

## เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



Harikul Science Co., Ltd.  
694 Soi Ratchadaniwet 24, Pracharatbamphen,  
Samsaenok, HuaiKhwang, Bangkok 10310  
Tel: 0-2274-2456 Fax: 0-2274-2443  
Email: info@harikul.com www.harikul.com  
Certificate of Calibration

CERT No.: HS-U0681

Calibration Date : 22 Sep 23  
Submitted by : TEST TECH CO., LTD.  
30,32 Ramall Soi 63, Ramall Road, Samaedam,  
Bangkhunthian, Bangkok 10150

Model : YSI 5000  
S/N : 16D105048  
Probe : YSI 5010  
S/N : 22A100334  
ID NO. : EQL-193  
Air Temp ref : S/N. F8065C26  
Barometric ref : S/N. F8065C26  
Water Temp ref : S/N. 11430

Technician : Kittipong M.

#### Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.09	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.08	(PASS)	-
Measurement 4 (mg/l)	9.08	(PASS)	-
Measurement 5 (mg/l)	9.07	(PASS)	-
Measurement 6 (mg/l)	9.08	(PASS)	-
Measurement 7 (mg/l)	9.07	(PASS)	-
Measurement 8 (mg/l)	9.07	(PASS)	-
Measurement 9 (mg/l)	9.07	(PASS)	-
Measurement 10 (mg/l)	9.07	(PASS)	-

Mean Measurement	9.08	mg/l	-
Inaccuracy	0.01	mg/l	-

Overall Status (PASS)

#### Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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

Technician Signature

(Kittipong Maekwang)

Laboratory Manager

(Natenaph Pissakunchon)



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



CERTIFICATE No : 24T1189  
REFERENCE No : 72116-7

PAGE : 1 OF 2

### Certificate of Calibration

EQUIPMENT : AUTOCLAVE  
MANUFACTURER : HIRAYAMA  
MODEL : HVE-50  
SERIAL No : 30612085166  
ID No : EQL-155  
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 : CHAICHARN CH.  
CALIBRATION DATE : 09-Feb-24  
APPROVED BY : PONGSAK J.  
ISSUED DATE : 12-Feb-24  
RECEIVED DATE : 09-Feb-24

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



QUALITY CALIBRATION CO., LTD.  
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CERTIFICATE No : 24T1189

PAGE : 2 OF 2

### Calibration Report

EQUIPMENT : AUTOCLAVE  
MANUFACTURER : HIRAYAMA  
ID NUMBER : EQL-155  
RECEIVED DATE : 09-Feb-24  
AMBIENT TEMPERATURE : 30° C ± 1° C  
MODEL : HVE-50  
SERIAL NUMBER : 30612085166  
CALIBRATION DATE : 09-Feb-24  
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

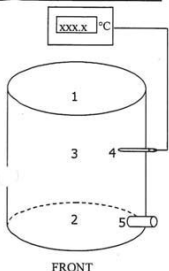
#### CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED BASED ON BS 2646-1:2021 BY COMPARISON WITH CALIBRATED RTD DATA LOGGERS 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.

#### REFERENCE STANDARD INSTRUMENTS :-

- DATA LOGGER : MODEL : VALPROBE S350, S367, DV35, DN94 24T0890 26-Jan-25
- THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
- THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
- 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 : 0.5 °C  
Autoclave Condition : Normal  
Chamber Size (Diameter\*H): 30 \* 71 cm

#### CHAMBER PERFORMANCE

Calibrate Point (°C)	Average all Position (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)	Pressure (MPa)	Holding time (min)	Operating Cycle time (min)
115	115.74	0.09	0.11	0.25	0.090	20	60
121	121.59	0.06	0.21	0.28	0.125	20	60

#### TEMPERATURE MEASUREMENT ACCURACY TEST (°C)

Cont Temp	Ind Temp	#1	#2	#3	#4	#5	Uncertainty (± °C)
115	115	115.72	115.74	115.79	115.71	115.71	0.59
121	121	121.59	121.62	121.56	121.58	121.59	0.59

- 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 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

F-G010 REV : 03 ภาคผนวก ข - 1



QUALITY CALIBRATION CO., LTD.  
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CERTIFICATE No : 23T8796  
REFERENCE No : 70515-4

PAGE : 1 OF 2

### Certificate of Calibration

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
MODEL : WNE 45  
SERIAL No : L720.0266  
ID No : EQL-241  
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 : CHAICHARN CH.  
CALIBRATION DATE : 16-Aug-23  
APPROVED BY : PONGSAK J.  
ISSUED DATE : 16-Aug-23  
RECEIVED DATE : 16-Aug-23

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





CERTIFICATE No : 23T8796

PAGE : 2 OF 2

### Calibration Report

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
ID NUMBER : EQL-241  
RECEIVED DATE : 16-Aug-23  
AMBIENT TEMPERATURE : 25 °C ± 1 °C  
MODEL : WNE 45  
SERIAL NUMBER : L720.0266  
CALIBRATION DATE : 16-Aug-23  
RELATIVE HUMIDITY : 50 %RH ± 10 % RH

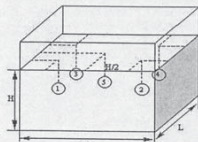
#### CONDITION OF THIS RESULTS OF CALIBRATION

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 : 23T6642 : 19-Jul-24  
THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.  
THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
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) : 0.6

Overall Variation of Line Voltage (V) : 3

Instrument Condition : Normal

Bath Inner Size (W\*L\*H) : 59\*35\*20 cm

#### BATH PERFORMANCE

Calibrate Point (°C)	Average All Position Temp. (±°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
83.0	83.09	0.05	0.07	0.05	0.16
92.0	92.13	0.11	0.06	0.06	0.28

#### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
83.0	83.0	83.08	83.09	83.06	83.11	83.12	0.15
92.0	92.0	92.11	92.13	92.10	92.16	92.16	0.19

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

F-G010 REV : 03



CERTIFICATE No : 23T6749  
REFERENCE No : 69853-3

PAGE : 1 OF 2

### Certificate of Calibration

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : INB 400  
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., SAMAEDAM,  
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.  
CALIBRATION DATE : 10-Jul-23

APPROVED BY : PONGSAK J.  
ISSUED DATE : 17-Jul-23  
RECEIVED DATE : 10-Jul-23

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



CERTIFICATE No : 23T6749

PAGE : 2 OF 2

### Calibration Report

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : INB 400  
ID No : EQL-087  
RECEIVED DATE : 10-Jul-23  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
S/N : E405.0946  
CALIBRATION DATE : 10-Jul-23  
RELATIVE HUMIDITY : 51 %RH ± 10 % RH

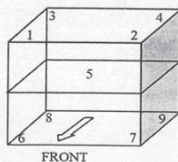
#### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TIAS G-20 BY COMPARISON WITH CALIBRATED RTD P100 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 : 7301307 : 22T7508 : 10-Aug-23  
THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.  
THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
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



FRONT

#### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 1

Overall Line Voltage (V) variation : 3

Instrument Condition : Normal

Chamber Size (W\*L\*H) : 40\*33\*40 cm

#### CHAMBER PERFORMANCE

Calibrate Point (°C)	Average All Location (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
44.0	43.96	0.06	0.54	0.71
55.0	55.00	0.05	0.58	0.79
58.0	57.96	0.06	0.69	0.81

#### TEMPERATURE MEASUREMENT ACCURACY TEST

Temperature Measurement Uncertainty 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	43.72	43.78	43.73	43.75	44.22	43.86	44.17	44.06	44.34	0.36
54.5	54.5	54.75	54.78	54.76	54.75	55.30	54.83	55.27	55.07	55.47	0.36
57.5	57.5	57.67	57.74	57.62	57.67	58.28	57.86	58.28	58.11	58.38	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

F-G010 REV : 03

ภาคผนวก ข - 2



### Metrology

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhohi, Saraburi 18110, Thailand.

Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100

Bangkok Tel : +668 9205 6851, +669 8247 2360

Website : www.scieco.co.th E-Mail : calibrate@scg.com



Certificate No. T240070

Page 1 of 4

### Certificate of Calibration

Equipment : Chamber ( Cooling Room )  
Manufacturer : -  
Model : -  
Serial No. : -  
Customer Code : EQL-167  
ID No. : T1447A1  
Customer : Test Tech Co.,Ltd  
30, 32 Rama II Soi 63, Rama II Rd., Samaedam,  
Bangkhunthian Bangkok 10150  
Customer Location : LABORATORY FLOOR 3  
Date of Receipt : 12 January 2024  
Calibrated By : Sujjar Naknakred ( Site Calibration Manager )  
Approved By : Boonchai Suriyawong (Site Calibration Manager)  
Date of Issue : 24 JAN 2024

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 standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology

FM-L14 [19/18-08-66



## Calibration Report

Equipment : Chamber ( Cooling Room )  
Date of Calibration : 16 January 2024  
Environment : Temperature : 19.4-24.1 °C  
Line Voltage : 221.3-226.1 V  
Relative Humidity : 55 - 65 %RH

## Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001 ) and AS2853-1986 ).

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

## 2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T230773	10 April 2024
TC	TYPE T	TN161-TN170	T230773	10 April 2024
DATA LOGGER	34970A	T149	T230773	10 April 2024

## 3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244 )

## 4. Condition of calibrated item : good

## Equipment Description :

Time Constant : Hour 37 Minute At 3 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

## 5. Adjustment :

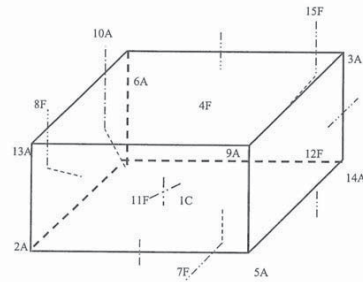
( ) without adjustment

( X ) after adjustment

Approved By: \_\_\_\_\_

FM-L15 I18/18-08-66

## Calibration Report



C = Centre , F = Centre of Face , A = Corner , E = Centre of Edge

1C =	TN161	11F =	TN161
2A =	TN162	12F =	TN162
3A =	TN163	13A =	TN163
4F =	TN164	14A =	TN164
5A =	TN165	15F =	TN165
6A =	TN166		
7F =	TN167		
8F =	TN168		
9A =	TN169		
10A =	TN170		

Approved By: \_\_\_\_\_

FM-L15 I18/18-08-66

## Calibration Report

## Measurement Results:

Calibration Point	Average Standard Reading at each position ( °C )								
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169
3	3.17	3.11	3.11	3.33	2.94	3.06	2.95	3.17	2.86
	TN161	TN162	TN163	TN164	TN165				
	2.74	2.95	2.75	2.95	2.85				

Chamber ( Cooling Room )			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min , Max	Average					
3.0	2.9 , 3.1	3.0	2.97	0.29	0.64	0.80	2.00

\* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By: \_\_\_\_\_

FM-L15 I18/18-08-66

ภาคผนวก ข - 3



## QUALITY CALIBRATION CO.,LTD.

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www.qcalibration.com



CERTIFICATE No : 23T8798  
REFERENCE No : 70515-6

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,  
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHACHARN CH.  
CALIBRATION DATE : 11-Sep-23

APPROVED BY : PONGSAK J.  
ISSUED DATE : 15-Sep-23  
RECEIVED DATE : 11-Sep-23

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



CERTIFICATE No : 23T8798

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### Calibration Report

EQUIPMENT : HOT AIR OVEN  
MANUFACTURER : MEMMERT  
MODEL : UFE 500  
ID No : EQL-128  
RECEIVED DATE : 11-Sep-23  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
S/N : G508.0791  
CALIBRATION DATE : 11-Sep-23  
RELATIVE HUMIDITY : 51 %RH ± 10 %RH

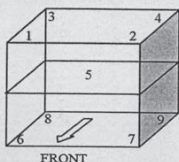
#### CONDITION OF THIS RESULTS OF CALIBRATION

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 MODEL SERIAL No CERTIFICATE No DUE DATE  
1) DATA LOGGER WITH RTD HYDRA 2635A 7301307 23T6636 10-Jul-24  
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 : 10

Instrument Condition : Normal

Chamber Size (W\*L\*H): 56\*40\*48 cm

#### CHAMBER PERFORMANCE

Calibrate Point (°C)	Average All Position Temp. (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	104.49	0.28	0.66	0.93
180.0	180.25	0.32	0.62	1.11

#### 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	104.46	104.13	104.45	104.28	104.57	104.67	104.60	104.58	104.67	0.38
180.0	180.0	180.27	179.85	180.41	179.93	180.19	180.54	180.41	180.51	180.13	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

F-G010 REV : 03



### Certificate of Calibration

Certificate No. : 23H2216  
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer  
Manufacturer : Barigo  
Model : -  
Serial No. : -  
ID No. : EQL-064  
Condition As-Received: Used Item  
Received Date: 12 October 2023  
Calibration Date: 17 October 2023  
Reference: 2310-0447DN  
Ambient Temperature: ( 25 ± 3 ) °C  
Relative Humidity: ( 50 ± 20 ) %  
Submitted by: TEST TECH CO.,LTD. (HEAD Office)  
30, 32 Rama II Soi 63, Rama II Rd.,  
Samaedam, Bangkokthian, Bangkok 10150

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

#### Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Handheld Thermometer With Sensor	1523	3240076	231305	15 Mar 2024
2) Dew Point Hygrometer	Optidew 401	164756	TH-0158-22	13 Dec 2023

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

3. This Certification is traceable to the International System of Unit maintained through:-

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Surasit Phansudnoi  
Issue Date : 26 October 2023

Approved Signatory :

[ ] Chakrit Waewwanjua  
[ ] Pornthippa Tameyakul  
[✓] Viporn Tantiyawutti

B 0327545



Cert. No.: 23H2216  
Page: 2 of 2

Result of Calibration:- Without Adjustment  
Function: Humidity Measurement

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	30.1	30.0	-0.1	1.5
25.0	40.1	39.0	-1.1	1.5
25.0	50.1	49.0	-1.1	1.7
25.0	60.0	59.0	-1.0	1.7
25.0	75.2	75.5	0.3	1.8

Result of Calibration:- Without Adjustment  
Function: Temperature Measurement

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
15.046	15.0	-0.046	0.72
19.975	20.0	0.025	0.72
25.022	25.0	-0.022	0.72
30.000	30.0	0.000	0.72

UUC\* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor k = 2.00, providing confidence level approximately 95%.

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### Certificate of Calibration

Certificate No. : 24M150  
Page : 1 of 2

Equipment : Standard Weight  
Manufacturer : LS  
Model : -  
Serial No. : -  
ID No. : EQL-121  
Condition As-Received: Used Item  
Received Date: 18 January 2024  
Calibration Date: 26 January 2024  
Reference: 2401-0593DN  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 10 ) %  
Atmospheric Pressure: 1017.0 hPa  
Submitted by: TEST TECH CO.,LTD. (Head Office)  
30, 32 Rama II Soi 63, Rama II Rd.,  
Samaedam, Bangkokthian, Bangkok 10150

Procedure used: Calibration were conducted using calibration procedure CP-M06 according to OIML R111-1 Edition 2004 (E).

#### Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard weight Set (E2)	YCS31-712-00	50202965	MM-0109-22	11 Jul 2024

2. This certificate is not certified for any commercial transaction.

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

4. This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suwat Wuthichareonmongkol  
Issue Date : 29 January 2024

Approved Signatory :

[ ] Phalinee Prapapal  
[✓] Sura Suwannasri  
[ ] Sorapong Koomkainam

a 1185882 ภาคผนวก ข - 4

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Cert No.: 24M150  
Page: 2 of 2

#### Result of calibration

Without adjustment

Nominal Value	Marking	Conventional mass	Uncertainty of Measurement ( $\pm$ )	Maximum Permissible error ( $\pm$ )
50 g	None	50.00001 g	0.10 mg	0.30 mg

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

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S. Sun

a 1200285



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2719-9484



#### Certificate of Calibration

Certificate No.: 24M151  
Page: 1 of 2

Equipment: Standard Weight

Manufacturer: -

Model: -

Serial No.: -

ID No.: EQL-258

Condition As-Received: Used Item

Received Date: 18 January 2024

Calibration Date: 26 January 2024

Reference: 2401-0593DN

Ambient Temperature: ( $23 \pm 2$ ) °C

Relative Humidity: ( $50 \pm 10$ ) %

Atmospheric Pressure: 1016.7 hPa

Submitted by: TEST TECH CO.,LTD. (Head Office)

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

Procedure used: Calibration were conducted using calibration procedure CP-M06 according to OIML R111-1 Edition 2004 (E).

#### Condition of this result of calibration

1.Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard weight Set (E2)	YCS31-712-00	50202965	MM-0109-22	11 Jul 2024
2) This certificate is not certified for any commercial transaction.				
3) The certificate is valid only to the item calibrated on date and place of calibration.				
4) This Certification is traceable to the International System of Unit maintained through:- -National Institute of Metrology Thailand (NIMT)				

Calibrated by: Suwat Wuthicharoenmongkol  
Issue Date: 29 January 2024

Approved Signatory:   
[ ] Phalinee Prabpaipal  
[x] Sure Suwannasri  
[ ] Sorapong Koomkainam

B 0333472



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
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TEL. 0-2717-3000-24 FAX. 0-2719-9484



#### Certificate of Calibration

Certificate No.: 23M1557  
Page: 1 of 2

Equipment: Standard Weight

Manufacturer: -

Model: -

Serial No.: M 0030/11

ID No.: EQL-139

Condition As-Received: Used Item

Received Date: 10 August 2023

Calibration Date: 17 August 2023

Reference: 2308-0284DN

Ambient Temperature: ( $23 \pm 2$ ) °C

Relative Humidity: ( $50 \pm 15$ ) %

Atmospheric Pressure: 1006.2 hPa

Submitted by: TEST TECH CO.,LTD. (HEAD Office)

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

Procedure used: Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method against standard weights on the basis of weighings at an average air density of 1.2 kg/m<sup>3</sup> and a temperature of 23.7 °C material density of weight is 8000 kg/m<sup>3</sup>.

#### Condition of this result of calibration

1.Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Weight Set (E2)	73336	20026	MM-0018-22	28 Feb 2024

2.This certificate is not certified for any commercial transaction.

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

4.This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Thapakorn Thammachai  
Issue Date: 17 August 2023

Approved Signatory:   
[ ] Phalinee Prabpaipal  
[x] Sure Suwannasri  
[ ] Sorapong Koomkainam

ภาคผนวก ข - 5



Cert No.: 23M1557  
Page: 2 of 2

#### Result of calibration

Without adjustment

Nominal Value	Conventional mass	Uncertainty of Measurement ( $\pm$ )	Maximum Permissible error ( $\pm$ )
2 g	2.000018 g	0.040 mg	0.12 mg

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

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S. Sun

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## Certificate of Calibration

Certificate No.: 23M1558  
Page: 1 of 2

Equipment: Standard Weight  
Manufacturer: Mettler Toledo  
Model: -  
Serial No.: 11119459  
ID No.: EQL-149

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except with the prior written approval of the head of  
Corporate Services 3: Equipment Calibration and Testing Services.

Condition As-Received: Used Item  
Received Date: 10 August 2023  
Calibration Date: 17 August 2023

Reference: 2308-0284DN Submitted by: TEST TECH CO.,LTD. (HEAD Office)  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Atmospheric Pressure: 1005.75 hPa

Procedure used: Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method against standard weights on the basis of weighings at an average air density of 1.2 kg/m³ and a temperature of 23.7 °C material density of weight is 8000 kg/m³.

### Condition of this result of calibration

#### 1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Weight Set (E2)	73336	20026	MM-0018-22	28 Feb 2024

2. This certificate is not certified for any commercial transaction.

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

4. This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Thapakorn Thammachai  
Issue Date: 17 August 2023

Approved Signatory:

[ ] Phalinee Prabpaipal  
[x] Sura Suwannasri  
[ ] Sorapong Koomkainam

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Cert No.: 23M1558  
Page: 2 of 2

### Result of calibration

Without adjustment

Nominal Value	Conventional mass	Uncertainty of Measurement (±)	Maximum Permissible error (±)
20 g	20.000008 g	0.080 mg	0.25 mg

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

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## Certificate of Calibration

Certificate No.: 24T680  
Page: 1 of 2

Equipment: Digital Thermometer With Sensor  
Manufacturer: Testo  
Model: 926  
Serial No.: 5609260110250914  
ID No.: EQL-058

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.

Condition As-Received: Used Item  
Received Date: 04 April 2024  
Calibration Date: 11 April 2024  
to 22 April 2024

Reference: 2404-0204DN Submitted by: TEST TECH CO.,LTD. (Head Office)  
Ambient Temperature: ( 25 ± 3 ) °C  
Relative Humidity: ( 50 ± 20 ) %

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

Procedure used: Calibration were conducted using in-house calibration procedure CP-T01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into liquid bath temperature controller. The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Black Stack Thermometer	1560	8C454	231600	30 May 2024
2) PRT Scanner Module	2562	A01303	231600	30 May 2024
3) Industrial Platinum Resistance Thermometer	5627	739433	231600	30 May 2024
4) Industrial PRT Probe	5627A	979442	231600	30 May 2024

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

3. This Certification is traceable to the International System of Unit maintained through:-

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by: Anuchit Pangchata  
Issue Date: 24 April 2024

Approved Signatory:

[ ] Phalinee Prabpaipal  
[ ] Chatchawan Khunpluek  
[x] Wanlop Larphern

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## Certificate of Calibration

Certificate No.: 23T475  
Page: 1 of 2

Equipment: Digital Thermometer With Sensor  
Manufacturer: Testo  
Model: 926  
Serial No.: 33824123/004  
ID No.: EQL-138

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.

Condition As-Received: Used Item  
Received Date: 09 March 2023  
Calibration Date: 20 March 2023  
to 22 March 2023

Reference: 2303-0314DN Submitted by: TEST TECH CO.,LTD. (HEAD Office)  
Ambient Temperature: ( 25 ± 3 ) °C  
Relative Humidity: ( 50 ± 20 ) %

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

Procedure used: Calibration were conducted using in-house calibration procedure CP-T01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into liquid bath temperature controller. The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Thermometer	1529	A7A609	221274	17 Oct 2023
2) Industrial Platinum Resistance Thermometer	5627-12	571970	221274	17 Oct 2023
3) Industrial Platinum Resistance Thermometer	5627	824304	221274	17 Oct 2023

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

3. This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Sataporn Mulkammee  
Issue Date: 23 March 2023

Approved Signatory:

[ ] Phalinee Prabpaipal  
[ ] Chatchawan Khunpluek  
[x] Wanlop Larphern

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Cert. No.: 23T475  
Page.: 2 of 2

**Result of Calibration:-**

Without Adjustment

**Function:**

Temperature measurement

This equipment was connected with Thermocouple Type T ID No. EQL-138

Immersion Depth (mm.)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
150	2.9962	2.6	-0.3962	0.24
150	35.0051	34.8	-0.2051	0.24
150	36.0061	35.8	-0.2061	0.24
150	36.9974	36.8	-0.1974	0.24
150	41.5051	41.4	-0.1051	0.24
150	43.9973	43.9	-0.0973	0.24
150	55.0047	55.0	-0.0047	0.25
150	169.9960	170.4	0.4040	0.55

UUC\* : Unit Under Calibration

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

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QUALITY CALIBRATION CO., LTD.

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



CERTIFICATE No : 23T7717  
REFERENCE No : 70152-1

PAGE : 1 OF 2

**Certificate of Calibration**

EQUIPMENT : LIQUID IN GLASS THERMOMETER

MANUFACTURER : PRECISION

MODEL : N/A

SERIAL No : 8925

ID No : EQL-103

RESOLUTION : 0.1 °C

TYPE : TOTAL IMMERSION

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 : CHARUKIT L.

CALIBRATION DATE : 15-Aug-23

APPROVED BY : PONGSAK J.

ISSUED DATE : 15-Aug-23

RECEIVED DATE : 08-Aug-23

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



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

CERTIFICATE No : 23T7717

PAGE : 2 OF 2

**Calibration Report**

EQUIPMENT : LIQUID IN GLASS THERMOMETER  
MANUFACTURER : PRECISION  
MODEL : N/A  
ID No : EQL-103  
RESOLUTION : 0.1 °C  
RECEIVED DATE : 08-Aug-23  
AMBIENT TEMPERATURE : 23 °C ± 3 °C  
SERIAL NUMBER : 8925  
TYPE : TOTAL IMMERSION  
CALIBRATION DATE : 15-Aug-23  
RELATIVE HUMIDITY : 50 % RH ± 20 % RH

**CONDITION OF THIS RESULTS OF CALIBRATION**

1. THIS INSTRUMENT WAS CALIBRATED BASED ON ASTM E77:1992 BY COMPARISON WITH STANDARD PLATINUM RESISTANCE THERMOMETER (SPRT) INTO LIQUID BATH TEMPERATURE CONTROLLER. THE TEMPERATURE SCALE USED WAS BASED ON ITS-90.

**REFERENCE STANDARD INSTRUMENTS :-**

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD THERMOMETER	1502	77964	23T3927	08-Mar-24
2) SPRT PROBE	5614	636626	23T3927	08-Mar-24
3) PRECISION BATH	7320	A21105	22T13199	14-Dec-23
4) PRECISION BATH	CTR-40	A68155	22T13198	09-Dec-23

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**

STANDARD READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	EMERGENT STEM TEMPERATURE (°C)	UNCERTAINTY OF MEASUREMENT (±°C)
20.013	20.0	140	0.013	N/A	0.10
25.010	25.0	160	0.010	N/A	0.10
41.508	41.5	230	0.008	N/A	0.10
44.505	44.5	240	0.005	N/A	0.10
45.003	45.0	245	0.003	N/A	0.10
49.999	50.0	265	-0.001	N/A	0.10

UUC\* : UNIT UNDER CALIBRATION

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

F-G010 REV 03



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2719-9484



**Certificate of Calibration**

Certificate No. : 23H2216

Page : 1 of 2

Equipment : Dial Thermo-Hygrometer

Manufacturer : Barigo

Model : -

Serial No. : -

ID No. : EQL-064

Condition As-Received: Used Item

Received Date: 12 October 2023

Calibration Date: 17 October 2023

Reference: 2310-0447DN

Ambient Temperature: ( 25 ± 3 ) °C

Relative Humidity: ( 50 ± 20 ) %

Submitted by: TEST TECH CO., LTD. (HEAD Office)

30, 32 Rama II Soi 63, Rama II Rd.,

Samaedam, Bangkhunthian, Bangkok 10150

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

**Condition of this result of calibration**

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Handheld Thermometer With Sensor	1523	3240076	231305	15 Mar 2024
2) Dew Point Hygrometer	Optidew 401	164756	TH-0158-22	13 Dec 2023

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

3. This Certification is traceable to the International System of Unit maintained through:-

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Surasit Phansudnoi  
Issue Date : 26 October 2023

Approved Signatory :

[ ] Chakrit Waewwanjua  
[ ] Pormthippa Tameyakul  
[✓] Viporn Tantiyawutti

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Cert. No.: 23H2216  
Page: 2 of 2

Result of Calibration:- Without Adjustment  
Function: Humidity Measurement

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	30.1	30.0	-0.1	1.5
25.0	40.1	39.0	-1.1	1.5
25.0	50.1	49.0	-1.1	1.7
25.0	60.0	59.0	-1.0	1.7
25.0	75.2	75.5	0.3	1.8

Result of Calibration:- Without Adjustment  
Function: Temperature Measurement

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
15.046	15.0	-0.046	0.72
19.975	20.0	0.025	0.72
25.022	25.0	-0.022	0.72
30.000	30.0	0.000	0.72

UUC\* : Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor  $k = 2.00$ , providing confidence level approximately 95%.

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



CERTIFICATE No : 23T7718  
REFERENCE No : 70152-2

PAGE : 1 OF 2

### Certificate of Calibration

EQUIPMENT : LIQUID IN GLASS THERMOMETER  
MANUFACTURER : PRECISION  
MODEL : G13004  
SERIAL No : N/A  
No : EQL-111  
RESOLUTION : 1 °C  
TYPE : TOTAL IMMERSION  
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 : CHARUKIT L.  
CALIBRATION DATE : 15-Aug-23  
APPROVED BY : PONGSAK J.  
ISSUED DATE : 15-Aug-23  
RECEIVED DATE : 08-Aug-23

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



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

CERTIFICATE No : 23T7718

PAGE : 2 OF 2

### Calibration Report

EQUIPMENT : LIQUID IN GLASS THERMOMETER  
MANUFACTURER : PRECISION  
MODEL : G13004  
ID No : EQL-111  
RESOLUTION : 1 °C  
RECEIVED DATE : 08-Aug-23  
AMBIENT TEMPERATURE : 23 °C ± 3 °C  
SERIAL NUMBER : N/A  
TYPE : TOTAL IMMERSION  
CALIBRATION DATE : 15-Aug-23  
RELATIVE HUMIDITY : 50 %RH ± 20 %RH

#### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON ASTM E77-1992 BY COMPARISON WITH STANDARD PLATINUM RESISTANCE THERMOMETER (SPRT) INTO LIQUID BATH TEMPERATURE CONTROLLER. THE TEMPERATURE SCALE USED WAS BASED ON ITS-90.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD THERMOMETER	1502	77964	23T3927	08-Mar-24
2) SPRT PROBE	5614	636626	23T3927	08-Mar-24
3) PRECISION BATH	7320	A21105	22T13199	14-Dec-23

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

STANDARD READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	EMERGENT STEM TEMPERATURE (°C)	UNCERTAINTY OF MEASUREMENT (±°C)
115.013	115.0	120	0.013	N/A	0.15
120.998	121.0	124	-0.002	N/A	0.15

UUC\* : UNIT UNDER CALIBRATION

5. 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

F-G010 REV 03

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