:** 31 October 2022

The uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม

A 0046800



**Equipment:** Hot Air Oven  
**Condition As-Received:** Used Item  
**Reference:** 2210-0575OC-1  
**Procedure Used:**

Cert. No.: 22TM1489  
Page: 2 of 3

Calibration was conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standard instrument:

| Instrument          | Model  | Serial No. | Cert. No. | Due Date    |
|---------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34970A | MY41021843 | 221MM     | 10 Jan 2023 |

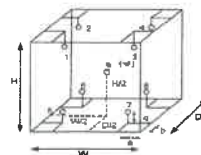
2. The certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

**Result of Calibration:** ( ) Without Adjustment

**Function of UUC:** Temperature Source

**Fresh air setting:** Close



Probe installation Details: Dimension of Chamber:

|            |                                 |
|------------|---------------------------------|
| a = 5.0 cm | D = 0.33 m                      |
| b = 5.0 cm | W = 0.40 m                      |
| c = 5.0 cm | H = 0.40 m                      |
|            | Capacity = 0.053 m <sup>3</sup> |

| Environment during calibration |           |          |
|--------------------------------|-----------|----------|
|                                | Beginning | Finished |
| Temp. (°C)                     | 26        | 30       |
| REL. Humid. (%)                | 47        | 49       |
| AC Supply (Volt)               | 221       | 220      |

| Ref. Std. ID No.: 48<br>Calibration Point |             |               |
|-------------------------------------------|-------------|---------------|
| Position                                  | (104) °C    | (140, 160) °C |
| 1                                         | 18-04RTD-01 | 21-04TC-01    |
| 2                                         | 18-04RTD-02 | 21-04TC-02    |
| 3                                         | 18-04RTD-03 | 21-04TC-03    |
| 4                                         | 18-04RTD-04 | 21-04TC-04    |
| 5                                         | 18-04RTD-05 | 21-04TC-05    |
| 6                                         | 18-04RTD-06 | 21-04TC-06    |
| 7                                         | 18-04RTD-07 | 21-04TC-07    |
| 8                                         | 18-04RTD-08 | 21-04TC-08    |
| 9 (ref.)                                  | 18-04RTD-09 | 21-04TC-09    |

เอกสารไม่ควบคุม

a 1133252



**Equipment:** Hot Air Oven  
**Condition As-Received:** Used Item  
**Reference:** 2210-0575OC-1  
**Result of Calibration:** ( ) Without Adjustment  
**Function of UUC:** Temperature Source  
**Fresh air setting:** Close

Cert. No.: 22TM1490  
Page: 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Uncertainty (± °C) | Coverage Factor k |
|------------------------|-------------------|-------------------|------------------------------|-----------------------------|------------------------|--------------------|-------------------|
| 104.0                  | 104.0             | 104.0             | 0.081                        | 1.3                         | 1.7                    | 0.42               | 2                 |
| 140.0                  | 140.0             | 140.0             | 0.14                         | 2.3                         | 2.4                    | 1.1                | 2                 |
| 160.0                  | 160.0             | 160.0             | 0.21                         | 3.5                         | 3.6                    | 1.3                | 2                 |

| Calibration Point (°C) | Measured Temperature (°C) |         |         |         |         |         |         |         |          |
|------------------------|---------------------------|---------|---------|---------|---------|---------|---------|---------|----------|
|                        | 1                         | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9 (ref.) |
| 104.0                  | 103.078                   | 103.878 | 103.777 | 104.124 | 104.887 | 104.426 | 104.012 | 103.828 | 104.370  |
| 140.0                  | 138.188                   | 139.188 | 138.808 | 139.590 | 140.286 | 139.822 | 139.263 | 139.385 | 140.260  |
| 160.0                  | 177.890                   | 179.287 | 178.643 | 179.753 | 181.011 | 180.063 | 178.496 | 178.743 | 181.278  |

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

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

Overall Variation: The Difference of the maximum and minimum measured temperatures throughout observation.  
UUC\*: Unit Under Calibration.

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

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

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เอกสารไม่ควบคุม

a 1133251

## Calibration Certificate

**Certificate No.:** 2302827-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
**Address:** 3 Sol Udomsak 41, Sukhumvit Road,  
Bangkok, Phraeknong, Bangkok 10260

Page 3 of 4

**Equipment:** Electronic Balance

**Manufacturer:** METTLER TOLEDO

**Model:** XSR204

**Serial No.:** C117639043

**ID No.:** UAE.WAS.012/1564

**Order No.:** 2302827

**Operation No.:** 2302827-001

**Date of Receipt:** 10 May 2023

**Date of Calibration:** 10 May 2023

**Calibrated by:** Mr. Manee Somrak  
Specialist

**Approved by:** [Signature]  
Manager, Division of Calibration Laboratory  
Responsible for the Technical Management Team

**Date of Issue:** 10 May 2023

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the National Food Institute.

F-CS-012 Revision: 01 Date: 20-04-65

## Calibration Report

**Certificate No.:** 2302827-001-01  
**Equipment:** Electronic Balance  
**Manufacturer:** METTLER TOLEDO  
**Model:** XSR204  
**Serial No.:** C117639043  
**Capacity:** 220 g  
**Resolution:** 0.0001 g  
**ID No.:** UAE.WAS.012/1564

Page 3 of 4

**Date of Calibration:** 10 May 2023  
**Environment Condition:** Ambient Temperature:  $24.4 \pm 0.2$  °C Relative Humidity:  $62.4 \pm 0.8$  %  
**Place of Calibration:** Solvay room (Water Analysis Unit), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
**Condition of Equipment:** Good Condition  
**Condition of This Results of Calibration:**

1. Calibration Method: BIP Method (BIP-001) In-house Method based on UKAS Lab 14: 2019

2. Reference Standard:

| Reference Standard       | Model       | Serial No.    | Calibrated By   | Certificate No. | Exp. Date        |
|--------------------------|-------------|---------------|-----------------|-----------------|------------------|
| Standard Weight Class E2 | 1mg to 100g | 850557572     | YCS             | PC3040579       | 8 Apr 2024       |
| Instrument               | Model       | Serial No.    | Calibrated By   | Certificate No. | Exp. Date        |
| Thermo-Hygro Meter       | 608-H1      | NPJ.BTH.01523 | Quality Section | QC23-0408       | 21 February 2024 |

3. This certificate is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

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

**Calibration Results:**

1. Repeatability of Reading:

| Nominal Value (g) | Standard Deviation of Reading (g) |
|-------------------|-----------------------------------|
| 100               | 0.000033                          |
| 200               | 0.000032                          |

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



| 1          | 2          | 3          | 4          | 5          | (Maximum Difference) |
|------------|------------|------------|------------|------------|----------------------|
| (100.0002) | (100.0002) | (100.0002) | (100.0002) | (100.0003) | (0.0001)             |

F-CS-012 Revision: 01 Date: 20-04-65

## Calibration Report

**Certificate No.:** 2302827-001-01  
**Equipment:** Electronic Balance  
**Manufacturer:** METTLER TOLEDO  
**Model:** XSR204  
**Serial No.:** C117639043  
**Capacity:** 220 g  
**Resolution:** 0.0001 g  
**ID No.:** UAE.WAS.012/1564

Page 3 of 4

**Date of Calibration:** 10 May 2023

**Calibration Results:** (Covered)

**Calibration Range:** 0 - 200 g

**Calibration Adjustment:** Internal Calibration

3. Departure from Nominal Values

| Nominal Value (g) | Standard Value (g) | Average Reading (g) | Correction (g) | Uncertainty (g) | Coverage Factor |
|-------------------|--------------------|---------------------|----------------|-----------------|-----------------|
| 100               | 100.0000           | 100.0000            | 0.0000         | 0.000005        | 2.00            |
| 0.01              | 0.01000            | 0.01000             | 0.0000         | 0.000005        | 2.00            |
| 0.02              | 0.02000            | 0.02000             | 0.0000         | 0.000005        | 2.00            |
| 0.05              | 0.05000            | 0.05000             | 0.0000         | 0.000005        | 2.00            |
| 0.1               | 0.10000            | 0.10000             | 0.0000         | 0.000005        | 2.00            |
| 0.2               | 0.20000            | 0.20000             | 0.0000         | 0.000005        | 2.00            |
| 0.5               | 0.50000            | 0.50000             | 0.0000         | 0.000005        | 2.00            |
| 1                 | 1.00000            | 1.00000             | 0.0000         | 0.000006        | 2.00            |
| 2                 | 2.00000            | 2.00000             | 0.0000         | 0.000006        | 2.00            |
| 3                 | 3.00000            | 3.00000             | 0.0000         | 0.000007        | 2.00            |
| 5                 | 5.00000            | 5.00000             | 0.0000         | 0.000007        | 2.00            |
| 10                | 10.00000           | 10.00000            | 0.0000         | 0.000006        | 2.00            |
| 20                | 20.00000           | 20.00000            | 0.0000         | 0.000007        | 2.00            |
| 30                | 30.00000           | 30.00000            | 0.0000         | 0.000009        | 2.00            |
| 40                | 40.00000           | 40.00000            | 0.0000         | 0.000011        | 2.00            |
| 45                | 45.00000           | 45.00000            | 0.0000         | 0.000013        | 2.00            |

F-CS-012 Revision: 01 Date: 20-04-65

## Calibration Report

**Certificate No.:** 2302827-001-01  
**Equipment:** Electronic Balance  
**Manufacturer:** METTLER TOLEDO  
**Model:** XSR204  
**Serial No.:** C117639043  
**Capacity:** 220 g  
**Resolution:** 0.0001 g  
**ID No.:** UAE.WAS.012/1564

Page 4 of 4

**Date of Calibration:** 10 May 2023

**Calibration Results:** (Covered)

**Calibration Range:** 0 - 200 g

**Calibration Adjustment:** Internal Calibration

3. Departure from Nominal Values

| Nominal Value (g) | Standard Value (g) | Average Reading (g) | Correction (g) | Uncertainty (g) | Coverage Factor |
|-------------------|--------------------|---------------------|----------------|-----------------|-----------------|
| 50                | 50.00000           | 50.00000            | 0.0000         | 0.000011        | 2.00            |
| 55                | 55.00000           | 55.00000            | 0.0000         | 0.000012        | 2.00            |
| 60                | 60.00000           | 60.00000            | 0.0000         | 0.000012        | 2.00            |
| 65                | 65.00000           | 65.00000            | 0.0000         | 0.000013        | 2.00            |
| 70                | 70.00000           | 70.00000            | 0.0000         | 0.000013        | 2.00            |
| 75                | 75.00000           | 75.00000            | 0.0000         | 0.000014        | 2.00            |
| 80                | 80.00000           | 80.00000            | 0.0000         | 0.000014        | 2.00            |
| 85                | 85.00000           | 85.00000            | 0.0000         | 0.000014        | 2.00            |
| 90                | 90.00000           | 90.00000            | 0.0000         | 0.000015        | 2.00            |
| 100               | 100.00000          | 100.00000           | 0.0000         | 0.000016        | 2.00            |
| 120               | 120.00000          | 120.00000           | 0.0000         | 0.000016        | 2.00            |
| 150               | 150.00000          | 150.00000           | 0.0000         | 0.000021        | 2.00            |
| 200               | 200.00000          | 200.00000           | 0.0000         | 0.000026        | 2.00            |

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

----- End -----

F-CS-012 Revision: 01 Date: 20-04-65



Cert. No.: 23TM249  
Page: 1 of 3

## Certificate of Calibration

Equipment : BOD Incubator  
Manufacturer : Arco  
Model : UC4-1320  
Serial No. : 13URC4S013201  
ID No. : UAE.WAQ.015/2561  
Submitted by : United Analytical and Engineering Consultant Co., Ltd  
3 Soi Udomsak 41, Sukhumvit Road,  
Bangchak, Phrekanong,  
Bangkok 10260  
Location : Lab Floor 2  
Received Order : 15 February 2023  
Calibration Date : 15 February 2023  
Ambient Temperature :  $(\pm 0.5 \pm 1.0) ^\circ\text{C}$   
Relative Humidity :  $(\pm 50 \pm 30) \%$   
Calibrated by : Prascha Hishin  
Approved by :  
( ) Pomsheep Tameykeul  
( ) Malee Butkrua  
( ) Suwit Imjai

Issue Date : 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the State of Calibration Services. Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม

A 0051476



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2302-0297QC-1  
Procedure Used :-

Calibration were conducted using calibration procedure CP-0702 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

### Condition of the result of calibration

#### 1. Reference standard instrument:-

| Instrument          | Model  | Serial No. | Cert. No. | Due Date    |
|---------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34872A | MY57013711 | 22LM83    | 02 Jul 2023 |

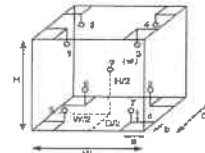
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certificate is traceable to the International System of Unit.

Result of Calibration :- ( ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available



#### Probe Installation Details :

| Probe Installation Details : | Dimension of Chamber :         |
|------------------------------|--------------------------------|
| a = 10 cm                    | D = 0.52 m                     |
| b = 10 cm                    | W = 1.2 m                      |
| c = 10 cm                    | H = 1.2 m                      |
|                              | Capacity = 0.89 m <sup>3</sup> |

| Environment during calibration |           |          |
|--------------------------------|-----------|----------|
|                                | Beginning | Finished |
| Temp. ( °C )                   | 29        | 31       |
| REL.Humid. ( % )               | 63        | 67       |
| AC Supply ( Volt )             | 220       | 220      |

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1          | 22-18RTD-2/1      |
| 2          | 16RTD-2/2         |
| 3          | 16RTD-2/3         |
| 4          | 16RTD-2/4         |
| 5          | 16RTD-2/5         |
| 6          | 16RTD-2/6         |
| 7          | 16RTD-2/7         |
| 8          | 16RTD-2/8         |
| 9 (ref.)   | 16RTD-2/9         |

เอกสารไม่ควบคุม



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2302-0297QC-1  
Result of Calibration :- ( ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 23TM249  
Page: 2 of 3

| Calibration Point ( °C ) | UUC* Setting ( °C ) | UUC* Reading ( °C ) | Temperature stability ( ± °C ) | Temperature uniformity ( °C ) | Overall Variation ( °C ) | Uncertainty ( ± °C ) | Coverage Factor k |
|--------------------------|---------------------|---------------------|--------------------------------|-------------------------------|--------------------------|----------------------|-------------------|
| 20.0                     | 20.0                | 19.3                | 0.32                           | 0.57                          | 1.0                      | 0.80                 | 2                 |

| Calibration Point ( °C ) | Measured Temperature ( °C ) |        |        |        |        |        |        |        |          |
|--------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|
|                          | 1                           | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9 (ref.) |
| 20.0                     | 20.086                      | 19.918 | 20.386 | 19.976 | 19.973 | 19.838 | 19.837 | 19.621 | 19.040   |

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

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

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

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

UUC\* : Used Under Calibration

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

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

-066-

เอกสารไม่ควบคุม

a 1149512



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD BKK, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL: 0-2113-3000 FAX: 0-2113-9434



NAC  
NAC-TAM-1781735  
CALIBRATION ROOM

Cert. No.: 23TM375  
Page: 1 of 3

## Certificate of Calibration

Equipment : BOD Incubator  
Manufacturer : ARCO  
Model : UR-1320  
Serial No. :  
ID No. : UAE.WAD.0182551  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Sol Udomsuk 41, Sukhumvit Road,  
Bangkok, Phrakhanong,  
Bangkok 10260  
Location : Lab Floor 2  
Received Order : 11 April 2023  
Calibration Date : 12 April 2023  
Ambient Temperature :  $(28 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$   
Calibrated by : Krida Malee  
Approved by :  
( ) Pomsilpa Tameyakul  
( ) Malee Buksrua  
( ) Suwit Injai  
Issue Date : 24 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the Technical Director/Service : Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม

A 0053360



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2304-0158OC-2  
Procedure Used :-

Cert. No.: 23TM375  
Page: 2 of 3

Calibration was conducted using calibration procedure CP-0702 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standard instrument:-

| Instrument          | Model  | Serial No. | Cert. No. | Due Date    |
|---------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34972A | MY59003411 | 221M165   | 26 Nov 2023 |

2. This certificate is valid only to the item calibrated on date and place of calibration.

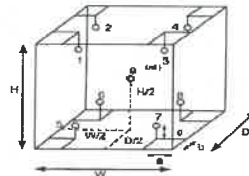
3. This certification is traceable to the International System of Unit.

Result of Calibration :- ( ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available

| Environment during calibration |           |          |
|--------------------------------|-----------|----------|
|                                | Beginning | Finished |
| Temp. (°C)                     | 28        | 27       |
| REL.Humid. (%)                 | 42        | 45       |
| AC Supply ( Volt )             | 218       | 220      |



#### Probe Installation Details :

a = 10 cm  
b = 10 cm  
c = 10 cm

#### Dimension of Chamber :

D = 0.62 m  
W = 1.2 m  
H = 1.2 m  
Capacity = 0.89 m<sup>3</sup>

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1          | 20RTD-2/1         |
| 2          | 20RTD-2/2         |
| 3          | 20RTD-2/3         |
| 4          | 20RTD-2/4         |
| 5          | 20RTD-2/5         |
| 6          | 20RTD-2/6         |
| 7          | 20RTD-2/7         |
| 8          | 20RTD-2/8         |
| 9 (ref.)   | 20RTD-2/9         |

เอกสารไม่ควบคุม

A 1158259



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2304-0158OC-2  
Result of Calibration :- ( ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 23TM375  
Page: 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Coverage Factor |
|------------------------|-------------------|-------------------|------------------------------|-----------------------------|------------------------|-----------------|
| 20.0                   | 20.0              | 20.0              | 0.48                         | 0.42                        | 1.2                    | 2               |

| Calibration Point (°C) | Measured Temperature (°C) |        |        |        |        |        |        |        |          | Uncertainty (± °C) |
|------------------------|---------------------------|--------|--------|--------|--------|--------|--------|--------|----------|--------------------|
|                        | 1                         | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9 (ref.) |                    |
| 20.0                   | 20.040                    | 20.170 | 20.363 | 20.099 | 19.749 | 19.704 | 19.920 | 20.191 | 20.020   | 0.66               |

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

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

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

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

UUC\* : Unit Under Calibration

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

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

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เอกสารไม่ควบคุม

A 1158259



## Verification Certificate

**Certificate No.:** 2302413-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
**Address:** 3 Sol Udomsak 43, Sukhumvit Road,  
Bangchack, Prakhong, Bangkok 10260

Page 1 of 4

**Equipment:** HEATING BLOCK DIGESTION  
**Manufacturer:** FOSS  
**Model:** 2520  
**Serial No.:** 91794469  
**ID No.:** UAE-WAS-011/2560  
**Order No.:** 2302413  
**Operation No.:** 2302413-001  
**Date of Receipt:** 28 March 2023  
**Date of Calibration:** 30-31 March 2023

**Calibrated by:** Mr. Nattapol Niyomchut  
Specialist  
**Approved by:** (Mr. Phongsak Manee)  
Manager, Division of Calibration Laboratory  
Responsible for the Technical Management Team  
**Date of Issue:** 10 April 2023

The uncertainties are for a confidence probability of approximately 95 %.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to designated 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 the National Food Institute.  
F-CS-009 Revision: 01 Date: 25-04-65

## Verification Report

**Certificate No.:** 2302413-001-01  
**Equipment:** HEATING BLOCK DIGESTION  
**Model:** 2520 **Serial No.:** 91794469  
**Resolution:** 1 °C **ID No.:** UAE-WAS-011/2560  
**Manufacturer:** FOSS

**Date of Calibration:** 30-31 March 2023

Page 2 of 4

**Location:** Laboratory Room, NATIONAL FOOD INSTITUTE  
**Environment Condition:** Ambient Temperature ( 25 ± 3 ) °C  
Relative Humidity ( 55 ± 15 ) %  
Line Voltage ( 220 ± 10 ) Volt

### Condition of this results of Calibration:

1. This instrument was calibrated by insert standard thermocouples type R into its heating block digestion and compared to temperature obtained from reference standards thermometer at calibrated point.  
- The temperature scale used was based on ITS - 90 .  
- All data show below were final values and the initial data may be obtained upon request.

### 2. Reference Standard Instrument :

| Instrument                               | Model            | Serial No.                                   | Certificate No. | Due Date   | Through                             |
|------------------------------------------|------------------|----------------------------------------------|-----------------|------------|-------------------------------------|
| Digital Thermometer<br>with Thermocouple | 34979A<br>Type R | 90000000000000000000<br>90000000000000000000 | TC22/0044       | 5-May-2023 | N.M. Technical<br>Center Laboratory |

3. This certificate is traceable to international system of units (SI Units).

4. This certificate was certified only for the instrument we calibrated.

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

6. Condition of Calibrated item : Good

UUC\* Description

Time of Record - Hour 30 Minute At 380 °C

7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

F-CS-009 Revision: 01 Date: 25-04-65

## Verification Report

**Certificate No.:** 2302413-001-01  
**Equipment:** HEATING BLOCK DIGESTION  
**Model:** 2520 **Serial No.:** 91794469  
**Resolution:** 1 °C **ID No.:** UAE-WAS-011/2560  
**Manufacturer:** FOSS

**Date of Calibration:** 30-31 March 2023

Page 2 of 4

**Calibration point:** 380 °C

**Calibration result:**

**Reporting of Temperature**

| Block No. | UUC* Setting (°C) | UUC* Reading (°C) | Stability (Δ°C) | Standard Thermometer (°C) | Uncertainty (Δ°C) |
|-----------|-------------------|-------------------|-----------------|---------------------------|-------------------|
| 1         | 380               | 380               | 0.95            | 377.74                    | 2.1               |
| 2         | 380               | 380               | 0.40            | 377.28                    | 2.1               |
| 3         | 380               | 380               | 1.18            | 377.82                    | 2.1               |
| 4         | 380               | 380               | 0.44            | 377.19                    | 1.6               |
| 5         | 380               | 380               | 0.13            | 377.35                    | 1.6               |
| 6         | 380               | 380               | 0.14            | 377.93                    | 1.6               |
| 7         | 380               | 380               | 1.17            | 377.85                    | 2.1               |
| 8         | 380               | 380               | 0.33            | 376.95                    | 2.1               |
| 9         | 380               | 380               | 0.14            | 374.18                    | 2.1               |
| 10        | 380               | 380               | 0.95            | 378.55                    | 2.0               |
| 11        | 380               | 380               | 1.04            | 378.34                    | 2.0               |
| 12        | 380               | 380               | 0.35            | 378.06                    | 2.0               |
| 13        | 380               | 380               | 0.48            | 377.05                    | 1.6               |
| 14        | 380               | 380               | 0.38            | 379.19                    | 1.6               |
| 15        | 380               | 380               | 0.50            | 377.48                    | 1.6               |
| 16        | 380               | 380               | 0.48            | 378.33                    | 1.7               |
| 17        | 380               | 380               | 0.71            | 377.60                    | 1.7               |
| 18        | 380               | 380               | 0.35            | 376.77                    | 1.7               |
| 19        | 380               | 380               | 0.64            | 377.08                    | 1.8               |
| 20        | 380               | 380               | 0.41            | 378.58                    | 1.8               |

**Note:**

- UUC\* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensor, for at least half an hour after reaching steady state.

F-CS-009 Revision: 01 Date: 25-04-65

## Verification Report

**Certificate No.:** 2302413-001-01  
**Equipment:** HEATING BLOCK DIGESTION  
**Model:** 2520 **Serial No.:** 91794469  
**Resolution:** 1 °C **ID No.:** UAE-WAS-011/2560  
**Manufacturer:** FOSS

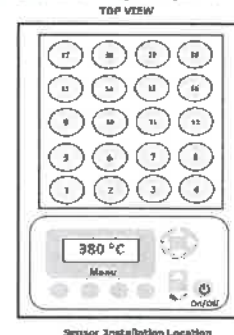
**Date of Calibration:** 30-31 March 2023

Page 4 of 4

**Calibration point:** 380 °C

**Calibration result:** Continued

Figure 1. Location of Reference Standard and Block Diagram of Digestion Unit



**Note:**

- UUC\* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensor, for at least half an hour after reaching steady state.

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

End

F-CS-009 Revision: 01 Date: 25-04-65

## Customer Service Report

FOSS South East Asia

3388 Sirinrat Building, 25th ~ 26th Floor, Unit No. 3388/90,  
Rama IV Road, Klongton , Klongtoey, Bangkok, Thailand 10110

Report No:

8411

Date: \_\_\_\_\_

27/05/23

**Customer:**

CAF

**Instrument:**

KT 8100

**Address:**

Bangkok, Thailand

Serial:

91889052

**Hours**

### Travel To Customer

## Start

30

## Finish

136

15 hr

## Labour

04:00

15108

Ghr.

### Travel From Customer

16930

18530

2hr

| Job Type        |   |                |   |              |   |          |   |
|-----------------|---|----------------|---|--------------|---|----------|---|
| Application     |   | Special        |   | Standard     |   |          |   |
| Normal          | x | Courtesy Visit | x | Installation | x | Training | x |
| Distributor     | x | PMA Onboarding | x | Quote        | x | In House | x |
| Internal        | x | Warranty       | x | Repair       | x | PM       | x |
| Digital Service | x | Sales Support  | x | Remote       | x | Other    | x |

**PO/Quote Number:**

if applicable

**PMA Type**

403042 If applicable

Contract No. \_\_\_\_\_

If applicable

| Details of Work / Test                                     |                                                                        | Condition / Status  |
|------------------------------------------------------------|------------------------------------------------------------------------|---------------------|
| - Napa Function Test various PM                            |                                                                        | OK                  |
| - Instandance Part Change PM - kit 8/10/820 12 Mo          |                                                                        | OK                  |
| - Napa ammonia test "Heating Coil" = 32.3 °C               |                                                                        | OK                  |
| - Napa ammonia splash head Steam Generator                 |                                                                        | OK                  |
| - Napa ammonia steam Valve = 54.8 °C                       |                                                                        | OK                  |
| - Napa ammonia Condenser Water Cooling Valve A/B = 94.1 °C |                                                                        | OK                  |
| - Napa ammonia water 100 ml → 100 ml Alkal soil → 51 ml    |                                                                        | OK                  |
| - Napa ammonia solid skin 70 → 170 ml                      |                                                                        | OK                  |
| - Napa Blank = 0.12 Recovery = 100%                        |                                                                        |                     |
| Instrument Ready for Use                                   | <input checked="" type="checkbox"/> OK <input type="checkbox"/> Not OK | If not OK - Comment |

[illegible]

**I confirm this report is accurate and complete**

**Signed FOSS**

**Signed Customer**

Name \_\_\_\_\_

Name \_\_\_\_\_

**Would you be willing to participate in a brief survey in order to tell us how we performed?**

karnphong.b@vaeconsultant.co.th

## เอกสารไม่ควบคุม



Cert. No.: 23TM378  
Page: 1 of 3

## Certificate of Calibration

Equipment : Incubator  
Manufacturer : Memmert  
Model : IPP 26D  
Serial No. : V815.0187  
ID No. : UAE.MIC.003.2558  
Submitted by : United Analyst and Engineering Consultant Co., Ltd.  
36/1 Udomsuk 41, Sukhumvit Road,  
Bangchak, Phraekhanong,  
Bangkok 10260  
Location : Microbiology Laboratory  
Received Order : 11 April 2023  
Calibration Date : 12 April 2023  
Ambient Temperature :  $(26 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$   
Calibrated by : Preecha Hahb  
Approved by :   
( ) Ponnipha Tamayethul  
( ) Males Butkrus  
( ) Sumit Injai  
Issue Date : 24 April 2023

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2304-01550C-1

Cert. No.: 23TM378  
Page: 2 of 3

### Procedure Used :-

Calibration were conducted using calibration procedure GP-0102 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standard instrument:-

| Instrument          | Model  | Serial No. | Cert. No. | Due Date    |
|---------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34972A | MY49001451 | 23LM27    | 25 Feb 2024 |

2. This certificate is valid only to the item calibrated on date and place of calibration.

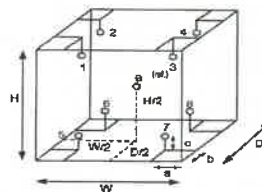
3. This certification is traceable to the International System of Unit.

Result of Calibration : ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available

| Environment during calibration |           |          |
|--------------------------------|-----------|----------|
|                                | Beginning | Finished |
| Temp. ( °C )                   | 25        | 26       |
| REL.Humid. ( % )               | 57        | 61       |
| AC Supply ( Volt )             | 220       | 220      |



#### Probe Installation Details :

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

#### Dimension of Chamber :

D = 0.50 m  
W = 0.64 m  
H = 0.60 m  
Capacity = 0.26 m<sup>3</sup>

| Position | Ref. Std. ID No. |
|----------|------------------|
| 1        | 19RTD-2/1        |
| 2        | 19RTD-2/2        |
| 3        | 19RTD-2/3        |
| 4        | 19RTD-2/4        |
| 5        | 19RTD-2/5        |
| 6        | 19RTD-2/6        |
| 7        | 19RTD-2/7        |
| 8        | 19RTD-2/8        |
| 9 (ref.) | 19RTD-2/9        |

เอกสารไม่ควบคุม



Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2304-01550C-1  
Result of Calibration : ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 23TM378  
Page: 3 of 3

| Calibration Point ( °C ) | UUC* Setting ( °C ) | UUC* Reading ( °C ) | Temperature stability ( ± °C ) | Temperature uniformity ( °C ) | Overall Variation ( °C ) | Coverage Factor |
|--------------------------|---------------------|---------------------|--------------------------------|-------------------------------|--------------------------|-----------------|
| 35.0                     | 35.0                | 35.0                | 0.052                          | 0.63                          | 0.60                     | 2               |

| Calibration Point ( °C ) | Measured Temperature ( °C ) |        |        |        |        |        |        |        |          | Uncertainty ( ± °C ) |
|--------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|----------------------|
|                          | 1                           | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9 (ref.) |                      |
| 35.0                     | 35.092                      | 35.148 | 34.817 | 35.148 | 34.894 | 35.323 | 34.773 | 35.058 | 34.802   | 0.30                 |

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

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

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

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

UUC\* : Unit Under Calibration

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

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

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เอกสารไม่ควบคุม





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES, EQUIPMENT CALIBRATION AND TESTING SERVICES  
112 PATTANABANG ROAD SOI 15, SUKUMVIT 15, SUKUMVIT BANGKOK 10250  
TEL. 0-27-51060-29 FAX 0-27-51061



Cert. No.: 23TM192  
Page : 1 of 3

## Certificate of Calibration

**Equipment :** Incubator  
**Manufacturer :** Binder  
**Model :** BD 53 E2  
**Serial No. :** 13-07343  
**ID No. :** UAE.MIC.0052550  
**Submitted by :** United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udonayuk 41, Sukhumvit Road,  
Bangchak, Phraekhanong,  
Bangkok 10250  
**Location :** Microbiology Laboratory  
**Received Order :** 15 February 2023  
**Calibration Date :** 15 February 2023  
**Ambient Temperature :** (26 ± 10) °C  
**Relative Humidity :** (50 ± 50) %  
**Calibrated by :** Suwit Imjai  
**Approved by :** [Signature]  
( ) Pannhippa Taneyakul  
( / ) Melea Buikuea  
**Issue Date :** 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the Head of Corporate Services, Equipment Calibration and Testing Services

เอกสารไม่ควบคุม



**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2302-0295OC-1

Cert. No.: 23TM192  
Page : 2 of 3

### Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standard instrument-

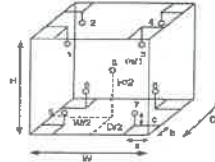
| Instrument          | Model  | Serial No. | Cert. No. | Due Date    |
|---------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34972A | MY59003411 | 22LM165   | 28 Nov 2023 |

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close



#### Probe Installation Details :

| Probe Installation Details | Dimension of Chamber            |
|----------------------------|---------------------------------|
| a = 5.0 cm                 | D = 0.33 m                      |
| b = 5.0 cm                 | W = 0.40 m                      |
| c = 5.0 cm                 | H = 0.40 m                      |
|                            | Capacity = 0.053 m <sup>3</sup> |

| Environment during calibration |           |          |
|--------------------------------|-----------|----------|
|                                | Beginning | Finished |
| Temp. ( °C )                   | 22        | 23       |
| REL. Humid. ( % )              | 65        | 61       |
| AC Supply ( Volt )             | 231       | 231      |

| Position | Ref. Std. ID No. |
|----------|------------------|
| 1        | 20RTD-2/1        |
| 2        | 20RTD-2/2        |
| 3        | 20RTD-2/3        |
| 4        | 20RTD-2/4        |
| 5        | 20RTD-2/5        |
| 6        | 20RTD-2/6        |
| 7        | 20RTD-2/7        |
| 8        | 20RTD-2/8        |
| 9 (ref.) | 20RTD-2/9        |

เอกสารไม่ควบคุม



**Equipment :** Incubator  
**Condition As-Received :** Used item  
**Reference :** 2302-0295OC-1  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

Cert. No.: 23TM192  
Page : 3 of 3

| Calibration Point<br>(°C) | UUC* Setting<br>(°C)      | UUC* Reading<br>(°C) | Temperature stability<br>(± °C) | Temperature uniformity<br>(°C) | Overall Variation<br>(°C) | Uncertainty<br>(± °C) | Coverage Factor<br>k |        |          |
|---------------------------|---------------------------|----------------------|---------------------------------|--------------------------------|---------------------------|-----------------------|----------------------|--------|----------|
| 35.0                      | 35.4                      | 35.4                 | 0.037                           | 0.56                           | 0.86                      | 0.30                  | 2                    |        |          |
| Calibration Point<br>(°C) | Measured Temperature (°C) |                      |                                 |                                |                           |                       |                      |        |          |
|                           | Position                  |                      |                                 |                                |                           |                       |                      |        |          |
|                           | 1                         | 2                    | 3                               | 4                              | 5                         | 6                     | 7                    | 8      | 8 (ref.) |
| 35.0                      | 35.256                    | 35.200               | 35.116                          | 35.453                         | 34.700                    | 34.798                | 34.718               | 34.667 | 34.938   |

**Averages\* :** The average of 30 values in each position

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

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

**UUC\* :** Unit Under Calibration

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

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

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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
151 PATTANAKARN ROAD SOI 15, SANGKAT 14, ANUSARIN BANGKOK 10260  
TEL: 0-2777-06078 FAX: 0-2749-0283



Cert. No.: 23TM193  
Page: 1 of 3

## Certificate of Calibration

Equipment : Water Bath  
Manufacturer : Memmert  
Model : WNE 14  
Serial No. : L418.0608  
ID No. : UAE.MIC.002/2560  
Submitted by : United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangkok, Phra Khanong,  
Bangkok 10260  
Location : Microbiology Laboratory  
Received Order : 15 February 2023  
Calibration Date : 15 February 2023  
Ambient Temperature :  $(26 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$   
Calibrated by : สุวิทย์ ไม้จตุมา  
Approved by :   
( ) Pomsipha Temayakul  
( / ) Meles Bulkras

Issue Date : 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services, Equipment Calibration and Testing Services

เอกสารไม่ควบคุม



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2302-02850C-2  
Result of Calibration : ( ' ) Without Adjustment  
Function of UUC : Temperature Source

Cert. No.: 23TM193  
Page: 3 of 3

| Calibration<br>point<br>( $^{\circ}\text{C}$ ) | UUC*<br>Setting<br>( $^{\circ}\text{C}$ ) | UUC*<br>Reading<br>( $^{\circ}\text{C}$ ) | Average* Standard Reading ( $^{\circ}\text{C}$ ) |        |        |        |          |
|------------------------------------------------|-------------------------------------------|-------------------------------------------|--------------------------------------------------|--------|--------|--------|----------|
|                                                |                                           |                                           | Position                                         |        |        |        |          |
|                                                |                                           |                                           | 1                                                | 2      | 3      | 4      | 5 (ref.) |
| 44.5                                           | 44.5                                      | 44.5                                      | 44.453                                           | 44.437 | 44.428 | 44.477 | 44.458   |

| Calibration<br>point<br>( $^{\circ}\text{C}$ ) | Uniformity<br>( $^{\circ}\text{C}$ ) | Stability<br>( $\pm ^{\circ}\text{C}$ ) | Uncertainty<br>( $\pm ^{\circ}\text{C}$ ) | Coverage<br>Factor<br>k |
|------------------------------------------------|--------------------------------------|-----------------------------------------|-------------------------------------------|-------------------------|
| 44.5                                           | 0.078                                | 0.036                                   | 0.15                                      | 2                       |

Average\* : The average of 30 values in each position.  
Uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature  
at the reference location which are observed at the same time or at as close an observation time as possible  
to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.  
Stability : One-half of the greatest maximum difference of measured temperature at any one probe.  
UUC\* : Unit Under Calibration.

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

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

-000-

เอกสารไม่ควบคุม



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2302-02850C-2  
Pressure Used :-

Cert. No.: 23TM193  
Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-QY04 according to direct  
measurement method with Data Acquisition which connected with Industrial Platinum Resistance  
Thermometer (IPRT).

The temperature scale used was based on ITS-90.

### Condition of the result of calibration

1. Reference standard instrument:-

| Instrument          | Model  | Serial No. | Cert. No. | Due Date    |
|---------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34972A | MY69303411 | 22LM165   | 28 Nov 2023 |

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certificate is traceable to the International System of Unit.

Result of Calibration :- ( ' ) Without Adjustment

Function of UUC : Temperature Source

|                          | Environmental          |                      | AC Voltage Supply |
|--------------------------|------------------------|----------------------|-------------------|
|                          | ( $^{\circ}\text{C}$ ) | ( $\% \text{R.H.}$ ) | ( Volt )          |
| Beginning of Calibration | 22                     | 85                   | 231               |
| Finished of Calibration  | 23                     | 81                   | 231               |

| Position : | Ref. Std.<br>ID No.: |
|------------|----------------------|
| 1          | 4804539-001          |
| 2          | 4804539-002          |
| 3          | 4804539-003          |
| 4          | 4804539-004          |
| 5(ref.)    | 4804539-005          |

Front

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
331 PATTANAKARN ROAD SOI 18, SUKUMVIT VANG, NANG LUANG BANGKOK 10260  
TEL. 0-2717-3000-50 FAX 0-2794-9444



Cert. No.: 23TM194  
Page: 1 of 3

## Certificate of Calibration

Equipment : Water Bath  
Manufacturer : Memmert  
Model : WNE 14  
Serial No. : L419.0612  
ID No. : UAE.MIC.003/2560  
Submitted by : United Analyst and Engineering Consultant Co., Ltd.  
330 Udonasak 41, Sukhumvit Road,  
Bangchak, Phrakhamong,  
Bangkok 10260  
Location : Microbiology Laboratory  
Received Order : 15 February 2023  
Calibration Date : 15 February 2023  
Ambient Temperature :  $26 \pm 10$  °C  
Relative Humidity :  $(50 \pm 30)$  %  
Calibrated by :   
Approved by :   
( ) Pomsilpa Temeyakul  
(✓) Meelee Bulkrasae  
Issue Date : 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2302-02950C-3  
Procedure Used :-

Cert. No.: 23TM194  
Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-0104 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| Instrument          | Model  | Serial No. | Cert. No. | Due Date    |
|---------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34972A | MY59003411 | 22LM105   | 26 Nov 2023 |

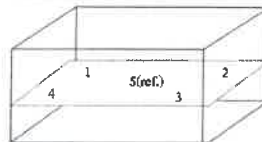
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- ( ) Without Adjustment

Function of UUC\* : Temperature Source

|                          | Environmental |           | AC Voltage Supply |
|--------------------------|---------------|-----------|-------------------|
|                          | ( °C )        | ( %R.H. ) | ( Volt )          |
| Beginning of Calibration | 22            | 55        | 231               |
| Finished of Calibration  | 22            | 53        | 230               |



Front

| Position | Ref. Std. ID No. |
|----------|------------------|
| 1        | 4804539-001      |
| 2        | 4804539-002      |
| 3        | 4804539-003      |
| 4        | 4804539-004      |
| 5 (ref.) | 4804539-005      |

เอกสารไม่ควบคุม



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2302-02950C-3  
Result of Calibration :- ( ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 23TM194  
Page: 3 of 3

| Calibration point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Average* Standard Reading (°C) |        |        |        |          |
|------------------------|-------------------|-------------------|--------------------------------|--------|--------|--------|----------|
|                        |                   |                   | 1                              | 2      | 3      | 4      | 5 (ref.) |
| 44.5                   | 44.5              | 44.5              | 44.520                         | 44.509 | 44.498 | 44.552 | 44.530   |

| Calibration point (°C) | Uniformity (°C) | Stability (± °C) | Uncertainty (± °C) | Coverage Factor k |
|------------------------|-----------------|------------------|--------------------|-------------------|
| 44.5                   | 0.077           | 0.037            | 0.15               | 2                 |

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

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

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

UUC\* : Unit Under Calibration

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

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

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เอกสารไม่ควบคุม



Cert. No.: 23TM783  
Page: 1 of 3

## Certificate of Calibration

Equipment : Autoclave  
Manufacturer : ALP  
Model : CL-40L  
Serial No. : 809763  
ID No. : UAE MIC.0262553

Submitted by : United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsak 41, Sukhumvit Road,  
Bangchak, Phraechanong,  
Bangkok 10250

Location : Microbiology Laboratory (301)

Received Order : 27 April 2023  
Calibration Date : 27 April 2023  
Ambient Temperature : (26 ± 10) °C  
Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hattib

Approved by :   
Approved Signatory

( / ) Poomthipha Tamoyakul  
( / ) Malee Bulkruee  
( / ) Siwat Imjai

Issue Date : 11 May 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing services.

เอกสารไม่ควบคุม

A 0053944



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2304-04610C-2

Cert. No.: 23TM783  
Page: 2 of 3

Procedure Used :

Calibration were conducted using in-house calibration procedure CP-0103 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument -

| Instrument           | Model  | Serial No. | Cert. No. | Due Date    |
|----------------------|--------|------------|-----------|-------------|
| 1.) Data Acquisition | 34972A | MY50003411 | 22LM185   | 26 Nov 2023 |

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

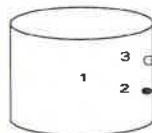
4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3\*\*

(\*\* = Categorization of pathogens according to hazard and categories of containment, second edition, 1990) It does not cover autoclaves for use with material infected with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

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

Result of Calibration :- ( / ) Without Adjustment

Function of UUC\* : Temperature Source



|                          | Environmental |         |        |
|--------------------------|---------------|---------|--------|
|                          | (°C)          | (%R.H.) | (Volt) |
| Beginning of Calibration | 27            | 80      | 220    |
| Finished of Calibration  | 27            | 50      | 220    |

| Position | Description        | Ref. Std. ID No.: |
|----------|--------------------|-------------------|
| 1 =      | Center of chamber  | 18-20TC-04        |
| 2 =      | Temperature sensor | 18-20TC-05        |
| 3 =      | Exhaust port       | 18-20TC-06        |

เอกสารไม่ควบคุม

a 1159968



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2304-04610C-2  
Result of Calibration :- ( / ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 23TM783  
Page: 3 of 3

Operating parameter Set : Temperature = 115.0 °C  
Sterilization period = 15 minute

| UUC* Setting (°C) | UUC* Reading (°C) | Position | Average* Standard Reading (°C) | Stability (± °C) | Pressure Reading (MPa) | Uncertainty (± °C) | Coverage Factor k |
|-------------------|-------------------|----------|--------------------------------|------------------|------------------------|--------------------|-------------------|
| 115.0             | 115.0             | 1        | 115.213                        | 0.22             | 0.08                   | 0.75               | 2                 |
|                   |                   | 2        | 115.100                        |                  |                        |                    |                   |
|                   |                   | 3        | 115.260                        |                  |                        |                    |                   |

Operating parameter Set : Temperature = 121.0 °C  
Sterilization period = 30 minute

| UUC* Setting (°C) | UUC* Reading (°C) | Position | Average* Standard Reading (°C) | Stability (± °C) | Pressure Reading (MPa) | Uncertainty (± °C) | Coverage Factor k |
|-------------------|-------------------|----------|--------------------------------|------------------|------------------------|--------------------|-------------------|
| 121.0             | 121.0             | 1        | 121.260                        | 0.29             | 1.1                    | 0.75               | 2                 |
|                   |                   | 2        | 121.224                        |                  |                        |                    |                   |
|                   |                   | 3        | 121.264                        |                  |                        |                    |                   |

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

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

UUC\* : Unit Under Calibration

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

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

-000-

เอกสารไม่ควบคุม

a 1159967



## Certificate of Calibration

Certificate No.: C11230106

Page: 2 of 4

Equipment: Autoclave  
Model: CL-40L  
Serial No. (or ID.): B10010  
Manufacturer: ALP  
Condition: In Condition

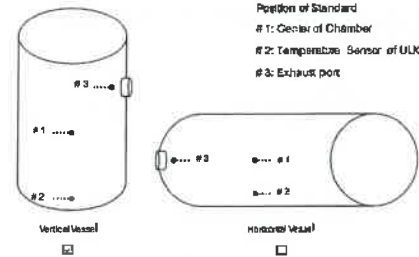
Certificate No.: C11230106  
Issued Date: 11 June 2023  
Job No.: KSPR230770  
Page: 1 of 4

Customer: United Analyst and Engineering Consultant Company Limited.  
3 Sol Udomsuk 41 Sukhumvit Road,  
Bangkok, Prakanong, Bangkok 10260 Thailand.

Environment Condition: Temperature: 22 °C ± 0.8 °C  
Humidity: 58 %RH ± 4.0 %RH  
Voltage: 220 VAC ± 1.3 VAC

Calibration Place: United Analyst and Engineering Consultant Company Limited. (301 Room)  
3 Sol Udomsuk 41 Sukhumvit Road,  
Bangkok, Prakanong, Bangkok 10260 Thailand.

Calibration By: Mr. Amornthep Phumpha  
Calibration Date: 08 June 2023  
The Method used: In house method, CAL-WI-16, base on BS 2646 : Part 5  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Quality reborn Co., Ltd.  
Certificate No. QR23-0086



## Standard Installation Locations

Standard Locations (#1): Geometric center of the chamber  
Standard Locations (#2): Distance from temperature sensor of UUC 2 (cm.)  
Standard Locations (#3): Distance from the wall 5 (cm.)

| Position of Std   | #1 | #2 | #3 |
|-------------------|----|----|----|
| Channel of Logger | 4  | 5  | 8  |

## Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.

**Measured Temperature:** The average reading of standards at any positions or location.

**Measured Stability:** The one-half of greatest maximum difference of measured temperature at any one probe.



(Mr. Amornthep Phumpha)

Person in charge



Authorized signatory

This certificate is based on 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 in 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 apply only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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CAL-FM-C11-15: 12 Sep 2022

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Certificate No.: C11230106

Page: 3 of 4

## Calibration Results:

Without adjustment

Measured Temperature at Spread Locations, Indicating of Unit Under Calibration: 115.0 °C

| Locations | Measured Temperature (°C) | Correction of UUC (°C) | Uncertainty (± °C) |
|-----------|---------------------------|------------------------|--------------------|
| #1        | 115.34                    | 0.34                   | 0.35               |
| #2        | 115.43                    | 0.43                   | 0.35               |
| #3        | 115.43                    | 0.43                   | 0.35               |

## Temperature Distribution

| Temperature  |              | Pressure        |                | Measured Temperature at Spread Locations |         |         | Uncertainty (± °C)* |
|--------------|--------------|-----------------|----------------|------------------------------------------|---------|---------|---------------------|
| Desired (°C) | Setting (°C) | Indicating (°C) | Indicating Mpa | #1 (°C)                                  | #2 (°C) | #3 (°C) |                     |
| 116          | 115          | 115.0           | 0.08           | 116.34                                   | 116.43  | 116.43  | 0.35                |

## Chamber Characterization

| Indicating Temperature (°C) | Indicating Pressure Mpa | Measured Stability (± °C) |
|-----------------------------|-------------------------|---------------------------|
| 115.0                       | 0.08                    | 0.15                      |

Note: \* Maximum uncertainty of the each position

Record every 10 seconds after reaching steady state or after one achieved complete cycle.

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CAL-FM-C11-15: 12 Sep 2022

## Without adjustment

Certificate No.: C11230106

Page: 4 of 4

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 121.0 °C

| Locations | Measured Temperature (°C) | Correction of UUC (°C) | Uncertainty (± °C) |
|-----------|---------------------------|------------------------|--------------------|
| #1        | 121.34                    | 0.34                   | 0.35               |
| #2        | 121.40                    | 0.40                   | 0.35               |
| #3        | 121.26                    | 0.26                   | 0.35               |

## Temperature Distribution

| Temperature  |              | Pressure        |                | Measured Temperature at Spread Locations |         |         | Uncertainty (± °C)* |
|--------------|--------------|-----------------|----------------|------------------------------------------|---------|---------|---------------------|
| Desired (°C) | Setting (°C) | Indicating (°C) | Indicating Mpa | #1 (°C)                                  | #2 (°C) | #3 (°C) |                     |
| 121          | 121          | 121.0           | 0.12           | 121.34                                   | 121.40  | 121.26  | 0.35                |

## Chamber Characterization

| Indicating Temperature (°C) | Indicating Pressure Mpa | Measured Stability (± °C) |
|-----------------------------|-------------------------|---------------------------|
| 121.0                       | 0.12                    | 0.07                      |

Note: \* Maximum uncertainty of the each position

Record every 10 seconds after reaching steady state or after one achieved complete cycle.

The End of Certificate

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CAL-FM-C11-15: 12 Sep 2022





## Certificate of Calibration

Equipment: Balance  
Model: FX623  
Serial No. (or ID.): C236754745  
Manufacturer: Ohaus  
Condition: New

Certificate No.: C01223732  
Issued Date: 09 December 2022  
Job No.: K6PR2215576  
Page: 1 of 2

Customer: United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,  
Phraekhanong District, Bangkok, THAILAND 10260

Environment Condition: Temperature 26 °C ± 0.5 °C  
Humidity 53 %RH ± 3.9 %RH

Calibration Place: United Analyst and Engineering Consultant Co., Ltd. (301 Microbiology Room)  
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,  
Phraekhanong District, Bangkok, THAILAND 10260

Calibration By: Mr. Adisai Mainol  
Calibration Date: 09 December 2022  
The Method Used: In-house method, CAL-MH-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. C02221785



Person in charge



Authorized signatory

This certificate is issued in accordance with the rules of measurement according to the International System of Units (SI). It provides traceability of measurement to International or national standard or other recognized reference standard (traceability).  
The measurement uncertainty stated in this report is based on the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
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CAL-FM-C01-14: 12 Sep 2022

Certificate No.: C01223732

Page: 2 of 2

## Calibration Results:

## Without Adjustment

Essential 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 | 200   | (g) |
| Reference Points (g)                                                              |                                                                                    |                                                                                     |                    |       |     |
| A                                                                                 | B                                                                                  | C                                                                                   | D                  | E     |     |
| -                                                                                 | 0.000                                                                              | 0.000                                                                               | 0.000              | 0.000 |     |

Repeatability: Determination of the standard deviation of weighing balance. Repeatability 0.001 (g)

| Nominal test value (g) | Standard Deviation |
|------------------------|--------------------|
| 50                     | 0.0004             |
| 500                    | 0.0005             |

Error of Indication from nominal or conventional mass values. Repeatability 0.001 (g)

| Nominal Value (g) | Conventional Mass (g) | Displayed Value (g) | Error of Indication (g) | Uncertainty (g) | k    |
|-------------------|-----------------------|---------------------|-------------------------|-----------------|------|
| 1                 | 1.0000                | 1.000               | 0.000                   | 0.0010          | 2.03 |
| 5                 | 5.0001                | 5.000               | 0.000                   | 0.0010          | 2.03 |
| 10                | 10.0001               | 10.000              | 0.000                   | 0.0010          | 2.03 |
| 20                | 20.0001               | 20.000              | 0.000                   | 0.0010          | 2.03 |
| 50                | 50.0001               | 50.000              | 0.000                   | 0.0010          | 2.03 |
| 100               | 100.0001              | 100.000             | 0.000                   | 0.0011          | 2.03 |
| 200               | 200.0004              | 200.000             | 0.000                   | 0.0011          | 2.02 |
| 300               | 300.0005              | 300.000             | -0.001                  | 0.0013          | 2.01 |
| 400               | 400.0008              | 400.001             | 0.000                   | 0.0014          | 2.01 |
| 500               | 500.0005              | 500.000             | 0.000                   | 0.0017          | 2.00 |
| 600               | 600.0004              | 600.000             | 0.000                   | 0.0016          | 2.00 |

The End of Certificate

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CAL-FM-C01-14: 12 Sep 2022

Refer to Certificate No.: C01223732

Page: 1 of 2

## Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The error of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all affects by according to the standard method, UKAS Lab 14. Therefore, those parameters have not been assessed separately.

## Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerance and decision rule as prescribed by the customer.

- Decision rule: ☐ Choice A Binary Statement for Limits Acceptance Rule ( $\alpha = 0$ ). Specific Risk < 50% PFA  
☒ Choice B Non-binary statement with guard band ( $\alpha = 1$  U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA  
☐ Choice C Customer defined. Customers may define arbitrary multiple of  $\alpha$  to have applied as guard band ( $\alpha = 1$  U).

: PFA - Probability of False Accept

(Mr. Rungrat Jernkittakulchai)  
Authorized signatory

เอกสารไม่ควบคุม

CAL-FM-C01-14: 12 Sep 2022

Refer to Certificate No.: C01223732

Page: 2 of 2

## Statements of conformity:

## Without Adjustment

Repeatability: 0.001 g

| Nominal Value (g) | Error of Indication (g) | Guard band (g) | Tolerance (g) | Conformity |
|-------------------|-------------------------|----------------|---------------|------------|
| 1                 | 0.000                   | 0.0010         | 0.002         | Pass       |
| 5                 | 0.000                   | 0.0010         | 0.010         | Pass       |
| 10                | 0.000                   | 0.0010         | 0.020         | Pass       |
| 20                | 0.000                   | 0.0010         | 0.040         | Pass       |
| 50                | 0.000                   | 0.0010         | 0.100         | Pass       |
| 100               | 0.000                   | 0.0011         | 0.200         | Pass       |
| 200               | 0.000                   | 0.0011         | 0.400         | Pass       |
| 300               | -0.001                  | 0.0013         | 0.600         | Pass       |
| 400               | 0.000                   | 0.0014         | 0.800         | Pass       |
| 500               | 0.000                   | 0.0017         | 1.000         | Pass       |
| 600               | 0.000                   | 0.0016         | 1.200         | Pass       |

The validity of the statements of conformity cannot be guaranteed for different pieces of use, environmental conditions or improper use.

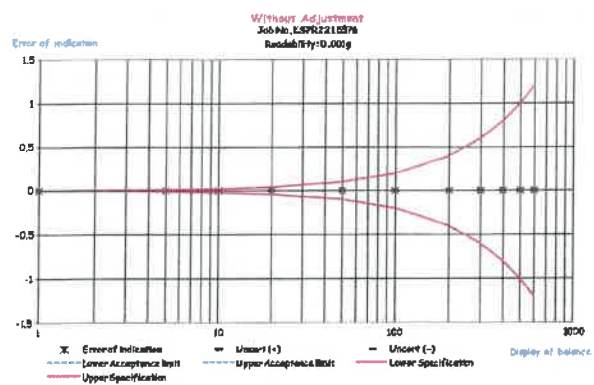
The End of Statements of conformity

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CAL-FM-C01-14: 12 Sep 2022



เอกสารไม่ควบคุม



List of Instruments Certification for Water Quality Analysis

| No.   | Instrument/Equipment | Parameter | Manufacturer | Model/Serial No.        | Calibrator                                           | Certification No. | Date of Calibration | Due date of Calibration | Remark |
|-------|----------------------|-----------|--------------|-------------------------|------------------------------------------------------|-------------------|---------------------|-------------------------|--------|
| Water |                      |           |              |                         |                                                      |                   |                     |                         |        |
| 1     | pH Meter             | pH        | Horiba       | LAQUA-PH210<br>HA0F0026 | Technology Promotion Association<br>(Thailand-Japan) | 23CH98            | 23 Jan 23           | 22 Jan 24               | -      |



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23CH98

Page.: 1 of 3

## Certificate of Calibration

**Equipment :** pH Meter  
**Manufacturer :** Horiba  
**Model :** LAQUA-PH210  
**Serial No. :** HA0F0026  
**ID No. :** UAE.EFM.068/2564(EFM.ph.01/64)  
**Condition As-Received:** Used Item  
**Received Date :** 20 January 2023  
**Calibration Date :** 23 January 2023  
**Reference :** 2301-0687WSC-1  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong, Bangkok 10260  
**Ambient Temperature :** (25 ± 2.5) °C  
**Relative Humidity :** (50 ± 15) %  
**Calibration Procedure :** In - house method :  
- CP-CH5 by direct measurement with standard  
voltage calibrator and direct measurement with  
certified reference material (CRM)  
- CP-CH8 by comparison with standard thermometer

**Calibrated by :** Warakorn Lernagatrakul

**Approved by :**

Approved Signatory

- ( ☒ ) Malee Butkruea  
( ☐ ) Saithip Meangmai  
( ☐ ) Warakorn Lernagatrakul

**Issue Date :** 25 January 2023

**The Uncertainties are for a confidence probability of approximately 95 %**

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

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**Condition of this calibration result**

1. Reference Standard Instrument : -

| <u>Instrument</u>              | <u>Serial No.</u> | <u>ID No.</u> | <u>Cert. No.</u> | <u>Due Date</u> |
|--------------------------------|-------------------|---------------|------------------|-----------------|
| 1) Document Process Calibrator | 54030049          | 130RC116      | 22E2769          | 24 Aug 2023     |
| 2) Ref. Standard Thermometer   | 4982054           | 110RC044      | 2211306          | 27 Oct 2023     |

This certification is traceable to the International System of Unit maintained at:-

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,  
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

| <u>Buffer Solution</u> | <u>Manufacturer</u> | <u>Lot No.</u> | <u>Exp. date</u> |
|------------------------|---------------------|----------------|------------------|
| pH 4.008               | CPA chem            | 826588         | 09 July 2024     |
| pH 6.987               | CPA chem            | 826589         | 09 July 2023     |
| pH 10.008              | CPA chem            | 826590         | 09 July 2023     |

3. This certificate is valid only to the item calibrated on date and place of calibration.

**Calibration Results**

**Function : mV Measurement**

**Performing standard curve by Fluke at pH (4,7)(7,10)**

| Unit Under Calibration     | Nominal Value | Standard Voltage Input | Actual Reading |       | Uncertainty of Measurement<br>( ±mV ) | Coverage factor<br><i>k</i> |
|----------------------------|---------------|------------------------|----------------|-------|---------------------------------------|-----------------------------|
|                            | pH            | mV                     | mV             | pH    |                                       |                             |
| pH Meter<br>S/N.: HA0F0026 | 4.00          | 177.48                 | 177.5          | 4.01  | 0.058                                 | 2.00                        |
|                            | 7.00          | 0.00                   | 0.1            | 7.00  | 0.058                                 | 2.00                        |
|                            | 7.00          | 0.00                   | 0.1            | 7.00  | 0.058                                 | 2.00                        |
|                            | 10.00         | -177.48                | -177.4         | 10.01 | 0.058                                 | 2.00                        |

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### Calibration Results

**Function :** pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

| Unit Under Calibration         | Standard pH Buffer Solution | Actual pH Reading | Actual mV Reading ( mV ) | Uncertainty of pH measurement ( ± ) | Coverage factor <i>k</i> |
|--------------------------------|-----------------------------|-------------------|--------------------------|-------------------------------------|--------------------------|
| pH Electrode<br>S/N.: 991L0035 | 4.008                       | 4.02              | 161                      | 0.0086                              | 2.05                     |
|                                | 6.987                       | 7.00              | -11                      | 0.011                               | 2.00                     |
|                                | 6.987                       | 7.00              | -11                      | 0.011                               | 2.00                     |
|                                | 10.008                      | 10.01             | -187                     | 0.0096                              | 2.00                     |

**Function :** Temperature Measurement

( \* ) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652  
- Serial No. : 991L0035

Dimension of probe;

- Length : 112 mm.  
- Diameter : 16 mm.  
- Immersion Depth : 100 mm.

| Calibration Point ( °C ) | Standard Temperature ( °C ) | UUC* Reading ( °C ) | Error ( °C ) | Uncertainty of measurement ( ± °C ) | Coverage factor <i>k</i> |
|--------------------------|-----------------------------|---------------------|--------------|-------------------------------------|--------------------------|
| 25.0                     | 25.002                      | 25.0                | -0.002       | 0.13                                | 2.00                     |
| 30.0                     | 30.003                      | 30.0                | -0.003       | 0.13                                | 2.00                     |
| 35.0                     | 35.002                      | 35.0                | -0.002       | 0.13                                | 2.00                     |

**Remark :** - UUC\* = Unit Under Calibration

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

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