

## เอกสารแนบ 6

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เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



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



Equipment : Auto Burette  
Received Date : 11 September 2025  
Condition As-Received : Used Item  
Calibration Date : 15 September 2025  
Reference : 2509-0413DN-1

Cert.No.: 25CG3566  
Page.: 2 of 2

#### Condition of this result of calibration

##### 1. Reference Standard Instruments :

| Instruments            | Model     | Serial No. | ID. No.  | Certificate No. | Traceability | Due date     |
|------------------------|-----------|------------|----------|-----------------|--------------|--------------|
| 1) Balance             | XP205     | B134206712 | 140RC007 | 25MM296         | TPA          | 16 July 2026 |
| 2) Humidity/Baro/Temp  | MHB-382SD | AM.42259   | 140EC016 | 25H1616         | TPA          | 14 Aug 2026  |
| 3) Digital Thermometer | HH376     | 230806555  | 140EC013 | 25I1740         | TPA          | 17 Jan 2026  |

This measurement result is traceable to SI Unit

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

3. True value is converted to true volume at the standard temperature of 20 °C

##### Calibration result :

| Nominal capacity<br>( mL ) | Reading<br>( mL ) | Std.dev | Uncertainty<br>( ± mL ) | k<br>Factor |
|----------------------------|-------------------|---------|-------------------------|-------------|
| 5                          | 5.0196            | 0.00120 | 0.0059                  | 2.00        |
| 15                         | 15.0159           | 0.00118 | 0.0065                  | 2.00        |

Remark mL = cm<sup>3</sup>

Std.dev = Standard deviation

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-

## Certificate of Calibration

Cert.No.: 25CG3566  
Page.: 1 of 2

Equipment : Auto Burette

Capacity : 25 mL

Serial No. :

ID. No. : 6210BU25/01

Manufacturer :

Made in : EM  
Germany

Submitted by :

TEST TECH CO.,LTD. (Head Office)  
30, 32 Rama II Soi 63, Rama II Rd.  
Samaedam, Bangkhunthian, Bangkok 10150

Ambient Temperature : (20 ± 2.5) °C

Relative Humidity : (50 ± 10) %

Barometric Pressure : 756 mmHg

Calibration Procedure : ASTM E 542 - 01

Calibrated by : Sa-engeunkam Wongsa

Approved by :

(✓) Srisuda Khamth  
( ) Ponpan Paipim  
( ) Chakrit Waewwa

Issue Date :

15 September 2025

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.



CERTIFICATE No : 26T0778

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : AUTOCLAVE  
MANUFACTURER : HIRAYAMA  
ID NUMBER : EQL-155  
RECEIVED DATE : 27-Jan-26  
AMBIENT TEMPERATURE : 26° C ± 1° C  
MODEL : HVE-50  
SERIAL NUMBER : 30612085166  
CALIBRATION DATE : 27-Jan-26  
RELATIVE HUMIDITY : 47 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON BS 2646-1:2021 BY COMPARISON WITH CALIBRATED THERMOCOUPLES UNDER NO LOAD CONDITION. THE SENSORS WERE PLACED ON FIVE LOCATIONS AS SHOWN IN THE PICTURE. THE SENSOR ON LOCATION 1 AND 2 WERE PLACED IN THE UPPER HALF AND LOWER HALF OF CHAMBER FREE SPACE RESPECTIVELY. THE THIRD SENSOR WAS PLACED WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE INSTRUMENT CHAMBER. SENSOR NUMBER 4 WAS ATTACHED TO THE LOAD TEMPERATURE PROBE, IF FITTED, WITHIN 15 mm OF ITS TIP. SENSOR NUMBER 5 WAS PLACED IN THE CHAMBER DRAIN OR VENT WITHIN 100 mm OF ITS CONNECTION TO THE CHAMBER.

### 2. REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER WITH TC TYPE K HYDRA 2635A 6635300 25T5343 27-Jun-26
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

| GENERAL INFORMATION                            |                    |
|------------------------------------------------|--------------------|
| Overall Ambient Temperature around the Chamber | variation : 1.2 °C |
| Autoclave Condition : Normal                   |                    |
| Chamber Size (Diameter*H): 30 * 71 cm          |                    |

| CHAMBER PERFORMANCE         |                           |                             |                             |                        |                |                    |
|-----------------------------|---------------------------|-----------------------------|-----------------------------|------------------------|----------------|--------------------|
| Controller Temperature (°C) | Average All Position (°C) | Temperature Stability (±°C) | Temperature Uniformity (°C) | Overall Variation (°C) | Pressure (MPa) | Holding time (min) |
| 115                         | 115.44                    | 0.19                        | 0.16                        | 0.48                   | 0.090          | 20                 |
| 121                         | 121.41                    | 0.14                        | 0.16                        | 0.40                   | 0.122          | 20                 |

FRONT

### TEMPERATURE MEASUREMENT ACCURACY TEST(°C)

| Calibration Point | Controller Temp. | Indicating Temp. | Measured Temperature (°C) at Spread Locations |        |        |        |        | Uncertainty (± °C) |
|-------------------|------------------|------------------|-----------------------------------------------|--------|--------|--------|--------|--------------------|
|                   |                  |                  | #1                                            | #2     | #3     | #4     | #5     |                    |
| 115               | 115              | 115              | 115.45                                        | 115.44 | 115.41 | 115.40 | 115.48 | 0.82               |
| 121               | 121              | 121              | 121.42                                        | 121.40 | 121.38 | 121.42 | 121.40 | 0.87               |

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT OF TEMPERATURE MEASUREMENT ACCURACY TEST EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : THE STABILITY TERM IN THE UNCERTAINTY BUDGET WAS REPLACED BY THE STANDARD REPEATABILITY.

NOTE 3 : LOCATION 3 WAS REFERENCE LOCATION.

NOTE 4 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF QUALITY CALIBRATION CO., LTD.



CERTIFICATE No : 25T8232

PAGE : 2 OF 3

## Calibration Report

|                     |   |               |                   |   |                  |
|---------------------|---|---------------|-------------------|---|------------------|
| EQUIPMENT           | : | BOD INCUBATOR | MODEL             | : | N/A              |
| MANUFACTURER        | : | N/A           | SERIAL NUMBER     | : | N/A              |
| ID NUMBER           | : | EQL-166       | CALIBRATION DATE  | : | 11-Aug-25        |
| RECEIVED DATE       | : | 11-Aug-25     | RELATIVE HUMIDITY | : | 45 %RH ± 10 % RH |
| AMBIENT TEMPERATURE | : | 27° C ± 1° C  |                   |   |                  |

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 19 POINTS AND LOCATED AS THE PICTURE BELOW AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE TENTH THERMOCOUPLE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

2. REFERENCE STANDARD INSTRUMENTS :-

- INSTRUMENT
- |                               |             |           |         |                |         |          |           |
|-------------------------------|-------------|-----------|---------|----------------|---------|----------|-----------|
| 1) DATA LOGGER WITH TC TYPE K | HYDRA 2635A | SERIAL No | 7286308 | CERTIFICATE No | 25T5347 | DUE DATE | 11-Jun-26 |
|-------------------------------|-------------|-----------|---------|----------------|---------|----------|-----------|
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

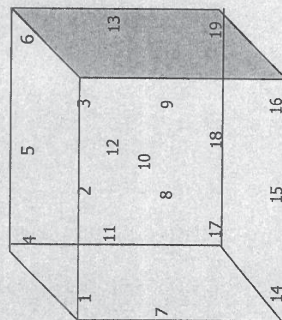
### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 0

Overall Line Voltage (V) variation : 2

Instrument Condition : Normal

Chamber Size (W\*L\*H): 190\*70\*174 cm



FRONT

END OF CALIBRATION REPORT PAGE 2 OF 3



CERTIFICATE No : 25T8232  
REFERENCE No : 78147-2

PAGE : 1 OF 3

## Certificate of Calibration

|                       |   |                                                                                                     |
|-----------------------|---|-----------------------------------------------------------------------------------------------------|
| EQUIPMENT             | : | BOD INCUBATOR                                                                                       |
| MANUFACTURER          | : | N/A                                                                                                 |
| MODEL                 | : | N/A                                                                                                 |
| SERIAL No             | : | N/A                                                                                                 |
| ID No                 | : | EQL-166                                                                                             |
| CONDITION AS RECEIVED | : | USED ITEM                                                                                           |
| SUBMITTED BY          | : | TEST TECH CO., LTD.<br>30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,<br>BANGKHUNTHIAN, BANGKOK 10150 |

|                  |   |           |
|------------------|---|-----------|
| CALIBRATED BY    | : |           |
| CALIBRATION DATE | : |           |
| APPROVED BY      | : |           |
| ISSUED DATE      | : |           |
| RECEIVED DATE    | : | 11-Aug-25 |

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.





QUALITY CALIBRATION CO., LTD.  
235 Petchkasem 63/2 Road, Laksong, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 25T8232

PAGE : 3 OF 3

## Calibration Report

### RESULT OF CALIBRATION (CONTINUE):-

| TEMPERATURE MEASUREMENT ACCURACY TEST |       |
|---------------------------------------|-------|
| Controller temperature (°C)           | 20.0  |
| Indicating Temperature                | 20.30 |
| 1                                     | 20.29 |
| 2                                     | 20.25 |
| 3                                     | 20.38 |
| 4                                     | 20.22 |
| 5                                     | 20.23 |
| 6                                     | 20.12 |
| 7                                     | 20.06 |
| 8                                     | 20.05 |
| 9                                     | 19.97 |
| 10 Ref.                               | 20.21 |
| 11                                    | 20.14 |
| 12                                    | 20.12 |
| 13                                    | 20.11 |
| 14                                    | 20.06 |
| 15                                    | 19.94 |
| 16                                    | 20.01 |
| 17                                    | 19.89 |
| 18                                    | 19.89 |
| 19                                    | 0.40  |
| Uncertainty of Measurement(± °C)      |       |

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR  $k=2$ , PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



## Certificate of Calibration

**Equipment:** SPECTROPHOTOMETER  
**Manufacturer:** HACH  
**Model:** DR6000  
**Serial No.:** 1693421  
**ID No.:** EQL-197  
**Condition of the item:** Normal  
**Certificate No.:** C06260124  
**Job No.:** WO-00112152  
**Issued Date:** 02 April 2026  
**Page:** 1 of 3  
**Customer:** TEST TECH CO., LTD.  
30,32 Rama II Soi 63, Rama II Rd., Samaedam,  
Bangkhunthian Bangkok 10150 Thailand.  
**Environment Condition:** Temperature 27.5 °C ± 0.6 °C  
Relative Humidity 46.3 % ± 2.1 %  
**Calibration Place:** TEST TECH CO., LTD. ( กรุงเทพมหานคร )  
30,32 Rama II Soi 63, Rama II Rd., Samaedam,  
Bangkhunthian Bangkok 10150 Thailand.  
**Calibration By:** Miss.Kaewkan Suradech  
**Calibration Date:** 02 April 2026  
**The Method Used:** In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04  
**Traceability:** This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.  
The standard for Wavelength Certificate No. 121284 and 121285  
The standard for Photometric Certificate No. 121289 and 121280  
The standard for Stray light Certificate No. 121281 and 121282  
The standard for Spectral resolution Certificate No. 121283

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Delivering Growth - in Asia and Beyond.

CAL-FM-C06-17: 30 Jun 2025



Calibration Results:  
Without Adjustment

| Photometric Accuracy (Absorbance) |                     |                        |                        |                |
|-----------------------------------|---------------------|------------------------|------------------------|----------------|
| Wavelength                        | Standard absorbance | Unit Under Calibration | Correction             | Uncertainty    |
| 235 nm                            | 0.0000              | 0.000                  | 0.0000                 | 0.0080         |
|                                   | 0.7403              | 0.739                  | 0.0013                 | 0.0080         |
| 257 nm                            | 0.0000              | 0.000                  | 0.0000                 | 0.0080         |
|                                   | 0.8586              | 0.856                  | 0.0026                 | 0.0080         |
| 313 nm                            | 0.0000              | 0.000                  | 0.0000                 | 0.0080         |
|                                   | 0.2886              | 0.290                  | -0.0014                | 0.0080         |
| 350 nm                            | 0.0000              | 0.000                  | 0.0000                 | 0.0080         |
|                                   | 0.6366              | 0.634                  | 0.0026                 | 0.0080         |
| Stray light *                     |                     |                        |                        |                |
| Standard: cut-off                 |                     | UUC: Wavelength (nm)   | UUC: Transmission (%T) | Absorbance (A) |
| 260.79 +/- 0.11 nm                |                     | 260.8                  | 1.0                    | 2.000          |
| 391.57 +/- 0.11 nm                |                     | 391.6                  | 1.2                    | 1.921          |

Spectral Resolution \*

| Nominal Concentration 0.02 % v/v | Peak | Trough | Ratio | SBW |
|----------------------------------|------|--------|-------|-----|
|----------------------------------|------|--------|-------|-----|

|                            |        |        |      |      |
|----------------------------|--------|--------|------|------|
| Standard Wavelength ( nm ) | 268.67 | 266.76 | 1.40 | 2.00 |
| UUC: Wavelength (nm)       | 268.5  | 266.6  |      |      |
| Std Absorbance ( A )       | 0.4064 | 0.2484 |      |      |
| UUC: Absorbance ( A )      | 0.368  | 0.263  |      |      |

\* Calibration Marked " Not TISI Accredited " in this Certificate have been included for completeness.

The End of Certificate



Calibration Results:  
Without Adjustment

| Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm |                        |            |             |  |
|---------------------------------------------------------------------------------|------------------------|------------|-------------|--|
| Standard Wavelength                                                             | Unit Under Calibration | Correction | Uncertainty |  |
| 418.61                                                                          | 418.5                  | 0.11       | 0.13        |  |
| 536.66                                                                          | 536.7                  | -0.04      | 0.13        |  |
| 637.98                                                                          | 638.0                  | -0.02      | 0.13        |  |
| 748.48                                                                          | 748.6                  | -0.12      | 0.14        |  |
| 807.03                                                                          | 807.4                  | -0.37      | 0.13        |  |

Photometric Accuracy (Absorbance)

| Wavelength | Standard absorbance | Unit Under Calibration | Correction | Uncertainty |
|------------|---------------------|------------------------|------------|-------------|
| 420 nm     | 0.0000              | 0.000                  | 0.0000     | 0.0045      |
|            | 0.5895              | 0.591                  | -0.0015    | 0.0045      |
|            | 0.7610              | 0.762                  | -0.0010    | 0.0045      |
|            | 1.0253              | 1.027                  | -0.0017    | 0.0045      |
| 440 nm     | 0.0000              | 0.000                  | 0.0000     | 0.0045      |
|            | 0.5783              | 0.579                  | -0.0007    | 0.0045      |
|            | 0.7430              | 0.744                  | -0.0010    | 0.0045      |
|            | 1.0022              | 1.003                  | -0.0008    | 0.0045      |
| 465 nm     | 0.0000              | 0.000                  | 0.0000     | 0.0045      |
|            | 0.5280              | 0.529                  | -0.0010    | 0.0045      |
|            | 0.6851              | 0.686                  | -0.0009    | 0.0045      |
|            | 0.9509              | 0.952                  | -0.0011    | 0.0045      |
| 546.1 nm   | 0.0000              | 0.000                  | 0.0000     | 0.0045      |
|            | 0.5446              | 0.545                  | -0.0004    | 0.0045      |
|            | 0.6932              | 0.693                  | 0.0002     | 0.0045      |
|            | 0.9952              | 0.995                  | 0.0002     | 0.0045      |
| 590 nm     | 0.0000              | 0.000                  | 0.0000     | 0.0045      |
|            | 0.5824              | 0.582                  | 0.0004     | 0.0045      |
|            | 0.7208              | 0.720                  | 0.0008     | 0.0045      |
|            | 1.0917              | 1.090                  | 0.0017     | 0.0045      |
| 635 nm     | 0.0000              | 0.000                  | 0.0000     | 0.0045      |
|            | 0.5660              | 0.566                  | 0.0000     | 0.0045      |
|            | 0.6882              | 0.688                  | 0.0002     | 0.0045      |
|            | 1.0846              | 1.083                  | 0.0016     | 0.0045      |



CERTIFICATE No : 25M6067

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE : QUINTIX2224-1S  
MANUFACTURER : SARTORIUS : 29302452  
ID No : EQL-164 : 23-Jun-25  
AIR PRESSURE : 1007mbar ± 1mbar : 23-Jun-25  
AMBIENT TEMPERATURE : 26° C ± 1° C : 40 %RH ± 10 % RH  
RELATIVE HUMIDITY : 40 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6/2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION, REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE  
1) STANDARD WEIGHT SET E2 QK-1151 C0250116 28-Jan-27  
2) STANDARD WEIGHT E2 15843 C0250117 29-Jan-27

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

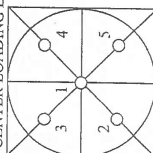
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

| NOMINAL VALUE (g) | BALANCE READING (g) | CORRECTION (g) | UNCERTAINTY (± g) |
|-------------------|---------------------|----------------|-------------------|
| 0.0               | 0.0000              | 0.0000         | 0.00010           |
| 0.1               | 0.1000              | 0.0000         | 0.00011           |
| 0.5               | 0.5000              | 0.0000         | 0.00010           |
| 1.0               | 1.0000              | 0.0000         | 0.00011           |
| 2.0               | 2.0000              | 0.0000         | 0.00011           |
| 20.0              | 20.0001             | -0.0001        | 0.00011           |
| 45.0              | 45.0001             | -0.0001        | 0.00016           |
| 50.0              | 50.0000             | 0.0000         | 0.00013           |
| 80.0              | 80.0000             | 0.0000         | 0.00018           |
| 100.0             | 100.0001            | -0.0001        | 0.00019           |
| 120.0             | 120.0001            | -0.0001        | 0.00022           |
| 140.0             | 140.0001            | -0.0001        | 0.00025           |
| 160.0             | 160.0001            | -0.0001        | 0.00027           |
| 180.0             | 180.0001            | -0.0001        | 0.00030           |
| 200.0             | 200.0001            | -0.0001        | 0.00032           |

5. OFF CENTER LOADING ERROR



| POINT              | READING (g) |
|--------------------|-------------|
| 1                  | 100.0000    |
| 2                  | 100.0000    |
| 3                  | 100.0000    |
| 4                  | 100.0000    |
| 5                  | 100.0000    |
| OFF-CENTER LOADING | 0.0000      |

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY. THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



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235 Petchkasem 63/2 Road, Laksong, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584  
www.qcalibration.com



CERTIFICATE No : 25T8754  
REFERENCE No : 78325-5

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : HOT AIR OVEN  
MANUFACTURER : MEMMERT  
MODEL : UFE 500  
SERIAL No : G512.2005  
ID No : EQL-161  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD.,  
SAMAEDAM, BANGKHUNTHIAN,  
BANGKOK 10150  
CALIBRATED BY :  
CALIBRATION DATE :  
APPROVED BY :  
ISSUED DATE :  
RECEIVED DATE : 26-Aug-25



THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.

F-G010 REV : 03



**Harikul Science Co., Ltd.**  
694 Soi Ratchadaniwet 24, Pracharabamphen,  
Samsaenok, Huai Khwang, Bangkok 10310  
Tel: 0-2274-2456 Fax: 0-2274-2443  
Email: info@harikul.com www.harikul.com

CERT. No.: HS-X010C

Certificate of Calibration

Calibration Date : 11 March 2026  
Submitted by : TEST TECH CO., LTD.  
30,32 Ramall Soi 63, Ramall Road, Samaedam,  
Bangkhunthian, Bangkok 10150

Avg Room Temp : 20 °C  
Avg Water Temp : 20 °C  
Air Pressure : 760.00 mmHg  
Salinity : 0 ppt  
Model : YSI 5000  
S/N : 18A103706  
Probe : YSI 5010  
S/N : 25G100244  
ID NO. : EQL-202  
Air Temp ref : S/N: F8065C26  
Barometric ref : S/N: F8065C26  
Water Temp ref : -  
ID NO. : HS001  
Technician : Kittipong M.

### Calibration Details

| Calibration Point     | 100% air sat.<br>(@20 °C, DO = 9.09 mg/l) | (status) | (status) |
|-----------------------|-------------------------------------------|----------|----------|
| Measurement 1 (mg/l)  | 9.09                                      | (PASS)   | -        |
| Measurement 2 (mg/l)  | 9.09                                      | (PASS)   | -        |
| Measurement 3 (mg/l)  | 9.09                                      | (PASS)   | -        |
| Measurement 4 (mg/l)  | 9.09                                      | (PASS)   | -        |
| Measurement 5 (mg/l)  | 9.09                                      | (PASS)   | -        |
| Measurement 6 (mg/l)  | 9.08                                      | (PASS)   | -        |
| Measurement 7 (mg/l)  | 9.08                                      | (PASS)   | -        |
| Measurement 8 (mg/l)  | 9.08                                      | (PASS)   | -        |
| Measurement 9 (mg/l)  | 9.08                                      | (PASS)   | -        |
| Measurement 10 (mg/l) | 9.08                                      | (PASS)   | -        |
| Mean Measurement      | 9.09                                      | mg/l     | -        |
| Inaccuracy            | 0.00                                      | mg/l     | -        |
| Overall Status        | (PASS)                                    |          |          |

### Manufacturer Specification

Accuracy = +/- 0.02 mg/l

- 1) This certificate is issued based on the result that are found as shown on date and place of test only.
- 2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
- 3) This result shall not be used for advertising purpose.



CERTIFICATE No : 25T8453  
REFERENCE No : 78325-4

PAGE : 1 OF 2

### Certificate of Calibration

EQUIPMENT : HOT AIR OVEN  
MANUFACTURER : MEMMERT  
MODEL : UFE 500  
SERIAL No : G508.0791  
ID No : EQL-128  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD.,  
SAMAEDAM, BANGKOKHUNTHIAN,  
BANGKOK 10150

CALIBRATED BY :

CALIBRATION DATE :

APPROVED BY :

ISSUED DATE :

RECEIVED DATE :



CERTIFICATE No : 25T8754

PAGE : 2 OF 2

### Calibration Report

EQUIPMENT : HOT AIR OVEN  
MANUFACTURER : MEMMERT  
MODEL : UFE 500  
ID No : EQL-161  
RECEIVED DATE : 26-Aug-25  
AMBIENT TEMPERATURE : 25 °C ± 1 °C  
S/N : G512.2005  
CALIBRATION DATE : 26-Aug-25  
RELATIVE HUMIDITY : 55 %RH ± 10 %RH

#### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

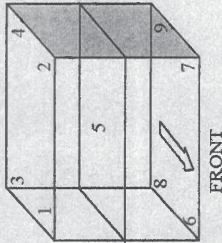
#### REFERENCE STANDARD INSTRUMENTS :-

- INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE
- 1) DATA LOGGER WITH RTD HYDRA 2635A 6849323 25T5342 18-Jun-26
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

#### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

##### GENERAL INFORMATION

|                                                                   |
|-------------------------------------------------------------------|
| Overall Ambient Temperature around the Chamber (°C) variation : 1 |
| Overall Line Voltage (V) variation : 3                            |
| Instrument Condition : Normal                                     |
| Chamber Size (W*H*H): 56*40*48 cm                                 |



##### CHAMBER PERFORMANCE

| Calibration Point (°C) | Average All Position (°C) | Temperature Stability (±°C) | Temperature Uniformity (°C) | Overall Variation (°C) |
|------------------------|---------------------------|-----------------------------|-----------------------------|------------------------|
| 104.0                  | 104.11                    | 0.10                        | 0.88                        | 0.97                   |

##### TEMPERATURE MEASUREMENT ACCURACY TEST

| Controller Temp (°C) | Indicating Temp (°C) | Measured Temperature (°C) at Spread Locations |        |        |        |        |        |        |        |        | Uncertainty (± °C) |
|----------------------|----------------------|-----------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------------------|
|                      |                      | #1                                            | #2     | #3     | #4     | Ref. 5 | #6     | #7     | #8     | #9     |                    |
| 104.5                | 104.5                | 104.15                                        | 104.14 | 104.25 | 103.95 | 103.64 | 104.12 | 104.46 | 104.06 | 104.24 | 0.38               |

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



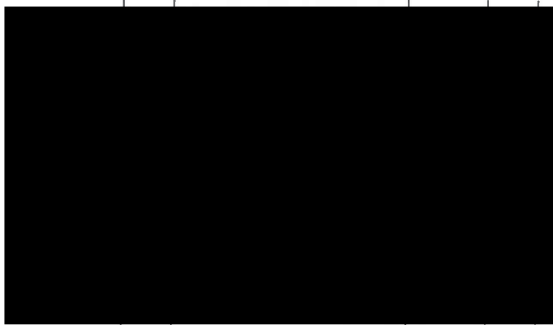


CERTIFICATE No : 25T6066  
REFERENCE No : 77516-6

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : OVEN  
MANUFACTURER : MEMMERT  
MODEL : UF110  
SERIAL No : B414.0764  
ID No : EQL-169  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30-32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,  
BANGKHUNTHIAN, BANGKOK 10150



CALIBRATED BY :  
CALIBRATION DATE :  
APPROVED BY :  
ISSUED DATE :  
RECEIVED DATE :



CERTIFICATE No : 25T8453

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : HOT AIR OVEN  
MANUFACTURER : MEMMERT  
MODEL : UFE 500  
ID No : EQL-128  
RECEIVED DATE : 26-Aug-25  
AMBIENT TEMPERATURE : 25 °C ± 1 °C  
S/N : G508.0791  
CALIBRATION DATE : 26-Aug-25  
RELATIVE HUMIDITY : 53 %RH ± 10 %RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

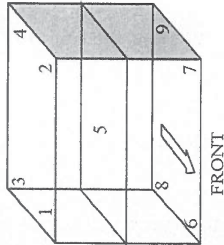
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE :  
1) DATA LOGGER WITH RTD HYDRA 2635A 6849323 25T5342 18-Jun-26  
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

#### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 3  
Overall Line Voltage (V) variation : 4  
Instrument Condition : Normal  
Chamber Size (W\*L\*H): 56\*40\*48 cm



#### CHAMBER PERFORMANCE

| Calibration Point (°C) | Average All Position (°C) | Temperature Stability (±°C) | Temperature Uniformity (°C) | Overall Variation (°C) |
|------------------------|---------------------------|-----------------------------|-----------------------------|------------------------|
| 104.0                  | 104.03                    | 0.16                        | 1.01                        | 1.19                   |
| 180.0                  | 180.26                    | 0.17                        | 2.22                        | 2.31                   |

#### TEMPERATURE MEASUREMENT ACCURACY TEST

| Controller Indicating Temp (°C) | Measured Temperature (°C) at Spread Locations |        |        |        |        |        |        |        |        | Uncertainty (± °C) |
|---------------------------------|-----------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------------------|
|                                 | #1                                            | #2     | #3     | #4     | Ref. 5 | #6     | #7     | #8     | #9     |                    |
| 103.5                           | 103.5                                         | 104.27 | 103.84 | 103.83 | 103.62 | 104.56 | 104.19 | 104.47 | 103.84 | 0.38               |
| 179.5                           | 179.5                                         | 180.73 | 179.83 | 179.93 | 179.37 | 179.40 | 181.40 | 181.12 | 179.85 | 1.1                |

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT





CERTIFICATE No. : 25T6066

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : OVEN  
MANUFACTURER : MEMMERT  
MODEL : UF110  
ID No : EQL-169  
RECEIVED DATE : 23-Jun-25  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
S/N : B414.0764  
CALIBRATION DATE : 23-Jun-25  
RELATIVE HUMIDITY : 51 %RH ± 10 %RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.
2. REFERENCE STANDARD INSTRUMENTS :-

### INSTRUMENT

1) DATA LOGGER WITH RTD  
MODEL : HYDRA 2635A  
SERIAL No : 6635300  
CERTIFICATE No : 24T6468  
DUE DATE : 26-Jun-25

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

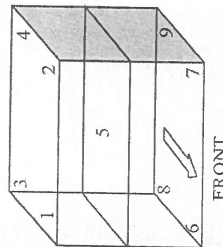
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

#### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 2  
Overall Line Voltage (V) variation : 5  
Instrument Condition : Normal  
Chamber Size (W\*L\*H): 56\*40\*48 cm



#### CHAMBER PERFORMANCE

| Calibration Point (°C) | Average All Position (°C) | Indicating Temperature (°C) | Temperature Stability (±°C) | Temperature Uniformity (°C) | Overall Variation (°C) |
|------------------------|---------------------------|-----------------------------|-----------------------------|-----------------------------|------------------------|
| 104.0                  | 103.88                    | 104.0                       | 0.18                        | 0.45                        | 0.64                   |
| 120.0                  | 119.93                    | 120.0                       | 0.28                        | 0.65                        | 0.93                   |
| 140.0                  | 140.03                    | 140.0                       | 0.19                        | 0.57                        | 0.87                   |
| 150.0                  | 150.09                    | 150.0                       | 0.23                        | 0.65                        | 0.86                   |
| 180.0                  | 180.02                    | 180.0                       | 0.16                        | 0.47                        | 0.62                   |

#### TEMPERATURE MEASUREMENT ACCURACY TEST

| Controller Temp (°C) | Indicating Temp (°C) | Measured Temperature (°C) at Spread Locations |        |        |        |        |        |        |        |        | Uncertainty (± °C) |
|----------------------|----------------------|-----------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------------------|
|                      |                      | #1                                            | #2     | #3     | #4     | Ref. 5 | #6     | #7     | #8     | #9     |                    |
| 104.0                | 104.0                | 103.71                                        | 103.85 | 103.77 | 103.91 | 104.03 | 103.80 | 103.82 | 104.17 | 103.85 | 0.38               |
| 120.0                | 120.0                | 119.67                                        | 119.87 | 119.79 | 119.99 | 120.16 | 119.83 | 120.35 | 119.85 | 119.85 | 0.46               |
| 140.0                | 140.0                | 139.76                                        | 140.01 | 139.94 | 140.10 | 140.23 | 139.91 | 139.95 | 140.45 | 139.93 | 0.46               |
| 150.0                | 150.0                | 149.80                                        | 150.05 | 150.00 | 150.15 | 150.31 | 149.97 | 150.03 | 150.49 | 149.95 | 1.1                |
| 180.0                | 180.0                | 179.84                                        | 180.02 | 179.95 | 180.05 | 180.18 | 179.92 | 179.99 | 180.30 | 179.98 | 1.1                |

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.  
NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.  
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



## Certificate of Calibration



Equipment: Incubator  
Manufacturer: Memmert  
Model: IF160  
Serial No.: D519.0140  
ID No.: EQL-231  
Shelves(pc.): 2  
Condition of the item: Normal  
Certificate No.: C31260154  
Issued Date: 20 January 2026  
Job No.: WO-00102613  
Ventilation Valve: Closed  
Page: 1 of 5

Customer: TEST TECH CO., LTD.

30,32 Rama II Soi 63, Rama II Rd.,  
Samaedam, Bangkokthunian Bangkok 10150 Thailand.

Environment Condition: Temperature: 23 °C ± 0.8 °C  
Relative Humidity: 48 % ± 3.2 %  
Voltage: 227 VAC ± 2.4 VAC

Calibration Place: TEST TECH CO., LTD. ( Incubation room 408 )

30,32 Rama II Soi 63, Rama II Rd.,  
Samaedam, Bangkokthunian Bangkok 10150 Thailand.

Calibration By: Mr. Natapat Rungrueang

Calibration Date: 20 January 2026

The Method Used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10250028

This internal

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 Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

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

DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok, Prakhonong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-11: 30 Jun 2025

**Calibration Results:**  
Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 35.0 °C

| Locations | Measured Temperature (°C) | Correction of UUC (°C) | Uncertainty (± °C) |
|-----------|---------------------------|------------------------|--------------------|
| #1        | 34.95                     | -0.05                  | 0.21               |
| #2        | 34.95                     | -0.05                  | 0.21               |
| #3        | 34.96                     | -0.04                  | 0.21               |
| #4        | 34.99                     | -0.01                  | 0.21               |
| #5        | 35.01                     | 0.01                   | 0.21               |
| #6        | 34.94                     | -0.06                  | 0.21               |
| #7        | 34.83                     | -0.17                  | 0.21               |
| #8        | 34.96                     | -0.04                  | 0.21               |
| #9        | 34.98                     | -0.02                  | 0.21               |

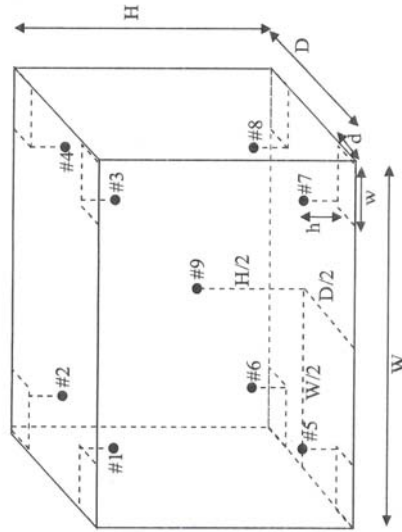
**Temperature Distribution**

| Desired<br>(°C) | Setting<br>(°C) | Indicating<br>(°C) | Measured Temperature at Spread Locations (°C) |       |       |       |       |       |       |       |       | Uncertainty<br>(± °C)* |
|-----------------|-----------------|--------------------|-----------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|
|                 |                 |                    | #1                                            | #2    | #3    | #4    | #5    | #6    | #7    | #8    | #9    |                        |
| 35.0            | 35.0            | 35.0               | 34.95                                         | 34.95 | 34.96 | 34.99 | 35.01 | 34.94 | 34.83 | 34.96 | 34.98 | 0.21                   |

**Chamber Characterization**

| Indicating (°C) | Measured Uniformity (°C) | Measured Stability (± °C) | Overall Variation (°C) |
|-----------------|--------------------------|---------------------------|------------------------|
| 35.0            | 0.16                     | 0.02                      | 0.21                   |

Note: \* Maximum uncertainty of the each position



**Standard Installation Locations**

Volume (Calibration Zone) = 43 (Liters)

Inside chamber:

W = 56 (cm) D = 40 (cm) H = 72 (cm)

Standard Locations (#1, #2, #3, #4): w = 10 (cm) d = 5 (cm) h = 20 (cm)

Standard Locations (#5, #6, #7, #8): w = 10 (cm) d = 5 (cm) h = 12 (cm)

#9: Geometric center of the chamber

| Position of Std   | #1  | #2  | #3  | #4  | #5  | #6  | #7  | #8  | #9  |
|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Channel of Logger | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 |

**Definitions**

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

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

**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

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

**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.



Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 41.5 °C

| Locations | Measured Temperature (°C) | Correction of UUC (°C) | Uncertainty (± °C) |
|-----------|---------------------------|------------------------|--------------------|
| #1        | 41.48                     | -0.02                  | 0.21               |
| #2        | 41.47                     | -0.03                  | 0.21               |
| #3        | 41.52                     | 0.02                   | 0.21               |
| #4        | 41.52                     | 0.02                   | 0.21               |
| #5        | 41.55                     | 0.05                   | 0.21               |
| #6        | 41.45                     | -0.05                  | 0.21               |
| #7        | 41.37                     | -0.13                  | 0.21               |
| #8        | 41.49                     | -0.01                  | 0.21               |
| #9        | 41.49                     | -0.01                  | 0.21               |

Temperature Distribution

| Desired<br>(°C) | Setting<br>(°C) | Indicating<br>(°C) | Measured Temperature at Spread Locations (°C) |       |       |       |       |       |       |       |       | Uncertainty<br>(± °C)* |
|-----------------|-----------------|--------------------|-----------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|
|                 |                 |                    | #1                                            | #2    | #3    | #4    | #5    | #6    | #7    | #8    | #9    |                        |
| 41.5            | 41.5            | 41.5               | 41.48                                         | 41.47 | 41.52 | 41.52 | 41.55 | 41.45 | 41.37 | 41.49 | 41.49 | 0.21                   |
|                 |                 |                    |                                               |       |       |       |       |       |       |       |       |                        |

Chamber Characterization

| Indicating (°C) | Measured Uniformity (°C) | Measured Stability (± °C) | Overall Variation (°C) |
|-----------------|--------------------------|---------------------------|------------------------|
| 41.5            | 0.13                     | 0.02                      | 0.20                   |

Note: \* Maximum uncertainty of the each position

The End of Certificate



Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 37.0 °C

| Locations | Measured Temperature (°C) | Correction of UUC (°C) | Uncertainty (± °C) |
|-----------|---------------------------|------------------------|--------------------|
| #1        | 36.97                     | -0.03                  | 0.21               |
| #2        | 36.97                     | -0.03                  | 0.21               |
| #3        | 36.99                     | -0.01                  | 0.21               |
| #4        | 37.01                     | 0.01                   | 0.21               |
| #5        | 37.04                     | 0.04                   | 0.21               |
| #6        | 36.96                     | -0.04                  | 0.21               |
| #7        | 36.88                     | -0.12                  | 0.21               |
| #8        | 36.98                     | -0.02                  | 0.21               |
| #9        | 37.00                     | 0.00                   | 0.21               |

Temperature Distribution

| Desired<br>(°C) | Setting<br>(°C) | Indicating<br>(°C) | Measured Temperature at Spread Locations (°C) |       |       |       |       |       |       |       |       | Uncertainty<br>(± °C)* |
|-----------------|-----------------|--------------------|-----------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|
|                 |                 |                    | #1                                            | #2    | #3    | #4    | #5    | #6    | #7    | #8    | #9    |                        |
| 37.0            | 37.0            | 37.0               | 36.97                                         | 36.97 | 36.99 | 37.01 | 37.04 | 36.96 | 36.88 | 36.98 | 37.00 | 0.21                   |

Chamber Characterization

| Indicating (°C) | Measured Uniformity (°C) | Measured Stability (± °C) | Overall Variation (°C) |
|-----------------|--------------------------|---------------------------|------------------------|
| 37.0            | 0.13                     | 0.02                      | 0.19                   |

Note: \* Maximum uncertainty of the each position



CERTIFICATE No : 25T6064

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : INB400  
ID No : EQL-087  
RECEIVED DATE : 23-Jun-25  
AMBIENT TEMPERATURE : 26 °C ± 1 °C  
S/N : E405.0946  
CALIBRATION DATE : 23-Jun-25  
RELATIVE HUMIDITY : 46 %RH ± 10 %RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IAS G-20 BY COMPARISON WITH CALIBRATED RTD PH100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

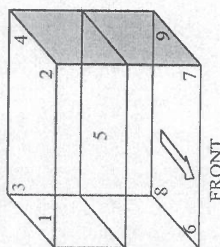
2. REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER WITH RTD  
2) HYDRA 2635A  
3) THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

#### GENERAL INFORMATION

|                                                                   |
|-------------------------------------------------------------------|
| Overall Ambient Temperature around the Chamber (°C) variation : 1 |
| Overall Line Voltage (V) variation : 6                            |
| Instrument Condition : Normal                                     |
| Chamber Size (W*L*H): 40*33*40 cm                                 |



#### CHAMBER PERFORMANCE

| Calibration Point (°C) | Average All Position (°C) | Indicating Temperature (°C) | Temperature Stability (±°C) | Temperature Uniformity (°C) | Overall Variation (°C) |
|------------------------|---------------------------|-----------------------------|-----------------------------|-----------------------------|------------------------|
| 44.0                   | 44.10                     | 43.5                        | 0.04                        | 0.57                        | 0.62                   |
| 58.0                   | 57.83                     | 57.0                        | 0.07                        | 0.75                        | 0.78                   |

#### TEMPERATURE MEASUREMENT ACCURACY TEST

| Controller Temp (°C) | Indicating Temp (°C) | Measured Temperature (°C) at Spread Locations |       |       |       |        |       |       |       |       | Uncertainty (± °C) |
|----------------------|----------------------|-----------------------------------------------|-------|-------|-------|--------|-------|-------|-------|-------|--------------------|
|                      |                      | #1                                            | #2    | #3    | #4    | Ref. 5 | #6    | #7    | #8    | #9    |                    |
| 43.5                 | 43.5                 | 43.94                                         | 44.08 | 43.84 | 43.77 | 44.34  | 44.29 | 44.31 | 44.04 | 44.30 | 0.36               |
| 57.0                 | 57.0                 | 57.65                                         | 57.75 | 57.52 | 57.51 | 58.22  | 57.98 | 58.16 | 57.59 | 58.14 | 0.36               |

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.  
END OF CALIBRATION REPORT



CERTIFICATE No : 25T6064  
REFERENCE No : 77516-4

## Certificate of Calibration

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : INB400  
SERIAL No : E405.0946  
ID No : EQL-087  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30.32 RAMA II SOI 63, RAMA II RD., SAMAEADAM,  
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY :  
CALIBRATION DATE :

APPROVED BY :  
ISSUED DATE :  
RECEIVED DATE :



CERTIFICATE No : 26E0471

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : pH METER  
MANUFACTURER : TOA DKK  
ID No : EQL-183  
RECEIVED DATE : 15-Jan-26  
AMBIENT TEMPERATURE : 24°C ± 1°C  
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD BASED ON WI-TQ-062 AND WI-TQ-063. THE DISPLAY UNIT WAS TESTED BY GENERATING STANDARD VOLTAGE TO THE UNIT AND READ THE VALUE COMPARED WITH CALCULATED VALUE. THE DISPLAY AND ELECTRODE WAS CALIBRATED BY USING STANDARD pH BUFFER SOLUTION.

2. REFERENCE STANDARD INSTRUMENTS :-

| INSTRUMENT                | MODEL    | SERIAL No/<br>LOT No | CERTIFICATE No | DUE DATE  |
|---------------------------|----------|----------------------|----------------|-----------|
| 1) pH STANDARD SOLUTION   | 00651-36 | CC813268             | 4956-15549758  | 19-Nov-26 |
| 2) pH STANDARD SOLUTION   | 00651-38 | CC815135             | 4957-15619979  | 31-Dec-26 |
| 3) pH STANDARD SOLUTION   | 00651-40 | CC814522             | 4958-15587041  | 12-Dec-26 |
| 4) PROCESS CALIBRATOR     | CA150    | 91S6079              | 25E1110        | 02-Apr-26 |
| 5) BATH                   | 260014   | 1247 48074           | 25T9431        | 12-Sep-26 |
| 6) THERMOMETER WITH PROBE | 421504   | 55000379             | 25T9466        | 12-Sep-26 |

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-  
- NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

### RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. DISPLAY UNIT ONLY

SLOPE FACTOR  $k = 2.303$  RT/F = 59 mV/pH

| mV<br>APPLIED | UUC<br>READING (mV) | CORRECTION<br>(mV) | UNCERTAINTY OF<br>MEASUREMENT<br>(± mV) | COVERAGE<br>FACTOR<br>k |
|---------------|---------------------|--------------------|-----------------------------------------|-------------------------|
| 177.48        | 179                 | -1.52              | 0.59                                    | 2.0                     |
| 0.00          | 1                   | -1.00              | 0.59                                    | 2.0                     |
| -177.48       | -177                | -0.48              | 0.59                                    | 2.0                     |

2. DISPLAY UNIT WITH pH ELECTRODE S/N: 501F0036AR

| STANDARD pH<br>BUFFER SOLUTION<br>(pH) | UUC READING<br>(pH) | CORRECTION<br>(pH) | UNCERTAINTY OF<br>MEASUREMENT<br>(± pH) | COVERAGE<br>FACTOR<br>k |
|----------------------------------------|---------------------|--------------------|-----------------------------------------|-------------------------|
| 4.011                                  | 4.01                | 0.001              | 0.012                                   | 2.0                     |
| 7.007                                  | 7.00                | 0.007              | 0.012                                   | 2.0                     |
| 10.006                                 | 10.01               | -0.004             | 0.014                                   | 2.0                     |

3. PERCENT SLOPE 98%

4. DISPLAY UNIT MEASUREMENT TEMPERATURE WITH PROBE

| STANDARD<br>READING<br>(°C) | UUC*<br>READING<br>(°C) | IMMERSION<br>DEPTH<br>(mm) | CORRECTION<br>(°C) | UNCERTAINTY<br>OF MEASUREMENT<br>(±°C) |
|-----------------------------|-------------------------|----------------------------|--------------------|----------------------------------------|
| 25.003                      | 24.8                    | 80                         | 0.203              | 0.17                                   |

UUC : UNIT UNDER CALIBRATION

THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA. THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY FACTOR k, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



u.6/14

CERTIFICATE No : 26E0471

REFERENCE No : 79663-1

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : pH METER  
MANUFACTURER : TOA DKK  
MODEL : HM-25R  
SERIAL No : 760205  
ID No : EQL-183  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.

30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,  
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY

CALIBRATION DATE

APPROVED BY

ISSUED DATE

RECEIVED DATE



THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF QUALITY CALIBRATION CO., LTD.

F-C010 REV 03

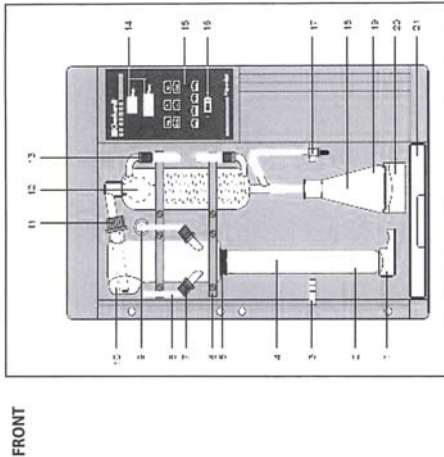


- Part 1: สัญญาการให้บริการ (Service Contact)  
Part 2: ข้อมูลพื้นฐานของเครื่องมือ (Details of Instrument)  
Part 3: ตรวจสอบเช็คสภาพเครื่อง  
Part 4: รายละเอียดและรายงานผลการให้บริการ Preventive Maintenance  
4.1 ขั้นตอนการบริการ  
4.2 รายงานผลการให้บริการ  
Part 5: ข้อมูลสนับสนุนด้านเทคนิค (General Technical Support)  
5.1 Care and Maintenance  
5.1.1 การบำรุงรักษาทั่วไป (Basic maintenance)  
5.1.2 General error message

## การดูแลบำรุงรักษาเชิงป้องกัน Preventive Maintenance

Customer Name : บริษัท เทสท์ เทค จำกัด  
Product : Distillation Unit  
Brand : GERHARDT  
Model : VAPODEST 30  
Serial number : GER003718

Part 3: Operational Qualification (OQ)  
3.1 ตรวจสอบสภาพเครื่อง



FRONT

| No  | Description                                  | PASS                                | FAIL                     | N/A                      |
|-----|----------------------------------------------|-------------------------------------|--------------------------|--------------------------|
| 1.  | Quick clamping device with wedge             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.  | Kjeldatherm digestion tube                   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3.  | Holder for steam inlet tubing                | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4.  | PTFE-Inlet tubing, steam                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5.  | Viton-cone                                   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6.  | Clamping for glassware                       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7.  | Screw cap GL18 with silicone seal            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8.  | PTFE-Inlet tubing, NaOH                      | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9.  | PP-Distributor with PP-threaded joint        | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. | Distribution head, glass                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. | Screw cap GL32 with silicone seal            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. | Distillation condenser                       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. | Screw cap GL14 with plastic screw connection | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. | Display                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. | Keyboard, chemical-resistant                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. | Main switch, green                           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. | Ventilation valve                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. | Distillate outlet tubing                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. | Erlenmeyer flask                             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. | Platform                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21. | Drip tray                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

1. สัญญาการให้บริการ (Service Contact)

หน่วยงานลูกค้า : บริษัท เพรส เทค จำกัด

ที่อยู่ : 30,32 ซอยพระรามที่ 2 ซอย 63 แขวงสามตำบล เขตบางขุนเทียน กรุงเทพมหานคร 10150

อีเมล

บุคคลติดต่อ

ชื่อ- นามสกุล

ตำแหน่ง

โทรศัพท์

อีเมล

สัญญาการบริการ

ครั้งที่ 1 วันที่ : 16-03-2026

ครั้งที่ 2 วันที่ :

ครั้งที่ 3 วันที่ :

2. ข้อมูลพื้นฐานของเครื่องมือ (Details of Instrument)

2.1 รายละเอียดเครื่องมือ (Instrument Description)

ประเภทเครื่องมือ : Distillation Unit

ผลิตภัณฑ์ : GERHARDT

รุ่น : VAPODEST 30

หมายเลขเครื่อง : GER003718

หมายเลขชุดรุ่น : EQL-062

2.2 ผู้ดำเนินการ

ดำเนินการทำ

ชื่อ-นามสกุล

ตำแหน่ง

แผนก

ฝ่าย



Part 4: รายละเอียดการตรวจสอบ

4.1 ขั้นตอนการบริการ

ตรวจสอบระบบไฟฟ้า (Electrical Test)

- ความต้านทานทางไฟฟ้าของเครื่องกับกราวด์
- กระแสไฟฟ้าที่ใช้งาน

ตรวจสอบสภาพเครื่อง (Optical Test)

- Main cable
- Electric wiring
- Pumps
- Distribution Head
- Condensor
- Steam generator
- Tubing
- Viton cone

ตรวจสอบ Function การทำงาน (The Function Test)

- ระบบสร้างและควบคุมความดันของ Steam
- ระบบการเติมน้ำเข้า Sample Tube
- ระบบการเติม Na OH
- ระบบการ Suction ถัง Sample Tube และ Receiver

4.2 รายงานผลการให้บริการ

1. TECHNICAL DATA

Main Supply 220 volt + 10% 50 Hz with ground  
Nominal current

1.1 COOLING WATER BATH

Temperature 15-20 °C  
Cooling Water Outlet  
Control Temperature

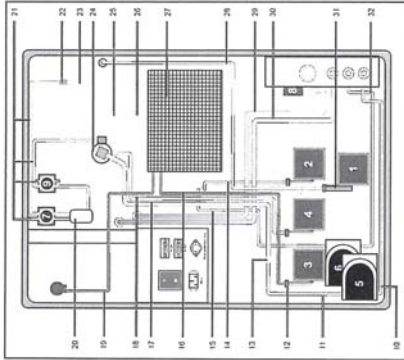
1.2 OPTICAL TEST VAP 30

- Screw cap GL14
- Screw cap GL18
- Screw cap GL32
- Distillation Head
- Condensor
- Viton Cone
- Ventilation Valve
- Micro Switch Sample

2. SYSTEM COOLING WATER INLET

- Cooling Water Inlet
- Cooling Water Outlet
- Flow control valve

REAR



No Description

| No  | Description                                         | PASS                                | FAIL                     | N/A                                            |
|-----|-----------------------------------------------------|-------------------------------------|--------------------------|------------------------------------------------|
| 1.  | Diaphragm pump NaOH                                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 2.  | Diaphragm pump H <sub>3</sub> BO <sub>3</sub>       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> *Vap40     |
| 3.  | Diaphragm pump H <sub>2</sub> O for steam generator | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 4.  | Diaphragm pump H <sub>2</sub> O for sample          | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> *Vap30,40  |
| 5.  | Peristaltic pump for suction sample                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> *Vap30, 40 |
| 6.  | Peristaltic pump for suction receiver               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> Option     |
| 7.  | Pinch-solenoid valve, steam                         | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 8.  | Magnetic valve with pressure control                | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 9.  | Pinch-solenoid valve, shut-off                      | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 10. | Verprene-tubing 4x8 mm.                             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 11. | Verprene-tubing 4x7 mm.                             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> *Vap30,40  |
| 12. | Non-return valve for diaphragm pumps                | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 13. | Tubing reduction PP 51x10x5 mm.                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> *Vap30,40  |
| 14. | Silicone tubing 4x7 mm.                             | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> *Vap40     |
| 15. | Silicone tubing 4x7 mm.                             | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> Option     |
| 16. | Silicone -tubing 4x7 mm.                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 17. | Verprene-tubing 8x12 mm.                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> *Vap30,40  |
| 18. | Verprene tubing 4x7 mm.                             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> *Vap30,40  |
| 19. | Silicone tubing 4x7 mm.                             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 20. | Ventilation glass                                   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 21. | Novoprene-tubing 4.8x8 mm.                          | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 22. | Tubing reduction                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 23. | Silicone tubing 6x10 mm.                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 24. | PP-distributor with PP-thread                       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 25. | SKT-valve (built in with brass fitting)             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 26. | Silicone tubing 8x16x80 mm.                         | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 27. | Steam generator                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 28. | PTFE-inlet tubing NaOH                              | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 29. | Silicone tubing 8x16 for cooling water inlet        | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 30. | Silicone tubing 8x16 for cooling water outlet       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 31. | Viton-tubing 6x12*50 mm.                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                       |
| 32. | Silicone tubing 4x7 mm.                             | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> Option     |

Part 5: ข้อมูลสนับสนุนด้านเทคนิค (General Technical Support)  
4.1 การบำรุงรักษาทั่วไป (Basic maintenance)

### Cleaning

Glass parts and suction pump should be cleaned before long periods of non-usage (i.e. holidays). This way blockages caused by crystalline deposits are avoided.

The following program should be run:

Addition  $H_3BO_3$  0 s  
Addition  $H_2O$ : 13 s  
Addition NaOH: 0 s  
Reaction time: 0 s  
Distillation time: 7 min.  
Steam capacity: 100 %  
Suction time: 20 s

Place an empty digestion tube and an Erlenmeyer flask into position, and start the program.  
In case of extreme deposits in the glassware you can clean the system by putting about 10 ml of sulphuric acid into the digestion tube.

| 3. SYSTEM CONTROL                            |                                          |                               |           |
|----------------------------------------------|------------------------------------------|-------------------------------|-----------|
| Key Board                                    | PASS <input checked="" type="checkbox"/> | FAIL <input type="checkbox"/> | Remark    |
| Display                                      | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Program                                      | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Adding $H_2O$                                | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      | *Vap30,40 |
| Adding NaOH                                  | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Adding $H_3BO_3$                             | <input type="checkbox"/>                 | <input type="checkbox"/>      | *Vap40    |
| Suction Sample                               | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      | *Vap30,40 |
| 4. SYSTEM DISTILLATION                       |                                          |                               |           |
| Boiler                                       | PASS <input checked="" type="checkbox"/> | FAIL <input type="checkbox"/> | Remark    |
| Level Sensor                                 | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Neoprene-Tubing                              | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Solenoid Valve Shut-Off                      | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Solenoid Valve Stream                        | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Excess Pressure Detector                     | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Ventilation Valve                            | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Heater                                       | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| 5. PUMP                                      |                                          |                               |           |
| Pump $H_2O$ Steam                            | PASS <input checked="" type="checkbox"/> | FAIL <input type="checkbox"/> | Remark    |
| - Non-Return Valve                           | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Pump $H_2O$ Sample                           | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| - Non-Return Valve                           | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Pump NaOH                                    | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| - Non-Return Valve                           | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Pump $H_3BO_3$                               | <input type="checkbox"/>                 | <input type="checkbox"/>      | N/A       |
| - Non-Return Valve                           | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Pump suction                                 | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| 6. THE FOLLOWING PROGRAM RUN                 |                                          |                               |           |
| Addition $H_2O$ 0-99 sec.                    | PASS <input checked="" type="checkbox"/> | FAIL <input type="checkbox"/> | Remark    |
| Addition NaOH 0-99 sec.                      | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Addition $H_3BO_3$ 0-99 sec.                 | <input type="checkbox"/>                 | <input type="checkbox"/>      | N/A       |
| Reaction Time 0-99 min                       | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Distillation Time 0-99 min                   | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Steam Capacity 30%-100%                      | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| Suction Time 0-99 sec.                       | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |
| The Instrument is in perfect technical shape | <input checked="" type="checkbox"/>      | <input type="checkbox"/>      |           |

Remark: Pump NaOH รั่วซึม



CERTIFICATE No : 25T8757

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : WATER BATH  
MANUFACTURER : N/A  
ID NUMBER : EQL-056  
RECEIVED DATE : 26-Aug-25  
AMBIENT TEMPERATURE : 23 °C ± 1 °C  
MODEL : SUP IV  
SERIAL NUMBER : N/A  
CALIBRATION DATE : 26-Aug-25  
RELATIVE HUMIDITY : 50 %RH ± 10 % RH

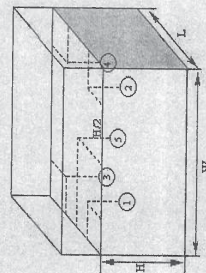
### CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.
- REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER WITH RTD  
MODEL 2625A SERIAL No 6603614 CERTIFICATE No 25T5341 DUE DATE 04-Jun-26
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION  
POSITION IN THE BATH

#### GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 0.5  
Overall Variation of Line Voltage (V) : 2  
Instrument Condition : Normal  
Bath Inner Size (W\*L\*H) : 59\*35\*20 cm

#### BATH PERFORMANCE

| Calibration Point (°C) | Average All Position (°C) | Temperature Stability (±°C) | Radius Uniformity (°C) | Axial Uniformity (°C) | Overall Variation (°C) |
|------------------------|---------------------------|-----------------------------|------------------------|-----------------------|------------------------|
| 83.0                   | 83.00                     | 0.13                        | 0.06                   | 0.08                  | 0.36                   |

#### TEMPERATURE MEASUREMENT ACCURACY TEST

| Controller Temp (°C) | Indicating Temp (°C) | Measured Temperature (°C) at Spread Locations |       |       |       | Uncertainty (± °C) |      |
|----------------------|----------------------|-----------------------------------------------|-------|-------|-------|--------------------|------|
|                      |                      | #1                                            | #2    | #3    | #4    |                    |      |
| 83.0                 | 83.0                 | 83.00                                         | 83.00 | 82.97 | 83.01 | 83.04              | 0.23 |

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE BATH.  
NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.  
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF QUALITY CALIBRATION CO., LTD.



CERTIFICATE No : 25T6062

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
ID NUMBER : EQL-147  
RECEIVED DATE : 23-Jun-25  
AMBIENT TEMPERATURE : 27 °C ± 1 °C  
MODEL : WPE 45  
SERIAL NUMBER : L711.0024  
CALIBRATION DATE : 23-Jun-25  
RELATIVE HUMIDITY : 51 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.

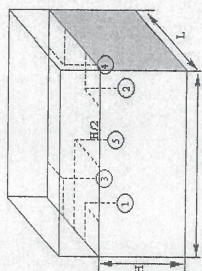
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE  
1) DATA LOGGER WITH RTD 2625A 6603614 25T5341 04-Jun-26  
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDES LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION  
POSITION IN THE BATH

#### GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 1.1  
Overall Variation of Line Voltage (V) : 4  
Instrument Condition : Normal  
Bath Inner Size (W\*L\*H) : 59\*35\*22 cm

#### BATH PERFORMANCE

| Calibration Point (°C) | Average All Position (°C) | Temperature Stability (±°C) | Radius Uniformity (°C) | Axial Uniformity (°C) | Overall Variation (°C) |
|------------------------|---------------------------|-----------------------------|------------------------|-----------------------|------------------------|
| 41.5                   | 41.50                     | 0.05                        | 0.04                   | 0.07                  | 0.12                   |
| 44.5                   | 44.48                     | 0.03                        | 0.04                   | 0.10                  | 0.08                   |

#### TEMPERATURE MEASUREMENT ACCURACY TEST

| Controller Temp (°C) | Indicating Temp (°C) | Measured Temperature (°C) at Spread Locations |       |       |       |        | Uncertainty (± °C) |
|----------------------|----------------------|-----------------------------------------------|-------|-------|-------|--------|--------------------|
|                      |                      | #1                                            | #2    | #3    | #4    | Ref. 5 |                    |
| 41.5                 | 41.5                 | 41.51                                         | 41.47 | 41.52 | 41.48 | 41.50  | 0.14               |
| 44.5                 | 44.5                 | 44.48                                         | 44.46 | 44.50 | 44.47 | 44.49  | 0.14               |

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE BATH.

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF QUALITY CALIBRATION CO., LTD.