

ภาคผนวก จ
ใบรับรองการสอบเทียบเครื่องมือ

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 HA1G0019 | Technology Promotion Association (Thailand-Japan) | 21CH1617 | 23 Nov 21 | 22 Nov 22 | - |



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 21CH1617

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Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA1G0019
ID No. : UAE.EFM.202/2564(EFM.pH.10/64)
Condition As-Received: Used Item
Received Date : 18 November 2021
Calibration Date : 23 November 2021
Reference : 2111-0736WSC-3
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 Lerngagtrakul

Approved by :

Approved Signatory

- (/) Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date : 25 November 2021

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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Cert.No.: 21CH1617

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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 | 21E2682 | 25 Aug 2022 |
| 2) Ref. Standard Thermometer | 4982054 | 110RC044 | 21I1201 | 26 Oct 2022 |

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 | 761016 | 02 Aug 2023 |
| pH 6.982 | CPA chem | 761017 | 02 Aug 2022 |
| pH 10.015 | CPA chem | 761018 | 02 Aug 2022 |

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 (±mV) | Coverage factor <i>k</i> |
|----------------------------|---------------|------------------------|----------------|-------|---------------------------------------|-----------------------------|
| | pH | mV | mV | pH | | |
| pH Meter S/N.: HA1G0019 | 4.00 | 177.48 | 177.6 | 4.01 | 0.058 | 2.00 |
| | 7.00 | 0.00 | 0.2 | 7.00 | 0.058 | 2.00 |
| | 7.00 | 0.00 | 0.2 | 7.00 | 0.058 | 2.00 |
| | 10.00 | -177.48 | -177.2 | 10.01 | 0.058 | 2.00 |

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Cert.No.: 21CH1617

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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 (\pm) | Coverage factor k |
|--------------------------------|-----------------------------|-------------------|--------------------------|-----------------------------------------|---------------------|
| pH Electrode S/N.: 991F0172 | 4.008 | 4.01 | 167.8 | 0.0079 | 2.00 |
| | 6.982 | 6.97 | -7.1 | 0.0093 | 2.00 |
| | 6.982 | 6.97 | -7.1 | 0.0093 | 2.00 |
| | 10.015 | 10.01 | -185.0 | 0.0092 | 2.00 |

Function : Temperature Measurement**(*) Without adjustment**

This equipment was connected with Temperature Probe;

- Model : 9652
- Serial No. : 991F0172

Dimension of probe;

- Length : 103 mm.
- Diameter : 16 mm.
- Immersion Depth : 90 mm.

| Calibration Point ($^{\circ}\text{C}$) | Standard Temperature ($^{\circ}\text{C}$) | UUC* Reading ($^{\circ}\text{C}$) | Error ($^{\circ}\text{C}$) | Uncertainty of measurement (\pm $^{\circ}\text{C}$) | Coverage factor k |
|------------------------------------------|---------------------------------------------|-------------------------------------|------------------------------|---------------------------------------------------------|---------------------|
| 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 | 35.004 | 35.0 | -0.004 | 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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List Certificate Instruments of Laboratory for Environmental Quality Analysis.

| No. | Instrument/Equipment | Parameter | Manufacturer | Model/Serial No. | Calibrator | Certification No. | Date of Calibration | Due date of Calibration* | Remark |
|----------------------------------------------|--------------------------|-----------------------------------------|----------------------|----------------------------|---------------------------------------------------|--------------------------|---------------------|--------------------------|--------|
| Laboratory Instrument/Equipments (คุณภาพน้ำ) | | | | | | | | | |
| 1 | UV-VIS Spectrophotometer | Color | Agilent Technologies | Cary60 G6860A / MY15410009 | DQE Services Co.,Ltd. | SP22-016 | 31 May 22 | 30 May 23 | - |
| 2 | UV-VIS Spectrophotometer | Nitrate | Hitachi | U-1900 / 2021-064 | DQE Services Co.,Ltd. | SP22-007 | 20 Jan 22 | 19 Jan 23 | - |
| 3 | UV-VIS Spectrophotometer | Ammonia Cyanuric acid | Merck | U-2900 / 21E22-009 | DQE Services Co.,Ltd. | SP22-008 | 20 Jan 22 | 19 Jan 23 | - |
| 4 | Turbidity Meter | Turbidity | Oakton | T100IR / 1120501017 | Technology Promotion Association (Thailand-Japan) | 21CH1017 | 17 Aug 21 | 16 Aug 22 | - |
| 5 | Incubator | TCB FCB | Memmert | IPP 260 / V616.0066 | Technology Promotion Association (Thailand-Japan) | 22TM672 | 5 May 22 | 4 May 23 | - |
| 6 | Incubator | E. Coli <i>Staphylococcus aureus</i> | Memmert | IPP 260 / V615.0187 | Technology Promotion Association (Thailand-Japan) | 22TM563 | 7 Apr 22 | 6 Apr 23 | - |
| 7 | Water Bath | Pseudomonas aeruginosa | Memmert | WNE 14 / L416.0606 | Technology Promotion Association (Thailand-Japan) | 22TM333 | 17 Feb 22 | 16 Feb 23 | - |
| 8 | Water Bath | | Memmert | WNE 14 / L416.0612 | Technology Promotion Association (Thailand-Japan) | 22TM334 | 17 Feb 22 | 16 Feb 23 | - |
| 9 | Analytical Balance | | Mettler-Toledo | XSR205DU / C210685394 | Mettler-Toledo (Thailand) Ltd. | TH2058-043-050622-ACC-TH | 9 May 22 | 8 May 23 | - |
| 10 | Auto Clave | | ALP | CL-40L / 802664 | Technology Promotion Association (Thailand-Japan) | 22TM89 | 17 Feb 22 | 16 Feb 23 | - |

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


CERTIFICATE OF CALIBRATION

Certificate No. : SP22-016

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Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)**Address :** 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,

Bangkok 10260

Location of calibration : Laboratory 315**Equipment :** UV-Vis Spectrophotometer**Manufacturer :** Agilent Technologies**Model :** Cary 60**Serial No. :** MY15410009**ID No. :** N/A**Received Date :** 23 May 2022**Calibration Date :** 23 May 2022**Issue Date :** 26 May 2022**Condition Instrument :** Good**Calibrated by :**
(Mr.Tanawut Rittidach)

Technical Manager

Approved by :
(Ms. Chonthicha Sangngern)

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit 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 DQE Services Co., Ltd.

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REPORT OF CALIBRATION

Certificate No. : SP22-016

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Environment Condition : Ambient Temperature 25 ± 5 °CRelative humidity 55 ± 20 %RH**Calibration method :** In-house method CP-01 Based on ASTM E275-08**Certified Reference Materials :**

| Material | Serial No. | Certificate No. | Due date |
|-------------------------|------------|-----------------|-----------------|
| Absorbance Standard set | 25760 | 95935 | 22 October 2023 |
| Absorbance Standard set | 25757 | 95929 | 22 October 2023 |
| Wavelength Standard set | 25806 | 95916 | 22 October 2023 |
| Wavelength Standard set | 25758 | 95915 | 22 October 2023 |

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

Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.**Scan Speed of UUC :** 90 nm/min**Scan Interval of UUC :** 0.15 nm.**Resolution of UUC :** Photometric 0.0001 Abs.

Wavelength 0.1 nm.

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FM-708-02 R01 1/11/2021

REPORT OF CALIBRATION

Certificate No. : SP22-016

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Calibration Results : Without adjustment

Photometric Accuracy :

| Wavelength (nm.) | CRMs Values (Abs) | UUC Reading (Abs) | Correction (Abs) | Uncertainty (Abs) | Coverage factor <i>k</i> |
|---------------------|----------------------|----------------------|---------------------|----------------------|-----------------------------|
| 420 | 0.0000 | 0.0000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5787 | 0.5755 | 0.0032 | 0.0031 | 2.00 |
| | 1.0490 | 1.0436 | 0.0054 | 0.0029 | 2.00 |
| | 2.1900 | 2.1847 | 0.0053 | 0.0075 | 2.00 |
| 440 | 0.0000 | 0.0000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5607 | 0.5588 | 0.0019 | 0.0034 | 2.00 |
| | 1.0247 | 1.0232 | 0.0015 | 0.0035 | 2.00 |
| | 2.1229 | 2.1211 | 0.0018 | 0.0082 | 2.00 |
| 465 | 0.0000 | 0.0000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5236 | 0.5197 | 0.0039 | 0.0029 | 2.00 |
| | 0.9634 | 0.9625 | 0.0009 | 0.0028 | 2.00 |
| | 1.9763 | 1.9752 | 0.0011 | 0.0070 | 2.00 |
| 546.1 | 0.0000 | -0.0001 | 0.0001 | 0.0028 | 2.00 |
| | 0.5191 | 0.5171 | 0.0020 | 0.0031 | 2.00 |
| | 1.0003 | 0.9984 | 0.0019 | 0.0033 | 2.00 |
| | 1.9987 | 1.9946 | 0.0041 | 0.0084 | 2.00 |
| 590 | 0.0000 | 0.0000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5523 | 0.5509 | 0.0014 | 0.0030 | 2.00 |
| | 1.0809 | 1.0799 | 0.0010 | 0.0029 | 2.00 |
| | 2.0391 | 2.0329 | 0.0062 | 0.0080 | 2.00 |
| 635 | 0.0000 | 0.0000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5601 | 0.5584 | 0.0017 | 0.0031 | 2.00 |
| | 1.0512 | 1.0498 | 0.0014 | 0.0029 | 2.00 |
| | 1.9294 | 1.9265 | 0.0029 | 0.0082 | 2.00 |

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REPORT OF CALIBRATION

Certificate No. : SP22-016

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Photometric Accuracy :

| Wavelength (nm.) | CRMs Values (Abs) | UUC Reading (Abs) | Correction (Abs) | Uncertainty (Abs) | Coverage factor <i>k</i> |
|---------------------|----------------------|----------------------|---------------------|----------------------|-----------------------------|
| 235 | 0.0000 | 0.0001 | -0.0001 | 0.0050 | 2.00 |
| | 0.7478 | 0.7421 | 0.0057 | 0.0056 | 2.00 |
| 257 | 0.0000 | 0.0000 | 0.0000 | 0.0050 | 2.00 |
| | 0.8686 | 0.8619 | 0.0067 | 0.0059 | 2.00 |
| 313 | 0.0000 | 0.0000 | 0.0000 | 0.0050 | 2.00 |
| | 0.2912 | 0.2896 | 0.0016 | 0.0051 | 2.00 |
| 350 | 0.0000 | 0.0000 | 0.0000 | 0.0050 | 2.00 |
| | 0.6448 | 0.6403 | 0.0045 | 0.0055 | 2.00 |

REPORT OF CALIBRATION

Certificate No. : SP22-016

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Wavelength Accuracy :

| CRMs Values (nm.) | UUC Reading (nm.) | Correction (nm.) | Uncertainty (nm.) | Coverage factor <i>k</i> |
|----------------------|----------------------|---------------------|----------------------|-----------------------------|
| 241.72 | 242.0 | -0.28 | 0.18 | 2.00 |
| 279.45 | 279.5 | -0.05 | 0.18 | 2.00 |
| 287.81 | 287.5 | 0.31 | 0.18 | 2.00 |
| 334.06 | 333.5 | 0.56 | 0.18 | 2.00 |
| 360.93 | 360.5 | 0.43 | 0.18 | 2.00 |
| 418.59 | 418.0 | 0.59 | 0.18 | 2.00 |
| 445.94 | 445.4 | 0.54 | 0.18 | 2.00 |
| 453.66 | 453.2 | 0.46 | 0.18 | 2.00 |
| 460.02 | 459.7 | 0.32 | 0.18 | 2.00 |
| 536.59 | 536.2 | 0.39 | 0.18 | 2.00 |
| 637.98 | 638.3 | -0.32 | 0.18 | 2.00 |
| 431.38 | 431.0 | 0.38 | 0.18 | 2.00 |
| 472.50 | 472.5 | 0.00 | 0.18 | 2.00 |
| 513.47 | 513.5 | -0.03 | 0.18 | 2.00 |
| 528.88 | 528.5 | 0.38 | 0.18 | 2.00 |
| 573.17 | 573.0 | 0.17 | 0.18 | 2.00 |
| 585.35 | 585.0 | 0.35 | 0.20 | 2.00 |
| 684.40 | 684.7 | -0.30 | 0.18 | 2.00 |
| 740.72 | 740.8 | -0.08 | 0.20 | 2.00 |
| 748.55 | 748.5 | 0.05 | 0.18 | 2.00 |
| 807.03 | 807.3 | -0.27 | 0.18 | 2.00 |
| 879.28 | 879.0 | 0.28 | 0.18 | 2.00 |

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k ,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- * Indicates non TISI accredited

- End of Certificate -

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CERTIFICATE OF CALIBRATION

Certificate No. : SP22-007

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Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)**Address :** 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,

Bangkok 10260

Location of calibration : Laboratory 315**Equipment :** UV-Vis Spectrophotometer**Manufacturer :** Hitachi**Model :** U-1900**Serial No. :** 2021-064**ID No. :** UAE.WAS.006/2552**Received Date :** 20 January 2022**Calibration Date :** 20 January 2022**Issue Date :** 24 January 2022**Condition Instrument :** Good**Calibrated by :**

(Mr.Tanawut Rittidach)

Technical Manager

Approved by :

(Ms. Chonthicha Sangngern)

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit 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 DQE Services Co., Ltd.

REPORT OF CALIBRATION

Certificate No. : SP22-007

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Environment Condition : Ambient Temperature 25 ± 5 °CRelative humidity 55 ± 20 %RH**Calibration method :** In-house method CP-01 Based on ASTM E275-08**Certified Reference Materials :**

| Material | Serial No. | Certificate No. | Due date |
|-------------------------|------------|-----------------|-----------------|
| Absorbance Standard set | 25760 | 95935 | 22 October 2023 |
| Absorbance Standard set | 25757 | 95929 | 22 October 2023 |
| Wavelength Standard set | 25806 | 95916 | 22 October 2023 |
| Wavelength Standard set | 25758 | 95915 | 22 October 2023 |

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

Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 4.0 nm.**Scan Speed of UUC :** 200 nm/min**Scan Interval of UUC :** 0.1 nm.**Resolution of UUC:** Photometric 0.001 Abs.

Wavelength 0.1 nm.

REPORT OF CALIBRATION

Certificate No. : SP22-007

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Calibration Results : Without adjustment

Photometric Accuracy :

| Wavelength (nm.) | CRMs Values (Abs) | UUC Reading (Abs) | Correction (Abs) | Uncertainty (Abs) | Coverage factor <i>k</i> |
|---------------------|----------------------|----------------------|---------------------|----------------------|-----------------------------|
| 420 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5787 | 0.577 | 0.0017 | 0.0031 | 2.00 |
| | 1.0490 | 1.050 | -0.0010 | 0.0029 | 2.00 |
| | 2.1900 | 2.183 | 0.0070 | 0.0080 | 2.00 |
| 440 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5607 | 0.560 | 0.0007 | 0.0034 | 2.00 |
| | 1.0247 | 1.023 | 0.0017 | 0.0035 | 2.00 |
| | 2.1229 | 2.118 | 0.0049 | 0.0079 | 2.00 |
| 465 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5236 | 0.521 | 0.0026 | 0.0030 | 2.00 |
| | 0.9634 | 0.963 | 0.0004 | 0.0029 | 2.00 |
| | 1.9763 | 1.974 | 0.0023 | 0.0070 | 2.00 |
| 546.1 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5191 | 0.518 | 0.0011 | 0.0031 | 2.00 |
| | 1.0003 | 1.000 | 0.0003 | 0.0033 | 2.00 |
| | 1.9987 | 1.996 | 0.0027 | 0.0084 | 2.00 |
| 590 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5523 | 0.552 | 0.0003 | 0.0030 | 2.00 |
| | 1.0809 | 1.082 | -0.0011 | 0.0030 | 2.00 |
| | 2.0391 | 2.033 | 0.0061 | 0.0079 | 2.00 |
| 635 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5601 | 0.562 | -0.0019 | 0.0031 | 2.00 |
| | 1.0512 | 1.052 | -0.0008 | 0.0030 | 2.00 |
| | 1.9294 | 1.925 | 0.0044 | 0.0079 | 2.00 |

REPORT OF CALIBRATION

Certificate No. : SP22-007

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Photometric Accuracy :

| Wavelength (nm.) | CRMs Values (Abs) | UUC Reading (Abs) | Correction (Abs) | Uncertainty (Abs) | Coverage factor <i>k</i> |
|---------------------|----------------------|----------------------|---------------------|----------------------|-----------------------------|
| 235 | 0.0000 | 0.000 | 0.0000 | 0.0050 | 2.00 |
| | 0.7478 | 0.746 | 0.0018 | 0.0057 | 2.00 |
| 257 | 0.0000 | 0.000 | 0.0000 | 0.0050 | 2.00 |
| | 0.8686 | 0.861 | 0.0076 | 0.0059 | 2.00 |
| 313 | 0.0000 | 0.000 | 0.0000 | 0.0050 | 2.00 |
| | 0.2912 | 0.291 | 0.0002 | 0.0051 | 2.00 |
| 350 | 0.0000 | 0.000 | 0.0000 | 0.0050 | 2.00 |
| | 0.6448 | 0.638 | 0.0068 | 0.0055 | 2.00 |

REPORT OF CALIBRATION

Certificate No. : SP22-007

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Wavelength Accuracy :

| CRMs Values (nm.) | UUC Reading (nm.) | Correction (nm.) | Uncertainty (nm.) | Coverage factor <i>k</i> |
|----------------------|----------------------|---------------------|----------------------|-----------------------------|
| 241.54 | 240.8 | 0.74 | 0.18 | 2.00 |
| 279.40 | 278.5 | 0.90 | 0.18 | 2.00 |
| 288.70 | 288.0 | 0.70 | 0.18 | 2.00 |
| 334.22 | 333.5 | 0.72 | 0.18 | 2.00 |
| 361.26 | 360.5 | 0.76 | 0.18 | 2.00 |
| 418.48 | 418.0 | 0.48 | 0.18 | 2.00 |
| 446.70 | 446.0 | 0.70 | 0.18 | 2.00 |
| 453.20 | 453.0 | 0.20 | 0.18 | 2.00 |
| 460.06 | 459.5 | 0.56 | 0.18 | 2.00 |
| 536.90 | 536.0 | 0.90 | 0.18 | 2.00 |
| 637.94 | 637.2 | 0.74 | 0.18 | 2.00 |
| 440.74 | 440.0 | 0.74 | 0.18 | 2.00 |
| 472.22 | 471.6 | 0.62 | 0.18 | 2.00 |
| 513.70 | 513.0 | 0.70 | 0.18 | 2.00 |
| 528.72 | 528.0 | 0.72 | 0.18 | 2.00 |
| 574.60 | 573.8 | 0.80 | 0.18 | 2.00 |
| 585.48 | 584.6 | 0.88 | 0.20 | 2.00 |
| 684.63 | 684.0 | 0.63 | 0.18 | 2.00 |
| 740.27 | 739.8 | 0.47 | 0.20 | 2.00 |
| 748.28 | 747.8 | 0.48 | 0.18 | 2.00 |
| 807.16 | 806.4 | 0.76 | 0.18 | 2.00 |
| 879.70 | 878.8 | 0.90 | 0.18 | 2.00 |

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k ,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- * Indicates non TISI accredited

- End of Certificate -

CERTIFICATE OF CALIBRATION

Certificate No. : SP22-008

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)**Address :** 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,
Bangkok 10260**Location of calibration :** Laboratory 213**Equipment :** UV-Vis Spectrophotometer**Manufacturer :** Hitachi**Model :** U-2900**Serial No. :** 21E22-009**ID No. :** UAE.WAT.051/2564**Received Date :** 20 January 2022**Calibration Date :** 20 January 2022**Issue Date :** 24 January 2022**Condition Instrument :** Good**Calibrated by :**

(Mr.Tanawut Rittidach)

Technical Manager

Approved by :

(Ms. Chonthicha Sangngern)

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit 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 DQE Services Co., Ltd.

REPORT OF CALIBRATION

Certificate No. : SP22-008

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Environment Condition : Ambient Temperature 25 ± 5 °CRelative humidity 55 ± 20 %RH**Calibration method :** In-house method CP-01 Based on ASTM E275-08**Certified Reference Materials :**

| Material | Serial No. | Certificate No. | Due date |
|-------------------------|------------|-----------------|-----------------|
| Absorbance Standard set | 25760 | 95935 | 22 October 2023 |
| Absorbance Standard set | 25757 | 95929 | 22 October 2023 |
| Wavelength Standard set | 25806 | 95916 | 22 October 2023 |
| Wavelength Standard set | 25758 | 95915 | 22 October 2023 |

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

Institute of Standards and Technology (NIST) through Sarna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.**Scan Speed of UUC :** 200 nm/min**Scan Interval of UUC :** 0.1 nm.**Resolution of UUC :** Photometric 0.001 Abs.

Wavelength 0.1 nm.

REPORT OF CALIBRATION

Certificate No. : SP22-008

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Calibration Results : Without adjustment

Photometric Accuracy :

| Wavelength (nm.) | CRMs Values (Abs) | UUC Reading (Abs) | Correction (Abs) | Uncertainty (Abs) | Coverage factor <i>k</i> |
|---------------------|----------------------|----------------------|---------------------|----------------------|-----------------------------|
| 420 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5787 | 0.576 | 0.0027 | 0.0031 | 2.00 |
| | 1.0490 | 1.046 | 0.0030 | 0.0029 | 2.00 |
| | 2.1900 | 2.182 | 0.0080 | 0.0075 | 2.00 |
| 440 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5607 | 0.559 | 0.0017 | 0.0034 | 2.00 |
| | 1.0247 | 1.023 | 0.0017 | 0.0035 | 2.00 |
| | 2.1229 | 2.116 | 0.0069 | 0.0079 | 2.00 |
| 465 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5236 | 0.521 | 0.0026 | 0.0030 | 2.00 |
| | 0.9634 | 0.962 | 0.0014 | 0.0029 | 2.00 |
| | 1.9763 | 1.970 | 0.0063 | 0.0070 | 2.00 |
| 546.1 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5191 | 0.519 | 0.0001 | 0.0031 | 2.00 |
| | 1.0003 | 0.999 | 0.0013 | 0.0033 | 2.00 |
| | 1.9987 | 1.992 | 0.0067 | 0.0084 | 2.00 |
| 590 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5523 | 0.552 | 0.0003 | 0.0030 | 2.00 |
| | 1.0809 | 1.080 | 0.0009 | 0.0030 | 2.00 |
| | 2.0391 | 2.031 | 0.0081 | 0.0079 | 2.00 |
| 635 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5601 | 0.560 | 0.0001 | 0.0031 | 2.00 |
| | 1.0512 | 1.052 | -0.0008 | 0.0030 | 2.00 |
| | 1.9294 | 1.922 | 0.0074 | 0.0079 | 2.00 |

REPORT OF CALIBRATION

Certificate No. : SP22-008

Page 4 of 5

Photometric Accuracy :

| Wavelength (nm.) | CRMs Values (Abs) | UUC Reading (Abs) | Correction (Abs) | Uncertainty (Abs) | Coverage factor <i>k</i> |
|---------------------|----------------------|----------------------|---------------------|----------------------|-----------------------------|
| 235 | 0.0000 | 0.000 | 0.0000 | 0.0050 | 2.00 |
| | 0.7478 | 0.747 | 0.0008 | 0.0057 | 2.00 |
| 257 | 0.0000 | 0.000 | 0.0000 | 0.0050 | 2.00 |
| | 0.8686 | 0.865 | 0.0036 | 0.0059 | 2.00 |
| 313 | 0.0000 | 0.000 | 0.0000 | 0.0050 | 2.00 |
| | 0.2912 | 0.290 | 0.0012 | 0.0051 | 2.00 |
| 350 | 0.0000 | 0.000 | 0.0000 | 0.0050 | 2.00 |
| | 0.6448 | 0.640 | 0.0048 | 0.0055 | 2.00 |

REPORT OF CALIBRATION

Certificate No. : SP22-008

Page 5 of 5

Wavelength Accuracy :

| CRMs Values (nm.) | UUC Reading (nm.) | Correction (nm.) | Uncertainty (nm.) | Coverage factor <i>k</i> |
|----------------------|----------------------|---------------------|----------------------|-----------------------------|
| 241.72 | 241.0 | 0.72 | 0.18 | 2.00 |
| 279.45 | 279.0 | 0.45 | 0.18 | 2.00 |
| 287.81 | 287.0 | 0.81 | 0.18 | 2.00 |
| 334.06 | 333.5 | 0.56 | 0.18 | 2.00 |
| 360.93 | 360.0 | 0.93 | 0.18 | 2.00 |
| 418.59 | 418.0 | 0.59 | 0.18 | 2.00 |
| 445.94 | 445.5 | 0.44 | 0.18 | 2.00 |
| 453.66 | 453.0 | 0.66 | 0.18 | 2.00 |
| 460.02 | 459.5 | 0.52 | 0.18 | 2.00 |
| 536.59 | 536.0 | 0.59 | 0.18 | 2.00 |
| 637.98 | 637.5 | 0.48 | 0.18 | 2.00 |
| 431.38 | 431.0 | 0.38 | 0.18 | 2.00 |
| 472.50 | 472.0 | 0.50 | 0.18 | 2.00 |
| 513.47 | 513.0 | 0.47 | 0.18 | 2.00 |
| 528.88 | 528.5 | 0.38 | 0.18 | 2.00 |
| 573.17 | 573.0 | 0.17 | 0.18 | 2.00 |
| 585.35 | 585.0 | 0.35 | 0.20 | 2.00 |
| 684.40 | 684.0 | 0.40 | 0.18 | 2.00 |
| 740.72 | 740.5 | 0.22 | 0.20 | 2.00 |
| 748.55 | 748.5 | 0.05 | 0.18 | 2.00 |
| 807.03 | 807.0 | 0.03 | 0.18 | 2.00 |
| 879.28 | 879.5 | -0.22 | 0.18 | 2.00 |

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k ,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- * Indicates non TISI accredited

- End of Certificate -



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CALIBRATION AND TESTING EQUIPMENT SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000-24 FAX. 0-2719-9484

Cert.No.: 20CH1186

Page.: 1 of 2

Certificate of Calibration

Equipment : Turbidity Meter
Manufacturer : Oakton
Model : T100IR
Serial No. : 1120501017
ID. No. : UAE.LAB.056/2563
Condition As-Received: New Item
Received Date : 10 August 2020
Calibration Date : 13 August 2020
Reference : 2008-0373WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260
Ambient Temperature : (25 \pm 2.5) °C
Relative Humidity : (50 \pm 20) %
Calibration Procedure : In - house method : CP-CH11
based on direct measurement by
using Formazin standard solution

Calibrated by : Walalak Sirithean

Approved by :

Approved Signatory

- () Pornthippa Tameyakul
(✓) Malee Butkruea
() Saithip Meangmai

Issue Date : 17 August 2020

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

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เอกสารไม่ควบคุม

A 0005233



Cert.No. : 20CH1186

Page. : 2 of 2

Condition of this calibration result

1. Reference Standard Instruments :

This certification is traceable to the International System of unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

| <u>Instruments</u> | <u>Model</u> | <u>Serial No.</u> | <u>ID No.</u> | <u>Certificate No.</u> | <u>Due date</u> |
|-----------------------|--------------|-------------------|---------------|------------------------|-----------------|
| 1) Thermo-Hygrograph | NSII-Q | 1103328 | 130EC010 | 20H1607 | 2 July 2021 |
| 2) Electronic Balance | AE200S | N03679 | 140RC001 | 19MM505 | 3 Oct 2020 |

2. Standard Material : The Formazin suspension has been prepared gravimetric from

| <u>Material</u> | <u>Manufacturer</u> | <u>Lot No.</u> | <u>Assay</u> |
|---------------------------|---------------------|----------------|--------------|
| 1) Hexamethylenetetramine | HIMEDIA | 0000343342 | 99.5% |
| 2) Hydrazinium Sulfate | HIMEDIA | 0000332928 | 99.2% |

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

Calibration result

Performing five - Formazin suspension standard curve by using 0,20,100,400,800 NTU
Turbidity Meter Serial Number : 1120501017

| Standard Formazine suspension (NTU) | UUC* Reading (NTU) | Uncertainty of Measurement (\pm NTU) | Coverage Factor <i>k</i> |
|---------------------------------------------|-------------------------|------------------------------------------------|--------------------------------|
| 0 | 0.04 | 0.0095 | 2.11 |
| 20 | 20.4 | 0.41 | 2.00 |
| 100 | 101 | 0.76 | 2.00 |
| 400 | 406 | 1.6 | 2.20 |
| 800 | 802 | 2.1 | 2.13 |

Remark

- UUC* = Unit Under Calibration

- NTU = Nephelometric Turbidity Units

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 %.

-o0o-

เอกสารไม่ควบคุม

a 1014620



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM672

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : IPP 260

Serial No. : V616.0066

ID No. : UAE.MIC.032/2559

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Microbiology Laboratory (302)

Received Order : 3 May 2022

Calibration Date : 5 May 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :

Approved Signatory

() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 11 May 2022

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

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2205-0003OC-3

Cert. No.: 22TM672

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 | 34970A | MY44067817 | 21LM10 | 20 Jul 2022 |

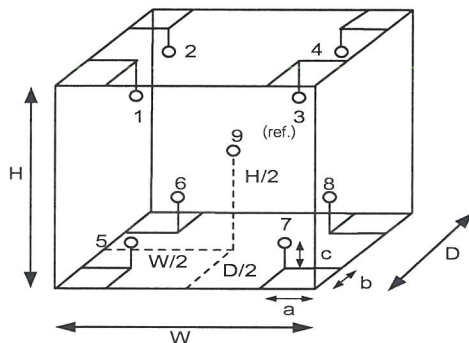
2. This certificate is valid only to the item calibrated on date and place of calibration.

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 | 23 |
| REL.Humid. (%) | 62 | 57 |
| AC Supply (Volt) | 221 | 221 |

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1 | 19-15RTD-01 |
| 2 | 19-15RTD-02 |
| 3 | 19-15RTD-03 |
| 4 | 19-15RTD-04 |
| 5 | 19-15RTD-05 |
| 6 | 21-15RTD-06 |
| 7 | 19-15RTD-07 |
| 8 | 19-15RTD-08 |
| 9 (ref.) | 19-15RTD-09 |

Probe Installation Details :

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

Dimension of Chamber :

D = 0.50 m
W = 0.60 m
H = 0.80 m
Capacity = 0.24 m³

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2205-0003OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 22TM672

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 <i>k</i> |
|-----------------------------|------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------|-------------------------|-----------------------------|
| 25.0 | 25.0 | 25.0 | 0.021 | 0.18 | 0.33 | 0.30 | 2 |
| 36.0 | 36.0 | 36.0 | 0.077 | 0.96 | 1.8 | 0.33 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | |
|-----------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|
| | Position | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) |
| 25.0 | 25.221 | 25.146 | 25.127 | 25.113 | 24.968 | 24.986 | 24.933 | 25.017 | 25.047 |
| 36.0 | 35.637 | 35.238 | 36.130 | 36.515 | 36.928 | 36.845 | 36.630 | 36.761 | 36.113 |

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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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM563

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : IPP 260

Serial No. : V615.0187

ID No. : UAE.MIC.003/2559

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 7 April 2022

Calibration Date : 7 April 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Prawit Sodavitchit

Approved by :

Approved Signatory

- () Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 18 April 2022

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.

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A 0040248



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2204-0016OC-1

Cert. No.: 22TM563

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:-

| <u>Instrument</u> | <u>Model</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Due Date</u> |
|----------------------|--------------|-------------------|------------------|-----------------|
| 1) Data Acquisition | 34970A | MY44067817 | 21LM10 | 20 Jul 2022 |

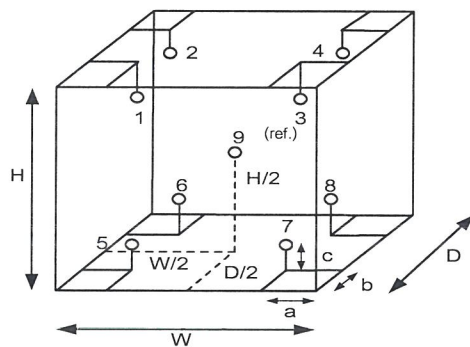
2. This certificate is valid only to the item calibrated on date and place of calibration.

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



| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 26 | 26 |
| REL.Humid. (%) | 60 | 62 |
| 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 = 0.80 m
Capacity = 0.26 m³

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1 | 15RTD2/11 |
| 2 | 15RTD2/12 |
| 3 | 15RTD2/13 |
| 4 | 15RTD2/14 |
| 5 | 15RTD2/15 |
| 6 | 15RTD2/16 |
| 7 | 15RTD2/17 |
| 8 | 15RTD2/18 |
| 9 (ref.) | 15RTD2/19 |

เอกสารไม่ควบคุม

a 1104310



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2204-0016OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 22TM563

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 <i>k</i> |
|-----------------------------|------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------|-------------------------|-----------------------------|
| 35.0 | 35.0 | 35.0 | 0.12 | 0.53 | 0.79 | 0.30 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | |
|-----------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|
| | Position | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) |
| 35.0 | 35.170 | 35.167 | 34.938 | 34.844 | 34.816 | 34.854 | 34.584 | 34.730 | 34.780 |

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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a 1104309



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM333

Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 14

Serial No. : L416.0606

ID No. : UAE.MIC.002/2560

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 17 February 2022

Calibration Date : 17 February 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Suwit Imjai

Approved by :

Approved Signatory

(/) Pornthippa Tameyakul
(/) Malee Butkruea

Issue Date : 22 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2202-0444OC-3
Procedure Used :-

Cert. No.: 22TM333

Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 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:-

| <u>Instrument</u> | <u>Model</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Due Date</u> |
|----------------------|--------------|-------------------|------------------|-----------------|
| 1) Data Acquisition | 34970A | MY44067817 | 21LM10 | 20 Jul 2022 |

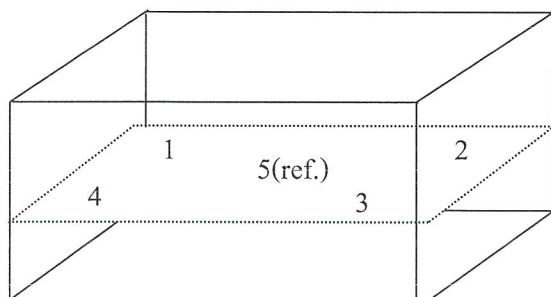
2. This certificate is valid only to the item calibrated on date and place of calibration.

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 | 21 | 65 | 229 |
| Finished of Calibration | 22 | 58 | 230 |



Front

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1 | 70RC143 |
| 2 | 70RC144 |
| 3 | 70RC145 |
| 4 | 70RC146 |
| 5(ref.) | 70RC147 |



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2202-0444OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 22TM333

Page.: 3 of 3

| Calibration point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Average* Standard Reading (°C) | | | | |
|--------------------------------|---------------------------|---------------------------|----------------------------------|--------|--------|--------|----------|
| | | | Position | | | | |
| | | | 1 | 2 | 3 | 4 | 5 (ref.) |
| 44.5 | 44.5 | 44.5 | 44.498 | 44.481 | 44.482 | 44.518 | 44.534 |

| Calibration point (°C) | Uniformity (°C) | Stability (± °C) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|--------------------------------|----------------------|-----------------------|-------------------------|--------------------------------|
| 44.5 | 0.13 | 0.057 | 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 %.

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เอกสาร [redacted] ควบคุม



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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM334

Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 14

Serial No. : L416.0612

ID No. : UAE.MIC.003/2560

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 17 February 2022

Calibration Date : 17 February 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Suwit Imjai

Approved by :

Approved Signatory

(/) Pornthippa Tameyakul
(/) Malee Butkruea

Issue Date :

22 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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A 0038095



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2202-0444OC-4

Cert. No.: 22TM334

Page.: 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT04 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:-

| <u>Instrument</u> | <u>Model</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Due Date</u> |
|----------------------|--------------|-------------------|------------------|-----------------|
| 1) Data Acquisition | 34970A | MY44067817 | 21LM10 | 20 Jul 2022 |

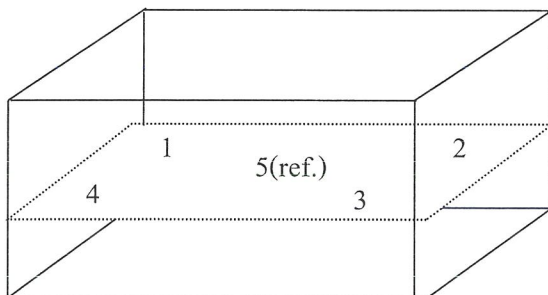
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

| | <u>Environmental</u> | | <u>AC Voltage Supply</u> |
|--------------------------|----------------------|-----------|--------------------------|
| | (°C) | (%R.H.) | (Volt) |
| Beginning of Calibration | 21 | 65 | 229 |
| Finished of Calibration | 22 | 57 | 230 |



Front

| <u>Position :</u> | <u>Ref. Std. ID No.:</u> |
|-------------------|--------------------------|
| 1 | 70RC143 |
| 2 | 70RC144 |
| 3 | 70RC145 |
| 4 | 70RC146 |
| 5(ref.) | 70RC147 |

เอกสารไม่ควบคุม

a 1096055



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2202-0444OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 22TM334

Page.: 3 of 3

| Calibration point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Average* Standard Reading (°C) | | | | |
|--------------------------------|---------------------------|---------------------------|----------------------------------|--------|--------|--------|----------|
| | | | Position | | | | |
| | | | 1 | 2 | 3 | 4 | 5 (ref.) |
| 44.5 | 44.5 | 44.5 | 44.572 | 44.514 | 44.507 | 44.530 | 44.565 |

| Calibration point (°C) | Uniformity (°C) | Stability (± °C) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|--------------------------------|----------------------|-----------------------|-------------------------|--------------------------------|
| 44.5 | 0.10 | 0.042 | 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 %.

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เอกสารไม่ควบคุม

a 1096054

Mettler-Toledo (Thailand) Ltd.

846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District

Bangna District, Bangkok 10260

+66 2723 0382

MT-TH.ServiceSupport@mt.com



NSC-TISI-TIS 17025
CALIBRATION 0062

Accuracy Calibration Certificate

Customer

Company: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Soi Udom Suk 41, Sukhumvit Rd., Bang Chak
City: Phra Khanong **Contact:** Suwit Chotnok
Zip / Postal: 10260
State / Province: Bangkok
Order Number: 
* 0 3 7 0 1 9 2 7 6 6 *

Weighing Device

Manufacturer: Mettler Toledo **Instrument Type:** Weighing Instrument
Model: XSR205DU **Asset Number:** UAE.WAO.010/2565
Serial No.: C210685394 **Terminal Model:** SRAT
Building: N/A **Terminal Serial No.:** C210685394
Floor: 2 **Terminal Asset No.:** N/A
Room: Balance Room

| Range | Max. Capacity | Readability (d) |
|-------|---------------|-----------------|
| 1 | 81 g | 0.00001 g |
| 2 | 220 g | 0.0001 g |

Procedure



Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CP/W002/20

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

| | Temperature | Humidity |
|----------|-----------------------------|---------------------------|
| As Found | Start: 22.4 °C End: 22.4 °C | Start: 47.5 % End: 46.2 % |

As Found Calibration Date: 06-May-2022 **Calibrator:** 
As Left Calibration Date: N/A
Issue Date: 09-May-2022
Approved Signatory: 
Technical Manager / Head of Calibration Center

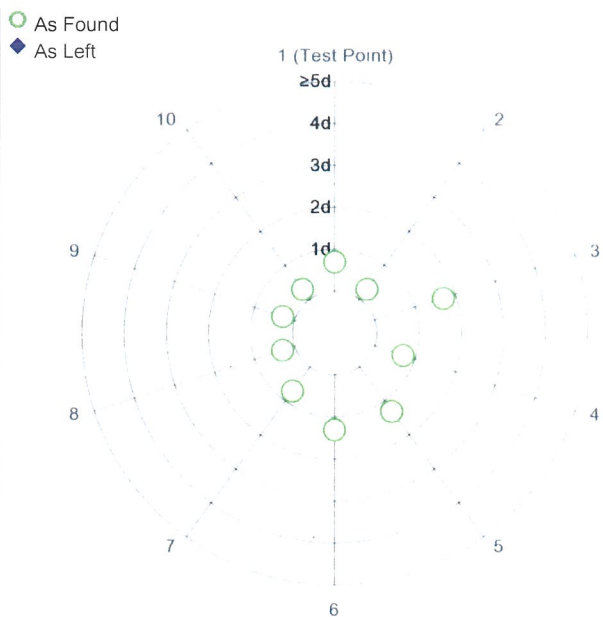
Measurement Results

Repeatability

Test Load: 70 g

| | As Found | As Left |
|----|------------|---------|
| 1 | 70.00005 g | N/A |
| 2 | 70.00006 g | N/A |
| 3 | 70.00004 g | N/A |
| 4 | 70.00005 g | N/A |
| 5 | 70.00007 g | N/A |
| 6 | 70.00007 g | N/A |
| 7 | 70.00005 g | N/A |
| 8 | 70.00006 g | N/A |
| 9 | 70.00006 g | N/A |
| 10 | 70.00006 g | N/A |

| | | |
|--------------------|------------|-----|
| Standard Deviation | 0.000009 g | N/A |
|--------------------|------------|-----|



The "d" in the graph represents the readability of the range/interval in which the test was performed.

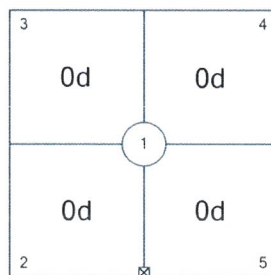
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

| Position | As Found | As Left |
|----------|------------|---------|
| 1 | 100.0000 g | N/A |
| 2 | 100.0000 g | N/A |
| 3 | 100.0000 g | N/A |
| 4 | 100.0000 g | N/A |
| 5 | 100.0000 g | N/A |

| | | |
|-------------------|----------|-----|
| Maximum Deviation | 0.0000 g | N/A |
|-------------------|----------|-----|



As Found

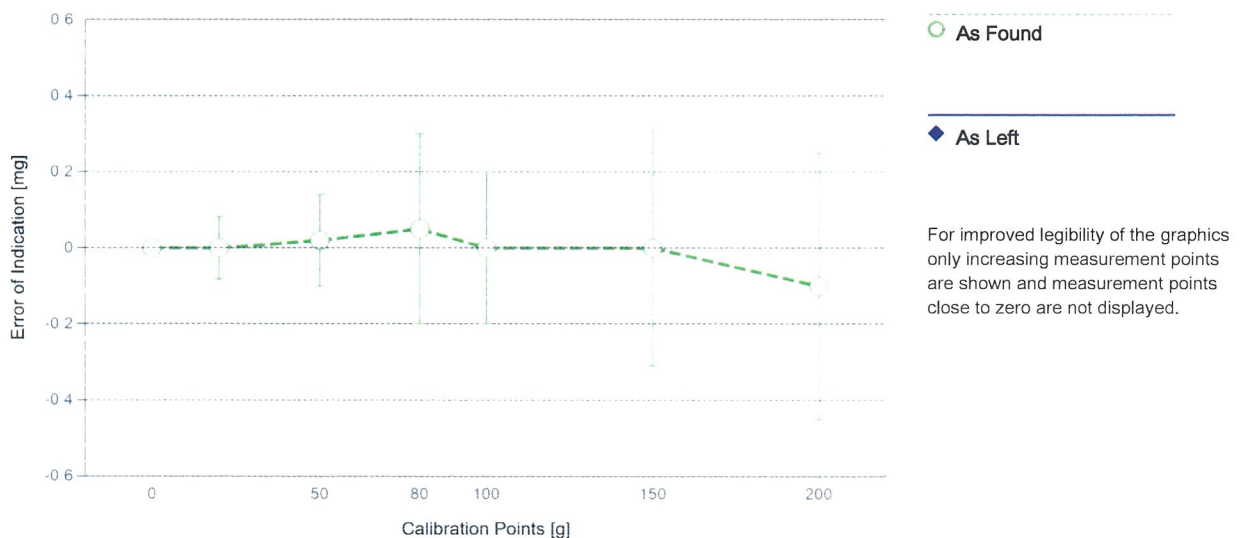
The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

As Found

| | Reference Value | Indication | Error of Indication | Expanded Uncertainty | k |
|-----------------|-----------------|------------|---------------------|----------------------|---|
| 1 | 0.00000 g | 0.00000 g | 0.00000 g | 0.020 mg | 2 |
| 2 | 0.05000 g | 0.05001 g | 0.00001 g | 0.023 mg | 2 |
| 3 | 0.10001 g | 0.10001 g | 0.00000 g | 0.025 mg | 2 |
| 4 | 1.00000 g | 1.00001 g | 0.00001 g | 0.034 mg | 2 |
| 5 | 5.00001 g | 5.00001 g | 0.00000 g | 0.049 mg | 2 |
| 6 | 20.00002 g | 20.00002 g | 0.00000 g | 0.082 mg | 2 |
| 7 ¹ | 50.00000 g | 50.00002 g | 0.00002 g | 0.12 mg | 2 |
| 8 | 80.00004 g | 80.00009 g | 0.00005 g | 0.25 mg | 2 |
| 9 | 100.0000 g | 100.0000 g | 0.0000 g | 0.20 mg | 2 |
| 10 ¹ | 150.0000 g | 150.0000 g | 0.0000 g | 0.31 mg | 2 |
| 11 | 200.0000 g | 199.9999 g | -0.0001 g | 0.35 mg | 2 |

¹The calculated uncertainty was replaced by the CMC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the CMC value.



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

| | | | |
|---------------------|--------|-----------------------|-------------|
| Weight Set No.: | WS54 | Date of Issue: | 17-Nov-2020 |
| Certificate Number: | 170240 | Calibration Due Date: | 15-May-2022 |

Thermo Hygrometer

| | | | |
|---------------------|---------|-----------------------|-------------|
| Equipment No.: | IN161 | Date of Issue: | 14-Jun-2021 |
| Certificate Number: | 21H1220 | Calibration Due Date: | 01-Jun-2022 |

Remarks

FACT adjustment functionality activated
Equipment condition: Good
Calibration after installation
Next calibration according to customer's procedure
Calibration data not decide by calibration laboratory

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.5 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 3 K

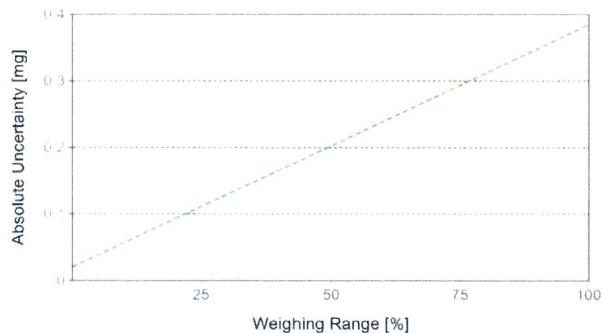
Linearization of Uncertainty Equation

| Range | | | As Found | As Left |
|-------|-----------|-------|---------------------------------------------------------|---------|
| | d | Max | | |
| 1 | 0.00001 g | 81 g | $U_1 = 0.021 \text{ mg} + 0.00450 \text{ mg/g} \cdot R$ | N/A |
| 2 | 0.0001 g | 220 g | $U_2 = 0.06 \text{ mg} + 0.00448 \text{ mg/g} \cdot R$ | N/A |

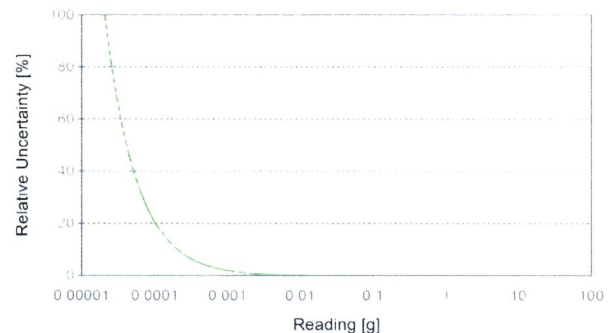
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

| Net Indication | As Found | | As Left | |
|----------------|----------|----------|---------|-----|
| 0.00220 g | 0.021 mg | 0.95% | N/A | N/A |
| 0.02200 g | 0.021 mg | 0.096% | N/A | N/A |
| 0.22000 g | 0.022 mg | 0.0100% | N/A | N/A |
| 2.20000 g | 0.031 mg | 0.0014% | N/A | N/A |
| 220.0000 g | 1.0 mg | 0.00048% | N/A | N/A |



As Found



As Left

The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.

GWP® Certificate



As
Found



As
Left



The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed:



As Found



As Left



No adjustments/modifications made. As Left results correspond to As Found.

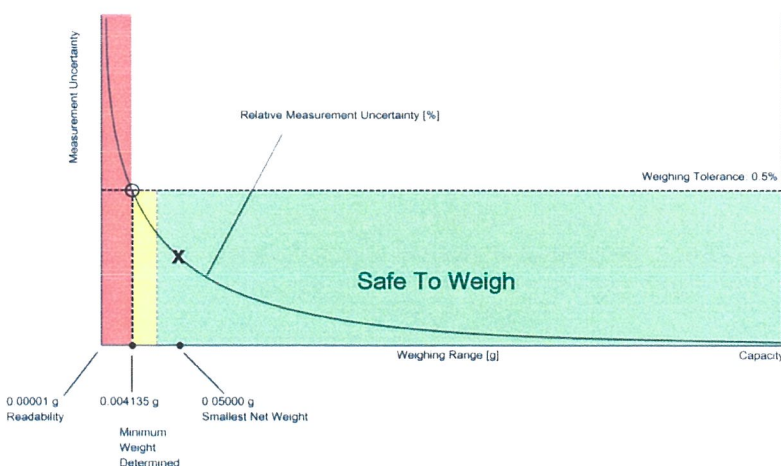
Process Requirements

Weighing Tolerance: 0.5%

Smallest Net Weight: 0.05000 g

Safety Factor: 2

Safe Weighing Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left testing, unless only As Found was performed.

Minimum Weight

As Found Minimum Weight Table

Range 1

| Minimum weights for different weighing tolerances and safety factors | | | | | |
|----------------------------------------------------------------------|---------------|------------|------------|------------|------------|
| Tolerance | Safety Factor | | | | |
| | 1 | 2 | 3 | 5 | 10 |
| 0.1% | 0.020749 g | 0.041687 g | 0.062816 g | 0.105659 g | 0.216300 g |
| 0.2% | 0.010351 g | 0.020749 g | 0.031195 g | 0.052228 g | 0.105659 g |
| 0.5% | 0.004135 g | 0.008277 g | 0.012427 g | 0.020749 g | 0.041687 g |
| 1% | 0.002067 g | 0.004135 g | 0.006205 g | 0.010351 g | 0.020749 g |
| 2% | 0.001033 g | 0.002067 g | 0.003100 g | 0.005170 g | 0.010351 g |
| 5% | 0.000413 g | 0.000826 g | 0.001240 g | 0.002067 g | 0.004135 g |

The minimum weight table applies to the fine range of the weighing device.



Pass: The determined minimum weight meets the requirement for the smallest net weight.

As Left Minimum Weight Table

Range 1

| Minimum weights for different weighing tolerances and safety factors | | | | | |
|----------------------------------------------------------------------|---------------|------------|------------|------------|------------|
| Tolerance | Safety Factor | | | | |
| | 1 | 2 | 3 | 5 | 10 |
| 0.1% | 0.020749 g | 0.041687 g | 0.062816 g | 0.105659 g | 0.216300 g |
| 0.2% | 0.010351 g | 0.020749 g | 0.031195 g | 0.052228 g | 0.105659 g |
| 0.5% | 0.004135 g | 0.008277 g | 0.012427 g | 0.020749 g | 0.041687 g |
| 1% | 0.002067 g | 0.004135 g | 0.006205 g | 0.010351 g | 0.020749 g |
| 2% | 0.001033 g | 0.002067 g | 0.003100 g | 0.005170 g | 0.010351 g |
| 5% | 0.000413 g | 0.000826 g | 0.001240 g | 0.002067 g | 0.004135 g |

The minimum weight table applies to the fine range of the weighing device.



Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with $k = 2$ and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

Measurement Results

Results Summary

| | Repeatability | Eccentricity | Error of Indication |
|----------|---------------|--------------|---------------------|
| As Found | ✓ | ✓ | ✓ |
| As Left | ✓ | ✓ | ✓ |

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

Repeatability

Test Load: 70 g

| Tolerance | Control Limit | As Found | | As Left | |
|-----------|---------------|----------------|--------|----------------|--------|
| | | Std. Deviation | Result | Std. Deviation | Result |
| 0.1% | 0.000025 g | 0.000009 g | ✓ | 0.000009 g | ✓ |
| 0.2% | 0.000050 g | | ✓ | | ✓ |
| 0.5% | 0.000125 g | | ✓ | | ✓ |
| 1% | 0.000250 g | | ✓ | | ✓ |
| 2% | 0.000500 g | | ✓ | | ✓ |
| 5% | 0.001250 g | | ✓ | | ✓ |

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

Eccentricity

Test Load: 100 g

| Tolerance | Control Limit | As Found | | As Left | |
|-----------|---------------|-----------|--------|-----------|--------|
| | | Deviation | Result | Deviation | Result |
| 0.1% | 0.0500 g | 0.0000 g | ✓ | 0.0000 g | ✓ |
| 0.2% | 0.1000 g | | ✓ | | ✓ |
| 0.5% | 0.2500 g | | ✓ | | ✓ |
| 1% | 0.5000 g | | ✓ | | ✓ |
| 2% | 1.0000 g | | ✓ | | ✓ |
| 5% | 2.5000 g | | ✓ | | ✓ |

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

Error of Indication

As Found

| Reference Value | Error | Control limits for various weighing tolerances | | | | | |
|-----------------|-----------|------------------------------------------------|-----------|-----------|-----------|-----------|-----------|
| | | 0.1% | 0.2% | 0.5% | 1% | 2% | 5% |
| 0.00000 g | 0.00000 g | N/A | N/A | N/A | N/A | N/A | N/A |
| 20.00002 g | 0.00000 g | 0.01000 g | 0.02000 g | 0.05000 g | 0.10000 g | 0.20000 g | 0.50000 g |
| 50.00000 g | 0.00002 g | 0.02500 g | 0.05000 g | 0.12500 g | 0.25000 g | 0.50000 g | 1.25000 g |
| 80.00004 g | 0.00005 g | 0.04000 g | 0.08000 g | 0.20000 g | 0.40000 g | 0.80000 g | 2.00000 g |
| 100.0000 g | 0.0000 g | 0.0500 g | 0.1000 g | 0.2500 g | 0.5000 g | 1.0000 g | 2.5000 g |
| 150.0000 g | 0.0000 g | 0.0750 g | 0.1500 g | 0.3750 g | 0.7500 g | 1.5000 g | 3.7500 g |
| 200.0000 g | -0.0001 g | 0.1000 g | 0.2000 g | 0.5000 g | 1.0000 g | 2.0000 g | 5.0000 g |
| Result | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

As Left

| Reference Value | Error | Control limits for various weighing tolerances | | | | | |
|-----------------|-----------|------------------------------------------------|-----------|-----------|-----------|-----------|-----------|
| | | 0.1% | 0.2% | 0.5% | 1% | 2% | 5% |
| 0.00000 g | 0.00000 g | N/A | N/A | N/A | N/A | N/A | N/A |
| 20.00002 g | 0.00000 g | 0.01000 g | 0.02000 g | 0.05000 g | 0.10000 g | 0.20000 g | 0.50000 g |
| 50.00000 g | 0.00002 g | 0.02500 g | 0.05000 g | 0.12500 g | 0.25000 g | 0.50000 g | 1.25000 g |
| 80.00004 g | 0.00005 g | 0.04000 g | 0.08000 g | 0.20000 g | 0.40000 g | 0.80000 g | 2.00000 g |
| 100.0000 g | 0.0000 g | 0.0500 g | 0.1000 g | 0.2500 g | 0.5000 g | 1.0000 g | 2.5000 g |
| 150.0000 g | 0.0000 g | 0.0750 g | 0.1500 g | 0.3750 g | 0.7500 g | 1.5000 g | 3.7500 g |
| 200.0000 g | -0.0001 g | 0.1000 g | 0.2000 g | 0.5000 g | 1.0000 g | 2.0000 g | 5.0000 g |
| Result | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Certificate of Calibration

Cert. No.: 22TM89

Page.: 1 of 3

Equipment : Autoclave

Manufacturer : ALP

Model : CL-40L

Serial No. : 802664

ID No. : UAE.MIC.014/2550

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Air Analysis Unit


Received Order : 17 February 2022

Calibration Date : 17 February 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Kunchit Promprat

Approved by : 
Approved Signatory

(/) Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 22 February 2022

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.

เอกสารไม่ควบคุม



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2202-0444OC-1

Cert. No.: 22TM89
Page.: 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT03 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:-

| <u>Instrument</u> | <u>Model</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Due Date</u> |
|----------------------|--------------|-------------------|------------------|-----------------|
| 1) Data Acquisition | 34970A | MY44035217 | 21LM30 | 23 Dec 2022 |

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**

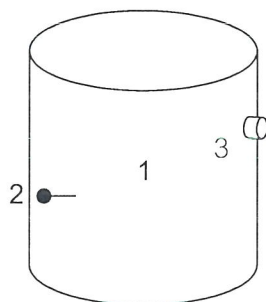
(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)

It does not cover autoclaves for use with material infect 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 | 68 | 226 |
| Finished of Calibration | 27 | 65 | 226 |

| <u>Position</u> | <u>Description</u> | <u>Ref. Std. ID No.:</u> |
|-----------------|--------------------|--------------------------|
| 1 = | Center of chamber | 22-10TC-01 |
| 2 = | Temperature sensor | 22-10TC-02 |
| 3 = | Exhaust port | 22-10TC-03 |

เอกสารไม่ควบคุม



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2202-0444OC-1

Cert. No.: 22TM89

Page.: 3 of 3

Result of Calibration :- (*) Without Adjustment

Operating parameter Set : Temperature = 122 °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 <i>k</i> |
|---------------------------|---------------------------|----------|----------------------------------------|-----------------------|--------------------------------|-------------------------|--------------------------------|
| 122 | 122 | 1 | 122.373 | 0.32 | 0.12 | 1.2 | 2 |
| | | 2 | 122.421 | | | | |
| | | 3 | 122.292 | | | | |

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 %.

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