

เอกสารแนบ 6

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 (mL)	Reading (mL)	Std.dev	Uncertainty (± mL)	k Factor
5	5.0196	0.00120	0.0059	2.00
15	15.0159	0.00118	0.0065	2.00

Remark mL = cm³

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 %.

-oOo-

Certificate of Calibration

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

Equipment : Auto Burette

Capacity : 25 mL

Serial No. : -

ID. No. : 6210BU25/01

Manufacturer : EM

Made in : 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 :

Approved by :

(✓)
()
()
()



Approved Signatory

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)	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 AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTI 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

- 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.
- REFERENCE STANDARD INSTRUMENTS :-
 - 1) DATA LOGGER WITH TC TYPE K HYDRA 2635A 2515347 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.

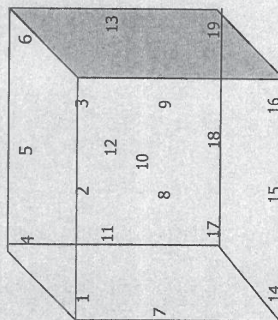
RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

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

CHAMBER PERFORMANCE

Calibration Point (°C)	Average All Located (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
20.0	20.12	0.06	0.46	0.51



FRONT

END OF CALIBRATION REPORT PAGE 2 OF 3



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 : 25T8232
REFERENCE No : 78147-2

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

CALIBRATED BY : 
CALIBRATION DATE : 11-Aug-25

APPROVED BY : 
ISSUED DATE : 14-Aug-25
RECEIVED DATE : 11-Aug-25



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

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

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: [Redacted]
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

Person in charge [Redacted]
Authorized signatory [Redacted]

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

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with 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, Prachinong, Bangkok 10260
Phone: +66 2059 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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 $\pm$ 1mbar : 23-Jun-25
AMBIENT TEMPERATURE : 26°C $\pm$ 1°C : 40 %RH $\pm$ 10 % RH
RELATIVE HUMIDITY : 40 %RH $\pm$ 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 C02250116 28-Jan-27
2) STANDARD WEIGHT E2 15843 C02250117 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.

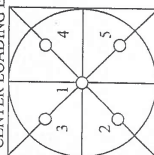
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

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 ($\pm$ 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 AREA. 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



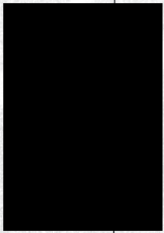
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CERTIFICATE No : 25T8754
REFERENCE No : 78325-5

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 : 26-Aug-25
APPROVED BY : 
ISSUED DATE : 28-Aug-25
RECEIVED DATE : 26-Aug-25



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

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.

Avg Room Temp : 20 °C
Avg Water Temp : 20 °C
Air Pressure : 760.00 mmHg
Salinity : 0 ppt

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)	9.09	(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.



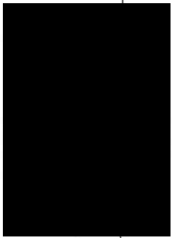
CERTIFICATE No : 25T8453
REFERENCE No : 78325-4

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 : 26-Aug-25

APPROVED BY : 
ISSUED DATE : 28-Aug-25
RECEIVED DATE : 26-Aug-25



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.

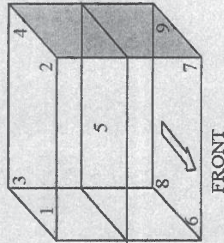
REFERENCE STANDARD INSTRUMENTS :-

- 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	#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 : 23-Jun-25

APPROVED BY : 
ISSUED DATE : 24-Jun-25
RECEIVED DATE : 23-Jun-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



CERTIFICATE No : 25T8453

PAGE : 2 OF 2

Calibration Report

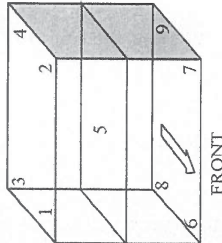
EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UFE 500
ID No : EQL-128
RECEIVED DATE : 26-Aug-25
AMBIENT TEMPERATURE : 25 °C ± 1 °C
S/N : G508.0791
CALIBRATION DATE : 26-Aug-25
RELATIVE HUMIDITY : 53 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

- 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 : 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



F-G010 REV : 03



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

- 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 :-

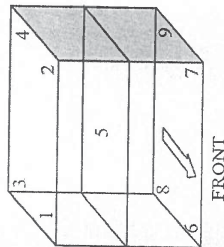
INSTRUMENT

1) DATA LOGGER WITH RTD
2) THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
3. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
4. 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 MULTIPLYING COVERAGE FACTOR k = 2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



F-C



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: [Redacted]
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

Person in charge

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

The measurement uncertainty stated is the expanded uncertainty 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.

Authorized signatory

Authorized signatory

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Prachinong, 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

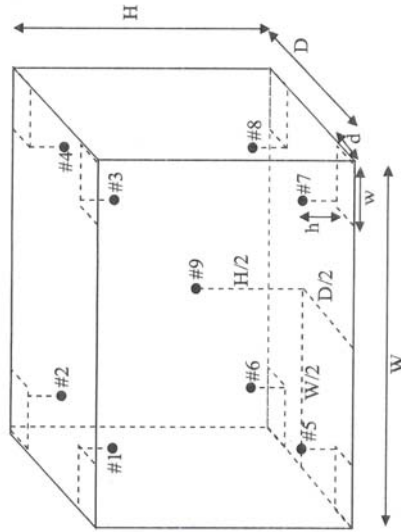
Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °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 (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °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 (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °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 TLAS 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 :-

INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE
1) DATA LOGGER WITH RTD HYDRA 2635A 6635300 24T6468 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.

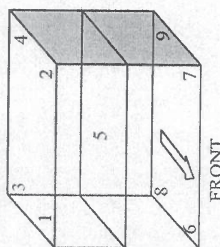
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- 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 : 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 : [REDACTED]

CALIBRATION DATE : 23-Jun-25

APPROVED BY : [REDACTED]

ISSUED DATE : 24-Jun-25

RECEIVED DATE : 23-Jun-25



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/ 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 $k = 2.303 \text{ RT/F} = 59 \text{ mV/pH}$

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR 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 BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	UNCERTAINTY OF MEASUREMENT (± pH)	COVERAGE FACTOR 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 READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	UNCERTAINTY OF MEASUREMENT (±°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 MULTIPLIED
FACTOR k, 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.



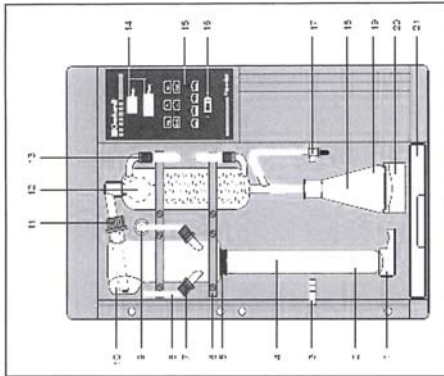
- Part 1: สัญญาการให้บริการ (Service Contact)
Part 2: ข้อมูลพื้นฐานของเครื่องมือ (Details of Instrument)
Part 3: ตรวจสอบเช็คสภาพเครื่อง
Part 4: รายละเอียดและรายงานผลการให้บริการ Preventive Maintenance
4.1 ขั้นตอนการบริการ
4.2 รายงานผลการให้บริการ
Part 5: ข้อมูลสนับสนุนด้านเทคนิค (General Technical Support)
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	☒	☐	☐
2.	Kjeldatherm digestion tube	☒	☐	☐
3.	Holder for steam inlet tubing	☒	☐	☐
4.	PTFP-Inlet tubing, steam	☒	☐	☐
5.	Viton-cone	☒	☐	☐
6.	Clamping for glassware	☒	☐	☐
7.	Screw cap GL18 with silicone seal	☒	☐	☐
8.	PTFP-Inlet tubing, NaOH	☒	☐	☐
9.	PP-Distributor with PP-threaded joint	☒	☐	☐
10.	Distribution head, glass	☒	☐	☐
11.	Screw cap GL32 with silicone seal	☒	☐	☐
12.	Distillation condenser	☒	☐	☐
13.	Screw cap GL14 with plastic screw connection	☒	☐	☐
14.	Display	☒	☐	☐
15.	Keyboard, chemical-resistant	☒	☐	☐
16.	Main switch, green	☒	☐	☐
17.	Ventilation valve	☒	☐	☐
18.	Distillate outlet tubing	☒	☐	☐
19.	Erlenmeyer flask	☒	☐	☐
20.	Platform	☒	☐	☐
21.	Drip tray	☒	☐	☐

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 :	lab_center@testtech.co.th

สัญญาการบริการจำนวน 1 ครั้ง ต่อ ปี

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
หมายเลขครุภัณฑ์ :	EQL-062

2.2 ผู้ดำเนินการ

ดำเนินการทำ PM โดย

ชื่อ-นามสกุล :	
ตำแหน่ง :	วิศวกร
แผนก :	บริการหลังการขาย
ฝ่าย :	บริการหลังการขาย



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

	PASS	FAIL	Remark
	☒	☐	
	☒	☐	
	PASS	FAIL	Remark
	☒	☐	
	☒	☐	
	☒	☐	
	☒	☐	
	☒	☐	
	☒	☐	
	☒	☐	

ตรวจสอบ Function การทำงาน (The Function Test)

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

	PASS	FAIL	Remark
	☒	☐	
	☒	☐	
	☒	☐	
	☒	☐	

4.2 รายงานผลการให้บริการ

1. TECHNICAL DATA

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

	PASS	FAIL	Remark
	☒	☐	
	☒	☐	

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

	PASS	FAIL	Remark
	☒	☐	
	☒	☐	
	☒	☐	
	☒	☐	
	☒	☐	
	☒	☐	
	☒	☐	
	☒	☐	
	☒	☐	
	☒	☐	

2. SYSTEM COOLING WATER INLET

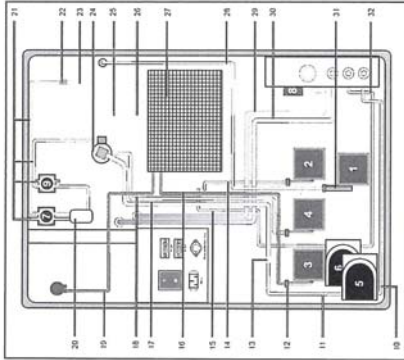
Cooling Water Inlet

Cooling Water Outlet

Flow control valve

	PASS	FAIL	Remark
	☒	☐	
	☒	☐	
	☒	☐	

REAR



No Description

No	Description	PASS	FAIL	N/A
1.	Diaphragm pump NaOH	☒	☐	☐
2.	Diaphragm pump H ₃ BO ₃	☒	☐	☒ *Vap40
3.	Diaphragm pump H ₂ O for steam generator	☒	☐	☐
4.	Diaphragm pump H ₂ O for sample	☒	☐	☒ *Vap30,40
5.	Peristaltic pump for suction sample	☒	☐	☒ *Vap30, 40
6.	Peristaltic pump for suction receiver	☒	☐	☒ Option
7.	Pinch-solenoid valve, steam	☒	☐	☐
8.	Magnetic valve with pressure control	☒	☐	☐
9.	Pinch-solenoid valve, shut-off	☒	☐	☐
10.	Verprene-tubing 4x8 mm.	☒	☐	☐
11.	Verprene-tubing 4x7 mm.	☒	☐	☒ *Vap30,40
12.	Non-return valve for diaphragm pumps	☒	☐	☐
13.	Tubing reduction PP 51x10x5 mm.	☒	☐	☒ *Vap30,40
14.	Silicone tubing 4x7 mm.	☐	☐	☒ *Vap40
15.	Silicone tubing 4x7 mm.	☐	☐	☒ Option
16.	Silicone -tubing 4x7 mm.	☒	☐	☐
17.	Verprene-tubing 8x12 mm.	☒	☐	☒ *Vap30,40
18.	Verprene tubing 4x7 mm.	☒	☐	☒ *Vap30,40
19.	Silicone tubing 4x7 mm.	☒	☐	☐
20.	Ventilation glass	☒	☐	☐
21.	Novoprene-tubing 4.8x8 mm.	☒	☐	☐
22.	Tubing reduction	☒	☐	☐
23.	Silicone tubing 6x10 mm.	☒	☐	☐
24.	PP-distributor with PP-thread	☒	☐	☐
25.	SKT-valve (built in with brass fitting)	☒	☐	☐
26.	Silicone tubing 8x16x80 mm.	☒	☐	☐
27.	Steam generator	☒	☐	☐
28.	PTFE-inlet tubing NaOH	☒	☐	☐
29.	Silicone tubing 8x16 for cooling water inlet	☒	☐	☐
30.	Silicone tubing 8x16 for cooling water outlet	☒	☐	☐
31.	Viton-tubing 6x12*50 mm.	☒	☐	☐
32.	Silicone tubing 4x7 mm.	☐	☐	☒ 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	PASS	FAIL	Remark
Key Board	☒	☐	
Display	☒	☐	
Program	☒	☐	
Adding H_2O	☒	☐	*Vap30,40
Adding NaOH	☒	☐	
Adding H_3BO_3	☐	☐	*Vap40
Suction Sample	☒	☐	*Vap30,40
4. SYSTEM DISTILLATION	PASS	FAIL	Remark
Boiler	☒	☐	
Level Sensor	☒	☐	
Neoprene-Tubing	☒	☐	
Solenoid Valve Shut-Off	☒	☐	
Solenoid Valve Stream	☒	☐	
Excess Pressure Detector	☒	☐	
Ventilation Valve	☒	☐	
Heater	☒	☐	
5. PUMPS	PASS	FAIL	Remark
Pump H_2O Steam	☒	☐	
- Non-Return Valve			
Pump H_2O Sample	☒	☐	
- Non-Return Valve			
Pump NaOH	☒	☐	
- Non-Return Valve			
Pump H_3BO_3	☐	☐	N/A
- Non-Return Valve	☒	☐	
Pump suction			
6. THE FOLLOWING PROGRAM RUN	PASS	FAIL	Remark
Addition H_2O 0-99 sec.	☒	☐	
Addition NaOH 0-99 sec.	☒	☐	
Addition H_3BO_3 0-99 sec.	☐	☐	N/A
Reaction Time 0-99 min	☒	☐	
Distillation Time 0-99 min	☒	☐	
Steam Capacity 30%-100%	☒	☐	
Suction Time 0-99 sec.	☒	☐	
The Instrument is in perfect technical shape	☒	☐	

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

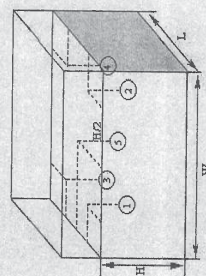
CONDITION OF THIS RESULTS OF CALIBRATION

- 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)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
	#1	#2	#3	#4	Ref. 5	
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

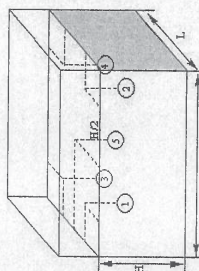
CONDITION OF THIS RESULTS OF CALIBRATION

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 |
|-------|-----------|----------------|-----------|
| 2625A | 6603614 | 25T5341 | 04-Jun-26 |
- 1) DATA LOGGER WITH RTD
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



CERTIFICATE No : 25T6062
REFERENCE No : 77516-2

Certificate of Calibration

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
MODEL : WPE 45
SERIAL No : L711.0024
ID No : EQL-147
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 : 23-Jun-25

APPROVED BY :
ISSUED DATE : 24-Jun-25
RECEIVED DATE : 23-Jun-25

