

ภาคผนวก จ

ใบรับรองการสอบเทียบเครื่องมือ

รายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบต่อสิ่งแวดล้อม และมาตรการติดตามตรวจสอบผลกระทบต่อสิ่งแวดล้อม
โครงการ EDGE Sukhumvit 23 (ระยะดำเนินการ) ระหว่างเดือนกรกฎาคม-ธันวาคม พ.ศ. 2566
นิติบุคคลอาคารชุด EDGE Sukhumvit 23

| Certificate of Instrument for Environment Quality Analysis. | | | | | | | | | |
|---|---|--------------------------------|----------------|----------------------------------|--|-------------------|---------------------|--------------------------|--------|
| No. | Instrument/Equipment | Parameter | Manufacturer | Model/Serial No. | Calibrator | Certification No. | Date of Calibration | Due date of Calibration* | Remark |
| Laboratory Instrument/Equipments (Water) | | | | | | | | | |
| 1 | pH Meter | ความเป็นกรดและด่าง อุณหภูมิ | Horiba | LAQUA-PH210 / HA0D0082 | Technology Promotion Association (Thailand-Japan) | 23CH59 | 16 Jan 23 | 15 Jan 24 | - |
| 2 | Analytical Balance (Repeatability 0.01 mg) | สารแขวนลอย | Mettler Toledo | XSR205DU / C210685394 | Technology Promotion Association (Thailand-Japan) | 23MM113 | 26 Apr 23 | 24 Apr 24 | - |
| 3 | Analytical Balance (Repeatability 0.01 mg) | สารที่ละลายได้ทั้งหมด | | XSR205DU / C009071872 | Technology Promotion Association (Thailand-Japan) | 23MM112 | 26 Apr 23 | 24 Apr 24 | - |
| 4 | Hot Air Oven | ปริมาณมวลสารที่ละลายได้ทั้งหมด | | UF55 / B212.0411 | Technology Promotion Association (Thailand-Japan) | 23TM373 | 11 Apr 23 | 9 Apr 24 | - |
| 5 | BOD Incubator | บีโอดี | Arco | UC4-1320 / (UAE.WAO.015/2561) | Technology Promotion Association (Thailand-Japan) | 23TM249 | 15 Feb 23 | 14 Feb 24 | - |
| 6 | Digestion Units | ทีเคเอ็น (TKN) | Foss Tecator | 2520 Auto / 91794469 | National Food Institute, Ministry of Industry, Thailand | 2302413-001-01 | 30 Mar 23 | 28 Mar 24 | - |
| 7 | Analytical Balance | น้ำมันและไขมัน | Mettler Toledo | AB204-S/FACT / 1129361010 | National Food Institute, Ministry of Industry, Thailand | 2303074-001-01 | 26 May 23 | 24 May 24 | - |

รายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อม และมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
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นิติบุคคลอาคารชุด EDGE Sukhumvit 23

| Certificate of Instrument for Environment Quality Analysis. | | | | | | | | | |
|---|--------------------------|---|----------------------|-------------------------------|--|-------------------|---------------------|--------------------------|--------|
| No. | Instrument/Equipment | Parameter | Manufacturer | Model/Serial No. | Calibrator | Certification No. | Date of Calibration | Due date of Calibration* | Remark |
| Laboratory Instrument/Equipments (Water) | | | | | | | | | |
| 8 | Incubator | แบคทีเรียกลุ่มฟีคอลโคลิฟอร์ม แบคทีเรียกลุ่มโคลิฟอร์มทั้งหมด อี.โคไล สตาฟีโลค็อกคัส ออเรียส ซูโดโมแนส แอรูจิโนซา | Memmert | IPP 260 / V616.0066 | Technology Promotion Association (Thailand-Japan) | 23TM728 | 27 Apr 23 | 25 Apr 24 | - |
| 9 | Incubator | | Memmert | IPP 260 / V615.0187 | Technology Promotion Association (Thailand-Japan) | 23TM378 | 12 Apr 23 | 10 Apr 24 | - |
| 10 | Incubator | | Memmert | IN 75 / D317.0307 | Technology Promotion Association (Thailand-Japan) | 23TM765 | 27 Apr 23 | 25 Apr 24 | - |
| 11 | Incubator | | Binder | BD 53 / 13-07343 | Technology Promotion Association (Thailand-Japan) | 23TM192 | 15 Feb 23 | 15 Feb 24 | - |
| 12 | Water Bath | | Memmert | WNE 14 / L416.0612 | Technology Promotion Association (Thailand-Japan) | 23TM194 | 15 Feb 23 | 14 Feb 24 | - |
| 13 | Water Bath | | Memmert | WNE 14 / L416.0614 | Technology Promotion Association (Thailand-Japan) | 23TM250 | 16 Feb 23 | 15 Feb 24 | - |
| 14 | Analytical Balance | | OHAUS | PX623 / C236754745 | DKSH (Thailand) Ltd. | C01223732 | 7 Dec 23 | 5 Dec 24 | - |
| 15 | Auto Clave | | ALP | CL-40L / 808763 | Technology Promotion Association (Thailand-Japan) | 23TM763 | 27 Apr 23 | 25 Apr 24 | - |
| 16 | UV-VIS Spectrophotometer | ซิลิโคน ไนโตรเจน-ไนโตรเจน | Hitachi | U-1900 / 2021-064 | DQE Services Co.,Ltd. | SP23-007 | 6 Jan 23 | 5 Jan 24 | - |
| 17 | UV-VIS Spectrophotometer | | Agilent Technologies | Cary60 G6860A / MY15410009 | DQE Services Co.,Ltd. | SP23-021 | 20 May 23 | 18 May 24 | - |

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



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.: 23CH59

Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA0D0082
ID No. : UAE.EFM.072/2564(EFM.pH.05/64)
Condition As-Received: Used Item
Received Date : 13 January 2023
Calibration Date : 16 January 2023
Reference : 2301-0432WSC-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 : Saithip Meangmai

Approved by :

Approved Signatory

Issue Date :

19 January 2023

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 23CH59

Page.: 2 of 3

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 | 22I1306 | 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 (±mV) | Coverage factor k |
|----------------------------|---------------|------------------------|----------------|-------|---------------------------------------|----------------------|
| | pH | mV | mV | pH | | |
| pH Meter S/N.: HA0D0082 | 4.00 | 177.48 | 177.5 | 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 | -177.1 | 10.01 | 0.058 | 2.00 |

เอกสารไม่



Cert.No.: 23CH59

Page.: 3 of 3

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 S/N.: 992C0037 | 4.008 | 4.01 | 165.2 | 0.0079 | 2.00 |
| | 6.987 | 7.00 | -8.3 | 0.011 | 2.00 |
| | 6.987 | 7.00 | -8.2 | 0.011 | 2.00 |
| | 10.008 | 10.02 | -182.5 | 0.0095 | 2.00 |

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652
- Serial No. : 992C0037

Dimension of probe;

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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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Cert.No.: 23MM113
Page.: 1 of 3

Certificate of Calibration

Equipment : Electronic Balance

Manufacturer : Mettler Toledo

Model : XSR205

Serial No. : C210685394

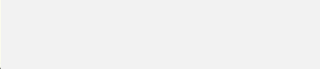
ID No. : UAE.WAO.010/2565

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

Location : Balance Room

Received order : 26 April 2023
Calibration Date : 26 April 2023
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %

Calibrated by : Man Pattanapongpaiboon

Approved by : 
Approved Signatory

Issue Date : 2 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 0053700



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

Cert.No.: 23MM113

Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OB01 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 | 70RC007 | 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 (g) | Balance Reading (g) | Correction (g) | Measurement Uncertainty (\pm mg) | Coverage Factor (k) |
|-------------------------|-----------------------------|---------------------|--|-----------------------------|
| 80 | 79.99992 | +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 (g) | Standard Deviation of Reading (g) |
|-------------------------|--|
| 80 | 0.000007 |
| 200 | 0.00004 |

เอกสารไม่ควรถูก
แก้ไข



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

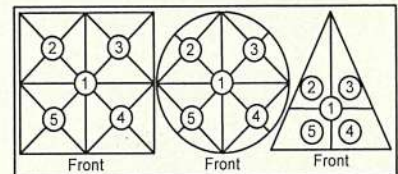
Cert.No.: 23MM113

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

3. Departure from nominal value

| Applied Weight (g) | Balance Reading (g) | Correction (g) | Measurement Uncertainty (\pm mg) | Coverage Factor (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 | 0.026 | 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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เอกสารไม่ควา

a 1159271



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23MM112

Page.: 1 of 3

Certificate of Calibration

Equipment : Electronic Balance

Manufacturer : Mettler Toledo

Model : XSR205

Serial No. : C009071872

ID No. : UAE.WAO.012/2563

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

Location : Balance Room

Received order : 26 April 2023

Calibration Date : 26 April 2023

Ambient Temperature : 15 °C to 40 °C

Relative Humidity : 30 % to 90 %

Calibrated by : Man Pattanapongpaiboon

Approved by : _____
Approved Signatory

Issue Date :

2 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



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-0459OC-1

Cert.No.: 23MM112

Page: 2 of 3

Procedure used :-

Calibration were conducted using in-house calibration procedure CP-OB01 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments:-

| <u>Instruments</u> | <u>Model</u> | <u>Serial No.</u> | <u>ID No.</u> | <u>Test report No.</u> | <u>Due date</u> |
|-----------------------------|--------------|-------------------|---------------|------------------------|-----------------|
| 1) Standard Weight Set (E2) | 15884 | 24053 | 70RC007 | 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 :

| <u>Applied Weight</u> | <u>Balance Reading</u> | <u>Correction</u> | <u>Measurement Uncertainty</u> | <u>Coverage Factor</u> |
|-----------------------|------------------------|-------------------|--------------------------------|------------------------|
| (g) | (g) | (g) | (± mg) | (k) |
| 80 | 80.00005 | -0.00005 | 0.15 | 2.00 |
| 200 | 199.9999 | +0.0001 | 0.29 | 2.00 |

After Adjustment :

1. **Determination of the standard deviation of weighing machine**

(n = 10)

| <u>Applied Weight</u> | <u>Standard Deviation of Reading (g)</u> |
|-----------------------|--|
| (g) | |
| 80 | 0.000007 |
| 200 | 0.00000 |

เอกสาร



Equipment : Electronic Balance
 Condition As-Received : Used Item
 Reference : 2304-0459OC-1

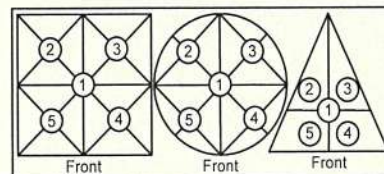
Cert.No.: 23MM112

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

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

3. Departure from nominal value

| Applied Weight (g) | Balance Reading (g) | Correction (g) | Measurement Uncertainty (± mg) | Coverage Factor (k) |
|-------------------------|-----------------------------|---------------------|--|-----------------------------|
| Unload | 0.00000 | 0.00000 | 0.014 | 2.13 |
| 0.05 | 0.05001 | -0.00001 | 0.015 | 2.09 |
| 0.1 | 0.10001 | -0.00001 | 0.015 | 2.09 |
| 1 | 1.00001 | -0.00001 | 0.018 | 2.04 |
| 5 | 5.00003 | -0.00003 | 0.026 | 2.00 |
| 20 | 20.00006 | -0.00006 | 0.045 | 2.00 |
| 50 | 50.00006 | -0.00006 | 0.080 | 2.00 |
| 80 | 80.00004 | -0.00004 | 0.15 | 2.00 |
| 100 | 100.0000 | 0.0000 | 0.16 | 2.00 |
| 150 | 150.0000 | 0.0000 | 0.29 | 2.00 |
| 200 | 200.0000 | 0.0000 | 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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TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM373

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Certificate of Calibration

Equipment : Hot Air Oven

Manufacturer : Memmert

Model : UF 55

Serial No. : B212.0411

ID No. : UAE.WAO.005/2556

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

Location : Lab Floor 2

Received Order : 11 April 2023

Calibration Date : 11 - 12 April 2023

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Krisda Malee

Approved by :

Approved Signatory

Issue Date :

24 April 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.

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A 0053359



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2304-0156OC-1

Cert. No.: 23TM373

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) 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 | 34972A | MY59003411 | 22LM165 | 26 Nov 2023 |

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

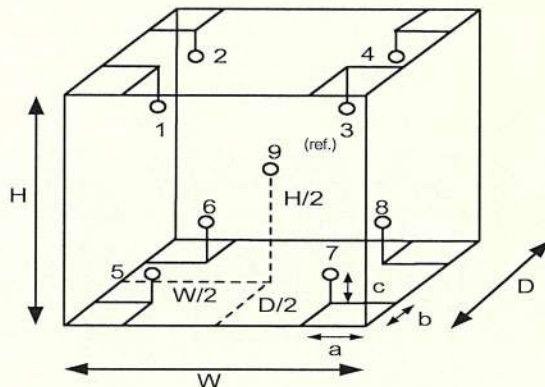
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 27 | 28 |
| REL.Humid. (%) | 45 | 44 |
| AC Supply (Volt) | 221 | 220 |



**Ref. Std. ID No.: @
Calibration Point**

| Position : | (120 to 180) °C | (104) °C |
|------------|-------------------|------------|
| 1 | 18-20TC-01 | 20RTD-2/1 |
| 2 | 18-20TC-02 | 20RTD-2/2 |
| 3 | 18-20TC-03 | 20RTD-2/3 |
| 4 | 18-20TC-04 | 20RTD-2/4 |
| 5 | 18-20TC-05 | 20RTD-2/5 |
| 6 | 18-20TC-06 | 20RTD-2/6 |
| 7 | 18-20TC-07 | 20RTD-2/7 |
| 8 | 18-20TC-08 | 20RTD-2/8 |
| 9 (ref.) | 18-20TC-09 | 20RTD-2/9 |

Probe Installation Details :

Dimension of Chamber :

| | | | | | |
|------------|-----|----|------|----------------|---|
| a = | 5.0 | cm | D = | 0.50 | m |
| b = | 5.0 | cm | W = | 0.80 | m |
| c = | 5.0 | cm | H = | 0.75 | m |
| Capacity = | | | 0.30 | m ³ | |

เอกสารไม่ควบคุม

a 1158261



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2304-0156OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 23TM373

Page : 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Coverage Factor <i>k</i> |
|-----------------------------|------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------|-----------------------------|
| 104.0 | 104.0 | 104.0 | 0.054 | 0.59 | 0.95 | 2 |
| 120.0 | 120.0 | 120.0 | 0.12 | 0.89 | 1.5 | 2 |
| 180.0 | 180.0 | 180.0 | 0.12 | 1.5 | 2.5 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | | Uncertainty (±°C) |
|--------------------------------|-----------------------------|---------|---------|---------|---------|---------|---------|---------|----------|----------------------------|
| | Position | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | |
| 104.0 | 104.512 | 104.016 | 104.542 | 104.407 | 103.704 | 103.729 | 104.167 | 104.158 | 104.001 | 0.42 |
| 120.0 | 120.317 | 119.768 | 120.524 | 120.232 | 119.363 | 119.209 | 119.888 | 119.797 | 119.735 | 1.1 |
| 180.0 | 180.878 | 179.819 | 181.357 | 180.871 | 179.303 | 179.139 | 180.230 | 180.055 | 179.960 | 1.1 |

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 %.

-o0o-

เอกสารไม่ควบคุม

a 1158260



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.: 23TM249

Page : 1 of 3

Certificate of Calibration

Equipment : BOD Incubator

Manufacturer : Arco

Model : UC4-1320

Serial No. : 13URC4S013201

ID No. : UAE.WAO.015/2561

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

Location : Lab Floor 2

Received Order : 15 February 2023
Calibration Date : 15 February 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :

Approved Signatory

Issue Date :

24 February 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.

เอกสารไม่ควบคุม

A 0051476



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

Cert. No.: 23TM249

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 | 34972A | MY57013711 | 22LM93 | 02 Jul 2023 |

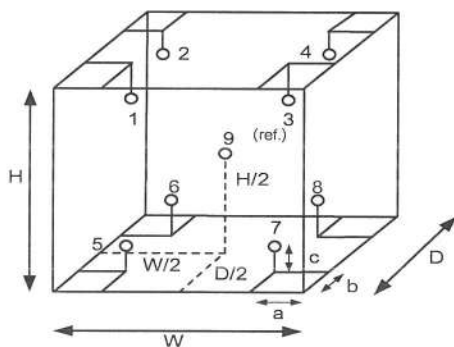
2. This certificate is valid only to the item calibrated on date and place of calibration.

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) | 29 | 31 |
| REL.Humid. (%) | 63 | 67 |
| AC Supply (Volt) | 220 | 220 |

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

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 m³

เอกสารไม่ควมค



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

Cert. No.: 23TM249

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> |
|-----------------------------|------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------|-------------------------|-----------------------------|
| 20.0 | 20.0 | 19.3 | 0.32 | 0.57 | 1.0 | 0.60 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | |
|-----------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|
| | Position | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) |
| 20.0 | 20.086 | 19.916 | 20.386 | 19.976 | 19.973 | 19.838 | 19.837 | 19.821 | 19.949 |

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 %.

-o0o-

เอกสารไม่ควม...

a 1149512

Verification Certificate

Certificate No.: 2302413-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhnong, Bangkok 10260

Page 1 of 4

Equipment: HEATING BLOCK DIGESTION

Manufacturer: FOSS

Model: 2520

Serial No.: 91794469

ID No.: UAE.WAS.011/2560

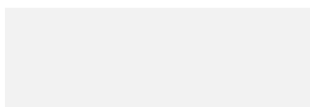
Order No.: 2302413

Operation No.: 2302413-001

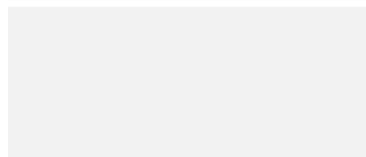
Date of Receipt: 28 March 2023

Date of Calibration: 30-31 March 2023

Calibrated by



Approved by



Manager, Division of Calibration Laboratory

Date of Issue: 10 April 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 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-009 Revision: 01 Date: 20-04-65



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:

- 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 with Thermocouple | 34970A | MY44045576/MY41194453 | TC22/0044 | 5-May-2023 | N.M. Technical Center Laboratory |
| | Type R | TC#101-103 / CH#101-103 | | | |

- 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

UUC* Description

Time of Record - Hour 30 Minute At 380 °C

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

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 3 of 4

Calibration point:

380 °C

Calibration result:

Reporting of Temperature

| Block No. | UUC* Setting (°C) | UUC* Reading (°C) | Stability (±°C) | Standard Thermometer (°C) | Uncertainty (±°C) |
|-----------|-------------------|-------------------|-----------------|---------------------------|-------------------|
| 1 | 380 | 380 | 0.96 | 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 | 0.11 | 377.30 | 1.6 |
| 6 | 380 | 380 | 0.14 | 377.90 | 1.6 |
| 7 | 380 | 380 | 1.17 | 373.85 | 2.1 |
| 8 | 380 | 380 | 0.33 | 376.96 | 2.1 |
| 9 | 380 | 380 | 0.14 | 374.18 | 2.1 |
| 10 | 380 | 380 | 0.96 | 378.56 | 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 | 0.84 | 377.06 | 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 sensors, for at least half an hour after reaching steady state.



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

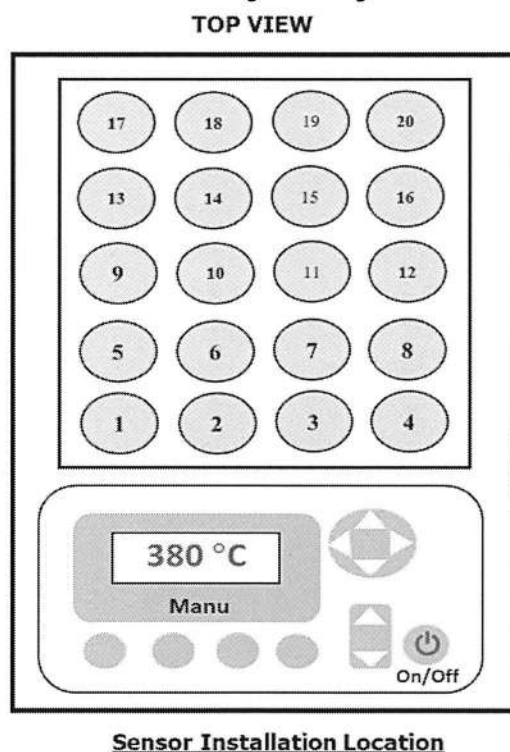
Date of Calibration: 30-31 March 2023

Calibration point: 380 °C

Calibration result: Continued

Page 4 of 4

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 sensors, 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: 20-04-65

Calibration Certificate

Certificate No.: 2303074-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhnong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Serial No.: 1129361010

ID No.: UAE.WAS.002/2552

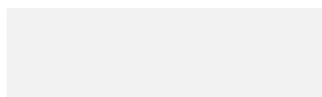
Order No.: 2303074

Operation No.: 2303074-001

Date of Receipt: 26 May 2023

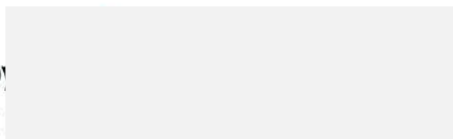
Date of Calibration: 26 May 2023

Calibrated by



Approved by

(



Vice President, Department of Laboratory Services
Responsible for the Technical Management Team

Date of Issue: 29 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-009 Revision: 01 Date: 20-04-65



Calibration Report

Certificate No.: 2303074-001-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Resolution: 0.0001 g

Serial No.: 1129361010

ID No.: UAE.WAS.002/2552

Capacity: 220 g

Date of Calibration: 26 May 2023

Page 2 of 3

Environment Condition: Ambient Temperature: 23.7 ± 0.1 °C Relative Humidity: 61 ± 2.2 %

Place of Calibration: Room 108 Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

| Reference Standard | Model | Serial No. | Calibrated By | Certificate No. | Due Date |
|--------------------------|-------------|----------------|----------------|-----------------|------------------|
| Standard Weight Class E2 | 1mg to 200g | B505567572 | TCS | M2304053S | 8 April 2024 |
| Instrument | Model | Serial No. | Calibrated By | Certificate No. | Due Date |
| Thermo-Hygro Meter | 608-H1 | NFI.BTH 018/23 | Quality Reborn | QR23-0491 | 21 February 2024 |

3. This certification 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:

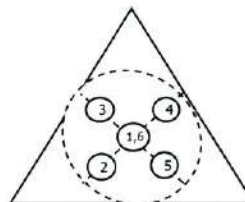
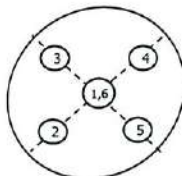
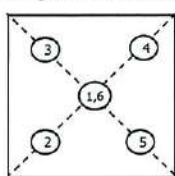
1. Repeatability of Reading:

| Nominal Value (g) | Standard Deviation of Reading (g) |
|---------------------|-------------------------------------|
| 100 | 0.000048 |
| 200 | 0.000048 |

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 (g) | 2 (g) | 3 (g) | 4 (g) | 5 (g) | 6 (g) | (Maximum Difference) (g) |
|------------|------------|------------|------------|------------|------------|-------------------------------|
| 99.9996 | 99.9995 | 99.9995 | 99.9999 | 99.9999 | 99.9997 | 0.0003 |

29 May 2023

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

Calibration Report

Certificate No.: 2303074-001-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Resolution: 0.0001 g

Serial No.: 1129361010

ID No.: UAE.WAS.002/2552

Capacity: 220 g

Date of Calibration: 26 May 2023

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

| Nominal Value (g) | Standard Value (g) | Average Reading (g) | Correction (g) | Uncertainty (± g) | Coverage Factor k |
|------------------------|-------------------------|--------------------------|---------------------|------------------------|----------------------|
| Unload | 0.00000 | 0.0000 | 0.0000 | 0.000088 | 2.00 |
| 0.01 | 0.01000 | 0.0100 | 0.0000 | 0.000088 | 2.00 |
| 0.05 | 0.05000 | 0.0500 | 0.0000 | 0.000088 | 2.00 |
| 0.1 | 0.10001 | 0.0999 | 0.0001 | 0.000088 | 2.00 |
| 0.2 | 0.20001 | 0.1999 | 0.0001 | 0.000088 | 2.00 |
| 0.5 | 0.50002 | 0.5000 | 0.0000 | 0.000088 | 2.00 |
| 1 | 1.00000 | 1.0000 | 0.0000 | 0.000089 | 2.00 |
| 2 | 2.00002 | 2.0000 | 0.0000 | 0.000089 | 2.00 |
| 5 | 5.00002 | 5.0000 | 0.0000 | 0.000090 | 2.00 |
| 10 | 10.00001 | 9.9999 | 0.0001 | 0.000091 | 2.00 |
| 20 | 20.00003 | 20.0000 | 0.0000 | 0.000095 | 2.00 |
| 50 | 50.00003 | 49.9999 | 0.0001 | 0.00011 | 2.00 |
| 70 | 70.00006 | 69.9999 | 0.0002 | 0.00013 | 2.00 |
| 100 | 100.00006 | 99.9999 | 0.0002 | 0.00016 | 2.00 |
| 150 | 150.00009 | 149.9999 | 0.0002 | 0.00021 | 2.00 |
| 200 | 200.00016 | 199.9998 | 0.0004 | 0.00028 | 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





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.: 23TM728

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 : 27 April 2023

Calibration Date : 27 - 28 April 2023

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Tawatchai Pama

Approved by :

Approved Signatory

Issue Date :

11 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 3 : Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-0461OC-6
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 23TM728

Page : 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Coverage Factor <i>k</i> |
|-----------------------------|------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------|-----------------------------|
| 25.0 | 25.0 | 25.0 | 0.020 | 0.81 | 1.2 | 2 |
| 36.0 | 36.0 | 36.0 | 0.15 | 1.1 | 1.6 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | | Uncertainty (± °C) |
|--------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|-----------------------------|
| | Position | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | |
| 25.0 | 25.541 | 25.354 | 25.388 | 25.278 | 24.341 | 24.349 | 24.379 | 24.455 | 24.747 | 0.30 |
| 36.0 | 35.275 | 35.351 | 35.768 | 35.941 | 36.543 | 36.590 | 36.653 | 36.728 | 36.232 | 0.39 |

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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เอกสารไม่ควา



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-0461OC-6

Cert. No.: 23TM728

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 | 34972A | MY57013711 | 22LM93 | 02 Jul 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.

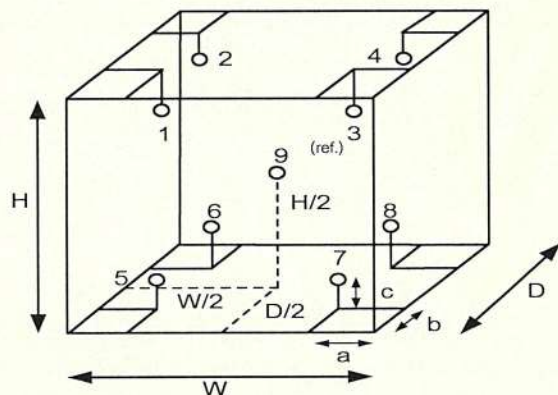
Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration

| | Beginning | Finished |
|--------------------|------------------|-----------------|
| Temp. (°C) | 25 | 22 |
| REL.Humid. (%) | 76 | 83 |
| AC Supply (Volt) | 231 | 231 |



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

Probe Installation Details :

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

Dimension of Chamber :

D = 0.50 m
W = 0.64 m
H = 0.80 m
Capacity = 0.26 m³

เอกสารไม่ควา



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.: 23TM378

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 : 11 April 2023

Calibration Date : 12 April 2023

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :

At ,

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 3 : Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-0155OC-1

Cert. No.: 23TM378

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 | 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.

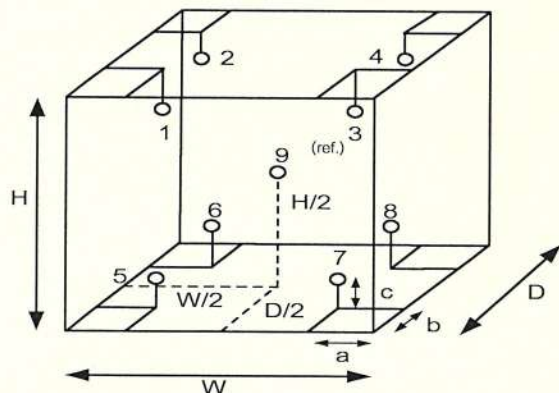
Result of Calibration :- (*) Without Adjustment

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 |



| 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 |

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

เอกสารไม่



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-0155OC-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 <i>k</i> |
|-----------------------------|------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------|-----------------------------|
| 35.0 | 35.0 | 35.0 | 0.052 | 0.53 | 0.60 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | | Uncertainty (± °C) |
|--------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|-----------------------------|
| | Position | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | |
| 35.0 | 35.092 | 35.148 | 34.817 | 35.149 | 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 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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เอกสารไม่คว



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.: 23TM765
Page : 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : Memmert
Model : IN 75
Serial No. : D317.0307
ID No. : UAE.MIC.023/2561
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 : 27 April 2023
Calibration Date : 27 April 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Preecha Hlahib

Approved by :

Issue Date :

11 May 2023

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-0461OC-5
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 23TM765

Page : 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Coverage Factor <i>k</i> |
|-----------------------------|------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------|-----------------------------|
| 37.0 | 37.0 | 37.0 | 0.070 | 0.28 | 0.39 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | | Uncertainty (± °C) |
|--------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|-----------------------------|
| | Position | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | |
| 37.0 | 37.164 | 37.118 | 37.079 | 37.121 | 36.852 | 37.039 | 36.822 | 36.923 | 36.905 | 0.30 |

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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เอกสารไม่



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-0461OC-5

Cert. No.: 23TM765

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 | 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.

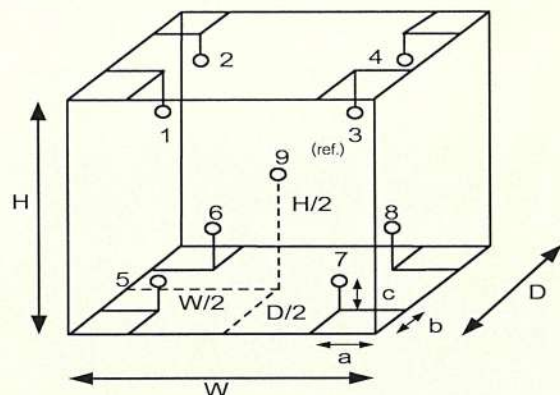
Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration

| | Beginning | Finished |
|--------------------|-----------|----------|
| Temp. (°C) | 23 | 22 |
| REL.Humid. (%) | 69 | 73 |
| AC Supply (Volt) | 220 | 221 |



| 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 |

Probe Installation Details :

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

Dimension of Chamber :

D = 0.32 m
W = 0.42 m
H = 0.56 m
Capacity = 0.075 m³

เอกสารไม่คว



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TEL. 0-2717-3000-29 FAX. 0-2719-9484



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.005/2558

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

Location : Microbiology Laboratory

Received Order : 15 February 2023

Calibration Date : 15 February 2023

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Suwit Imjai

Approved by :

Approved Signatory

Issue Date :

24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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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 | 26 Nov 2023 |

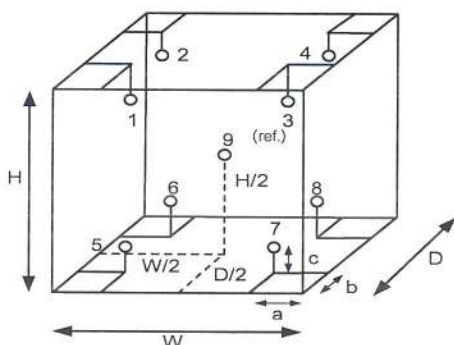
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



| 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 |

Probe Installation Details :

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

Dimension of Chamber :

D = 0.33 m
W = 0.40 m
H = 0.40 m
Capacity = 0.053 m³

เอกสารไม่ควม



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 (°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 | 35.4 | 35.4 | 0.037 | 0.56 | 0.86 | 0.30 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | |
|-----------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|
| | Position | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) |
| 35.0 | 35.256 | 35.308 | 35.116 | 35.453 | 34.700 | 34.798 | 34.718 | 34.657 | 34.938 |

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. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM194

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 : 15 February 2023
Calibration Date : 15 February 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Suwit Imjai

Approved by :

Approved Signatory

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 : 2302-0295OC-3

Cert. No.: 23TM194

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 | 34972A | MY59003411 | 22LM165 | 26 Nov 2023 |

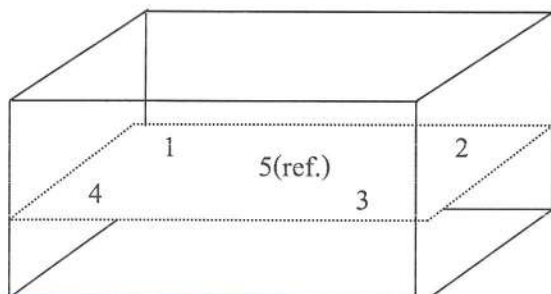
2. This certificate is valid only to the item calibrated on date and place of calibration.

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 | 65 | 231 |
| Finished of Calibration | 22 | 63 | 230 |



Front

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

เอกสารไม่ค



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2302-0295OC-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) | | | | |
|--------------------------------|---------------------------|---------------------------|----------------------------------|--------|--------|--------|----------|
| | | | Position | | | | |
| | | | 1 | 2 | 3 | 4 | 5 (ref.) |
| 44.5 | 44.5 | 44.6 | 44.520 | 44.509 | 44.498 | 44.552 | 44.530 |

| Calibration point (°C) | Uniformity (°C) | Stability (± °C) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|--------------------------------|----------------------|-----------------------|-------------------------|--------------------------------|
| 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 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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TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM250

Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 14

Serial No. : L416.0614

ID No. : UAE.MIC.020/2561

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

Location : Microbiology Laboratory

Received Order : 15 February 2023
Calibration Date : 16 February 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :

Approved Signatory

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 : 2302-0295OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 23TM250

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 | 44.4 | 44.4 | 44.482 | 44.458 | 44.461 | 44.461 | 44.460 |
| 50.0 | 50.0 | 50.0 | 50.087 | 50.061 | 50.066 | 50.064 | 50.068 |

| Calibration point (°C) | Uniformity (°C) | Stability (± °C) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|--------------------------------|----------------------|-----------------------|-------------------------|--------------------------------|
| 44.5 | 0.058 | 0.030 | 0.15 | 2 |
| 50.0 | 0.058 | 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 %.

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เอกสารไม่คว



Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2302-0295OC-4

Cert. No.: 23TM250

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 | 34972A | MY59003411 | 22LM165 | 26 Nov 2023 |

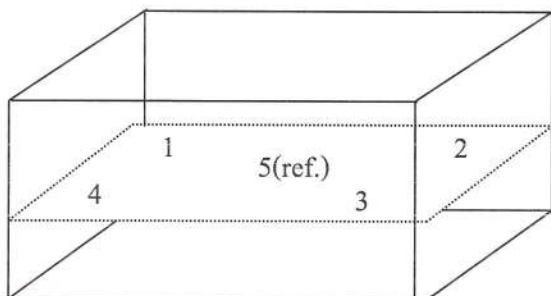
2. This certificate is valid only to the item calibrated on date and place of calibration.

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 | 220 |
| Finished of Calibration | 23 | 58 | 221 |



Front

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

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Certificate of Calibration

| | | | |
|-----------------------------|-------------------------------|-------------------------|------------------|
| Equipment: | Balance | Certificate No.: | C01234158 |
| Model: | PX623 | Issued Date: | 08 December 2023 |
| Serial No. (or ID.): | C236754745 (UAE.MIC.055/2565) | Job No.: | WO-00011251 |
| Manufacturer: | Ohaus | Page: | 1 of 3 |
| Condition: | In condition | | |

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

Environment Condition: Temperature 25 °C ± 0.5 °C
Humidity 54 %RH ± 1.7 %RH

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

Calibration By: Mr. Adisai Maknoi

Calibration Date: 07 December 2023

The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02222534

Person in charge

Authorized signatory

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

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

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

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2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
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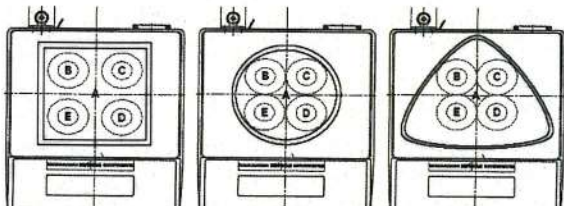
เอกสารไม่ควบคุม

CAL-FM-C01-14: 12 Sep 2022

Calibration Results:

Before Adjustment

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

| | | | | | | |
|---|--|-------|--------------------|--------|-----|-------|
|  | | | Nominal Test Value | | 200 | (g) |
| Reference Points (g) | | | | | | |
| A | | B | | C | | E |
| - | | 0.000 | | -0.003 | | 0.001 |

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

| Nominal test value (g) | Standard Deviation |
|------------------------|--------------------|
| 50 | 0.0006 |
| 500 | 0.0008 |

Error of indication from nominal or conventional mass value., Readability 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 | 0.0013 | 2.10 |
| 5 | 5.0001 | 5.000 | 0.000 | 0.0013 | 2.10 |
| 10 | 10.0001 | 10.001 | 0.001 | 0.0013 | 2.10 |
| 20 | 20.0000 | 20.000 | 0.000 | 0.0013 | 2.09 |
| 50 | 50.0001 | 50.000 | 0.000 | 0.0013 | 2.09 |
| 100 | 100.0001 | 100.001 | 0.001 | 0.0013 | 2.09 |
| 200 | 200.0004 | 200.002 | 0.002 | 0.0014 | 2.07 |
| 300 | 300.0005 | 300.002 | 0.002 | 0.0015 | 2.05 |
| 400 | 400.0006 | 400.004 | 0.003 | 0.0016 | 2.03 |
| 500 | 500.0006 | 500.008 | 0.007 | 0.0019 | 2.02 |
| 600 | 600.0007 | 600.009 | 0.008 | 0.0021 | 2.01 |

After Adjustment

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

The image displays three diagrams of a balance pan with four weights labeled B, C, D, and E. The first diagram shows weights B and C at the top corners and E and D at the bottom corners. The second diagram shows weights B and C at the top corners and E and D at the bottom corners. The third diagram shows weights B and C at the top corners and E and D at the bottom corners.

Nominal Test Value 200 (g)

Reference Points (g)

| A | B | C | D | E |
|---|-------|--------|--------|-------|
| - | 0.001 | -0.002 | -0.002 | 0.001 |

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

| Nominal test value (g) | Standard Deviation |
|------------------------|--------------------|
| 50 | 0.0006 |
| 500 | 0.0008 |

Error of indication from nominal or conventional mass value., Readability 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 | 0.0013 | 2.10 |
| 5 | 5.0001 | 5.000 | 0.000 | 0.0013 | 2.10 |
| 10 | 10.0001 | 10.000 | 0.000 | 0.0013 | 2.10 |
| 20 | 20.0000 | 20.000 | 0.000 | 0.0013 | 2.10 |
| 50 | 50.0001 | 50.000 | 0.000 | 0.0013 | 2.10 |
| 100 | 100.0001 | 100.000 | 0.000 | 0.0014 | 2.09 |
| 200 | 200.0004 | 200.000 | 0.000 | 0.0014 | 2.07 |
| 300 | 300.0005 | 300.001 | 0.001 | 0.0015 | 2.05 |
| 400 | 400.0006 | 400.002 | 0.001 | 0.0017 | 2.04 |
| 500 | 500.0006 | 500.001 | 0.000 | 0.0019 | 2.02 |
| 600 | 600.0007 | 600.002 | 0.001 | 0.0021 | 2.01 |

The End of Certificate

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 effects by according to the standard method, UKAS Lab14. 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 tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA.
- ☒ Choice B Non-binary statement with guard band ($w = 1 U$), 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 r to have applied as guard band ($w = r U$).
- ; PFA – Probability of False Accept


Authorized signatory

Statements of conformity:**Before Adjustment**

Readability; 0.001 g

| Nominal Value g | Error of indication g | Guard band (w) g | Tolerance (\pm) g | Conformity |
|--------------------|-----------------------------|---------------------|--------------------------|------------|
| 1 | 0.000 | 0.0013 | 0.002 | Pass |
| 5 | 0.000 | 0.0013 | 0.010 | Pass |
| 10 | 0.001 | 0.0013 | 0.020 | Pass |
| 20 | 0.000 | 0.0013 | 0.040 | Pass |
| 50 | 0.000 | 0.0013 | 0.100 | Pass |
| 100 | 0.001 | 0.0013 | 0.200 | Pass |
| 200 | 0.002 | 0.0014 | 0.400 | Pass |
| 300 | 0.002 | 0.0015 | 0.600 | Pass |
| 400 | 0.003 | 0.0016 | 0.800 | Pass |
| 500 | 0.007 | 0.0019 | 1.000 | Pass |
| 600 | 0.008 | 0.0021 | 1.200 | Pass |

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

Statements of conformity:**After Adjustment**

Readability; 0.001 g

| Nominal Value g | Error of indication g | Guard band (w) g | Tolerance (\pm) g | Conformity |
|--------------------|-----------------------------|---------------------|--------------------------|------------|
| 1 | 0.000 | 0.0013 | 0.002 | Pass |
| 5 | 0.000 | 0.0013 | 0.010 | Pass |
| 10 | 0.000 | 0.0013 | 0.020 | Pass |
| 20 | 0.000 | 0.0013 | 0.040 | Pass |
| 50 | 0.000 | 0.0013 | 0.100 | Pass |
| 100 | 0.000 | 0.0014 | 0.200 | Pass |
| 200 | 0.000 | 0.0014 | 0.400 | Pass |
| 300 | 0.001 | 0.0015 | 0.600 | Pass |
| 400 | 0.001 | 0.0017 | 0.800 | Pass |
| 500 | 0.000 | 0.0019 | 1.000 | Pass |
| 600 | 0.001 | 0.0021 | 1.200 | Pass |

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

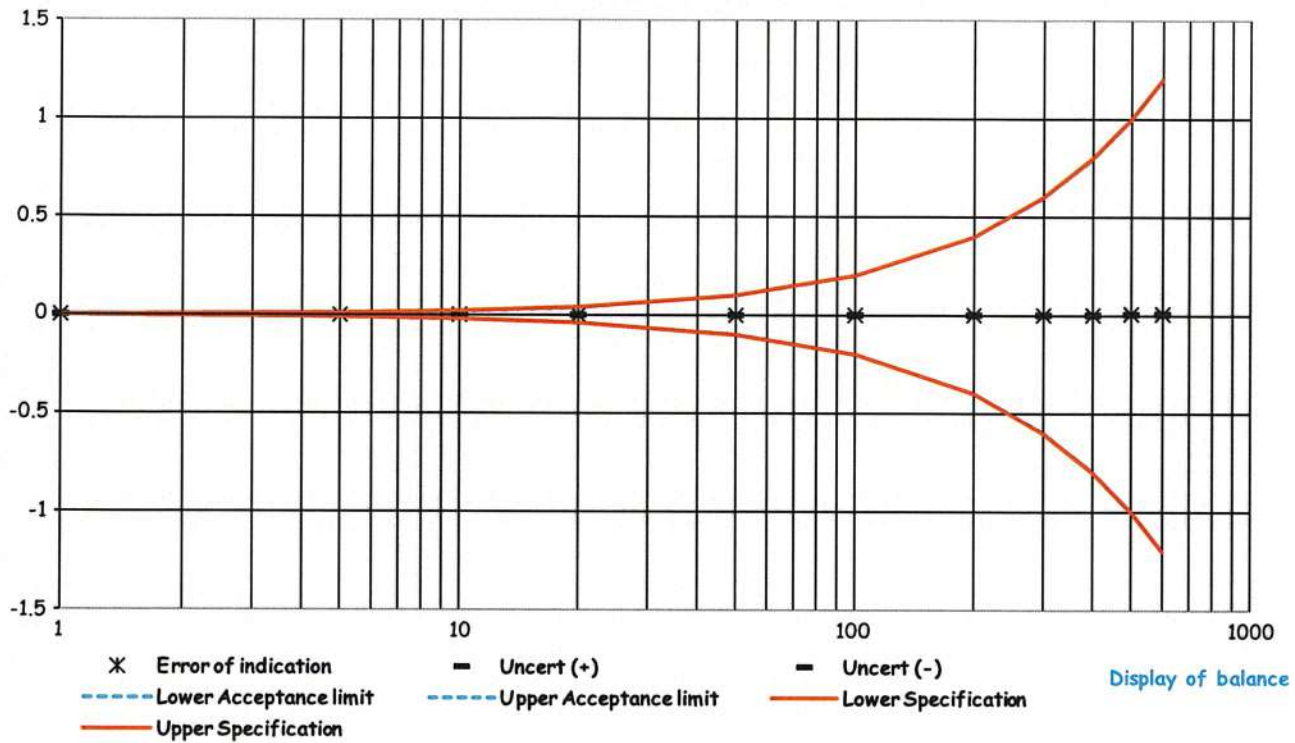
The End of Statements of conformity

Before Adjust

Job No. WO-00011251

Readability: 0.001g

Error of indication

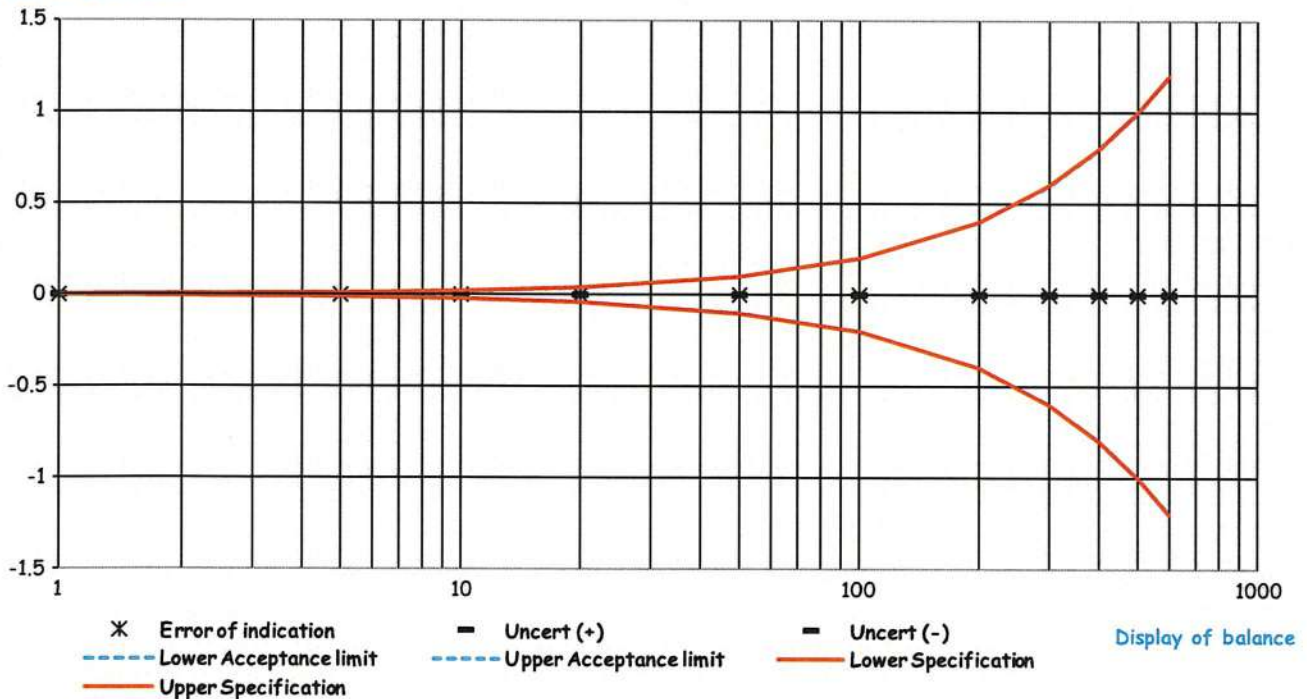


After Adjust

Job No. WO-00011251

Readability: 0.001g

Error of indication



เอกสารไม่ควบคุม

ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: WO-00011251

ชนิดเครื่องมือ: Balance

รุ่น: PX623

หมายเลขเครื่อง: C236754745

| ตรวจสอบ (รับ) | | รายการตรวจเช็ค | ตรวจสอบ (ส่ง) | | หมายเหตุ |
|-------------------------------------|--------------------------|--|-------------------------------------|--------------------------|----------|
| 07 Dec 2023 | | | 07 Dec 2023 | | |
| ปกติ | ไม่ปกติ | | ปกติ | ไม่ปกติ | |
| | | General | | | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | 1. สายไฟ/Adapter, power supply 220/110V | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | 2. ความสมบูรณ์ชุดกระจกกันลม (Cover) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | 3. ความสมบูรณ์ชุดของระดับน้ำ | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | 4. การปรับระดับของขาตั้งเครื่อง | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | 5. การตอบสนองของปุ่มกด | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | 6. ความสมบูรณ์ของ Display | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | 7. การแสดงผลของ Display หลังวางน้ำหนัก | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | 8. ชุดรองจานชั่ง (Stopper) / pan support | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | 9. การทำงานของ Function Internal / External | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | 10. ความสะอาดของตัวเครื่องภายนอกและแกน load cell | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | 11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Service Engineer



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.: 23TM763

Page : 1 of 3

Certificate of Calibration

Equipment : Autoclave

Manufacturer : ALP

Model : CL-40L

Serial No. : 808763

ID No. : UAE.MIC.026/2563

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

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 Hlahib

Approved by :

Approved Signatory

Issue Date :

11 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 3 : Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม

A 0053944



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2304-0461OC-2

Cert. No.: 23TM763

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 | 34972A | MY59003411 | 22LM165 | 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**

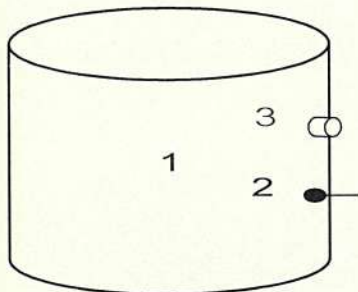
(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)

It does not cover autoclaves for use with material 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



| | <u>Environmental</u> | | |
|---------------------------------|----------------------|-----------|----------|
| | (°C) | (%R.H.) | (Volt) |
| Beginning of Calibration | 27 | 60 | 220 |
| Finished of Calibration | 27 | 58 | 220 |

| <u>Position</u> | <u>Description</u> | <u>Ref. Std. ID No.:</u> |
|-----------------|--------------------|--------------------------|
| 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 : 2304-0461OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 23TM763

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 <i>k</i> |
|---------------------------|---------------------------|----------|--|-----------------------|--------------------------------|-------------------------|--------------------------------|
| 115.0 | 115.0 | 1 | 115.213 | 0.22 | 0.08 | 0.75 | 2 |
| | | 2 | 115.166 | | | | |
| | | 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 <i>k</i> |
|---------------------------|---------------------------|----------|--|-----------------------|--------------------------------|-------------------------|--------------------------------|
| 121.0 | 121.0 | 1 | 121.260 | 0.29 | 1.1 | 0.75 | 2 |
| | | 2 | 121.224 | | | | |
| | | 3 | 121.284 | | | | |

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 %.

-o0o-

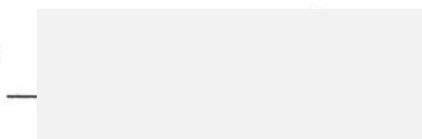
เอกสารไม่ควบคุม

a 1159967

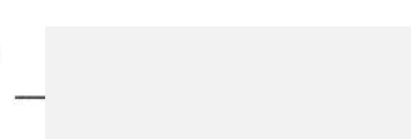
CERTIFICATE OF CALIBRATION

Certificate No. : SP23-007

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 315**Equipment :** UV-Vis Spectrophotometer**Manufacturer :** Hitachi**Model :** U-1900**Serial No. :** 2021-064**ID No. :** UAE.WAS.006/2552**Received Date :** 6 January 2023**Calibration Date :** 6 January 2023**Issue Date :** 10 January 2023**Condition Instrument :** Used**Calibrated by :**

Technical Manager

Approved by :

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.

เอกสารไม่ควบคุม

REPORT OF CALIBRATION

Certificate No. : SP23-007

Page 2 of 5

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.

เอกสารไม่ควบคุม

REPORT OF CALIBRATION

Certificate No. : SP23-007

Page 3 of 5

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 | 0.575 | 0.0037 | 0.0031 | 2.00 |
| | 1.0490 | 1.044 | 0.0050 | 0.0029 | 2.00 |
| | 2.1900 | 2.181 | 0.0090 | 0.0080 | 2.00 |
| 440 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5607 | 0.558 | 0.0027 | 0.0034 | 2.00 |
| | 1.0247 | 1.021 | 0.0037 | 0.0035 | 2.00 |
| | 2.1229 | 2.115 | 0.0079 | 0.0081 | 2.00 |
| 465 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5236 | 0.520 | 0.0036 | 0.0030 | 2.00 |
| | 0.9634 | 0.961 | 0.0024 | 0.0029 | 2.00 |
| | 1.9763 | 1.968 | 0.0083 | 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 | 1.993 | 0.0057 | 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 | 2.031 | 0.0081 | 0.0080 | 2.00 |
| 635 | 0.0000 | 0.000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5601 | 0.562 | -0.0019 | 0.0032 | 2.00 |
| | 1.0512 | 1.052 | -0.0008 | 0.0030 | 2.00 |
| | 1.9294 | 1.923 | 0.0064 | 0.0079 | 2.00 |

เอกสารไม่ควบคุม

REPORT OF CALIBRATION

Certificate No. : SP23-007

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 | 0.743 | 0.0048 | 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 | 0.639 | 0.0058 | 0.0055 | 2.00 |

เอกสารไม่ควบคุม

REPORT OF CALIBRATION

Certificate No. : SP23-007

Page 5 of 5

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 | 417.8 | 0.68 | 0.21 | 2.00 |
| 446.70 | 445.9 | 0.80 | 0.18 | 2.00 |
| 453.20 | 452.5 | 0.70 | 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 | 637.1 | 0.84 | 0.18 | 2.00 |
| 440.74 | 440.0 | 0.74 | 0.18 | 2.00 |
| 472.22 | 471.5 | 0.72 | 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 | 574.0 | 0.60 | 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 | 740.0 | 0.27 | 0.20 | 2.00 |
| 748.28 | 747.5 | 0.78 | 0.18 | 2.00 |
| 807.16 | 806.5 | 0.66 | 0.18 | 2.00 |
| 879.70 | 879.0 | 0.70 | 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 -

เอกสารไม่ควบคุม

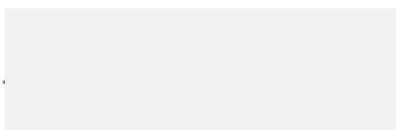
CERTIFICATE OF CALIBRATION

Certificate No. : SP23-021

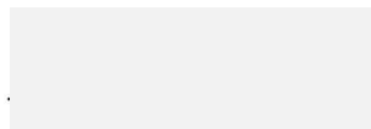
Page 1 of 5

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 315**Equipment :** UV-Vis Spectrophotometer**Manufacturer :** Agilent Technologies**Model :** Cary 60**Serial No. :** MY15410009**ID No. :** N/A**Received Date :** 20 May 2023**Calibration Date :** 20 May 2023**Issue Date :** 23 May 2023**Condition Instrument :** Good**Calibrated by :**

Technical Manager

Approved by :

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. : SP23-021

Page 2 of 5

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 :** 60 nm/min**Scan Interval of UUC :** 0.15 nm.**Resolution of UUC :** Photometric 0.0001 Abs.

Wavelength 0.1 nm.

REPORT OF CALIBRATION

Certificate No. : SP23-021

Page 3 of 5

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 | 0.5742 | 0.0045 | 0.0031 | 2.00 |
| | 1.0490 | 1.0423 | 0.0067 | 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 | 0.5577 | 0.0030 | 0.0034 | 2.00 |
| | 1.0247 | 1.0234 | 0.0013 | 0.0035 | 2.00 |
| | 2.1229 | 2.1171 | 0.0058 | 0.0088 | 2.00 |
| 465 | 0.0000 | 0.0000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5236 | 0.5184 | 0.0052 | 0.0029 | 2.00 |
| | 0.9634 | 0.9607 | 0.0027 | 0.0029 | 2.00 |
| | 1.9763 | 1.9715 | 0.0048 | 0.0081 | 2.00 |
| 546.1 | 0.0000 | -0.0001 | 0.0001 | 0.0028 | 2.00 |
| | 0.5191 | 0.5159 | 0.0032 | 0.0031 | 2.00 |
| | 1.0003 | 0.9980 | 0.0023 | 0.0033 | 2.00 |
| | 1.9987 | 1.9917 | 0.0070 | 0.0087 | 2.00 |
| 590 | 0.0000 | 0.0000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5523 | 0.5501 | 0.0022 | 0.0030 | 2.00 |
| | 1.0809 | 1.0808 | 0.0001 | 0.0030 | 2.00 |
| | 2.0391 | 2.0336 | 0.0055 | 0.0081 | 2.00 |
| 635 | 0.0000 | 0.0000 | 0.0000 | 0.0028 | 2.00 |
| | 0.5601 | 0.5585 | 0.0016 | 0.0031 | 2.00 |
| | 1.0512 | 1.0485 | 0.0027 | 0.0030 | 2.00 |
| | 1.9294 | 1.9317 | -0.0023 | 0.0083 | 2.00 |

REPORT OF CALIBRATION

Certificate No. : SP23-021

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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 | 0.0000 | 0.0000 | 0.0050 | 2.00 |
| | 0.7478 | 0.7436 | 0.0042 | 0.0058 | 2.00 |
| 257 | 0.0000 | 0.0000 | 0.0000 | 0.0050 | 2.00 |
| | 0.8686 | 0.8648 | 0.0038 | 0.0064 | 2.00 |
| 313 | 0.0000 | 0.0000 | 0.0000 | 0.0050 | 2.00 |
| | 0.2912 | 0.2908 | 0.0004 | 0.0052 | 2.00 |
| 350 | 0.0000 | 0.0000 | 0.0000 | 0.0050 | 2.00 |
| | 0.6448 | 0.6398 | 0.0050 | 0.0058 | 2.00 |

REPORT OF CALIBRATION

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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 | 360.3 | 0.63 | 0.18 | 2.00 |
| 418.59 | 418.0 | 0.59 | 0.18 | 2.00 |
| 445.94 | 445.3 | 0.64 | 0.18 | 2.00 |
| 453.66 | 453.0 | 0.66 | 0.18 | 2.00 |
| 460.02 | 459.6 | 0.42 | 0.18 | 2.00 |
| 536.59 | 536.4 | 0.19 | 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 | 529.0 | -0.12 | 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 | 684.5 | -0.10 | 0.18 | 2.00 |
| 740.72 | 741.0 | -0.28 | 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 -