



Certificate No.: C01232449

Page: 2 of 2

#### Calibration Results:

##### Without Adjustment

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

	Nominal Test Value				
	A	B	C	D	E
	-	0.0000	0.0000	-0.0001	-0.0001

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00004
200	0.00005

Error of Indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.001	0.00100	0.0010	0.0000	0.00010	2.03
0.01	0.01000	0.0100	0.0000	0.00010	2.03
0.1	0.10001	0.1000	0.0000	0.00010	2.03
0.5	0.50000	0.5000	0.0000	0.00010	2.03
1	1.00001	1.0000	0.0000	0.00010	2.03
2	2.00002	2.0000	0.0000	0.00010	2.03
5	5.00002	5.0000	0.0000	0.00011	2.03
10	10.00002	10.0000	0.0000	0.00011	2.03
20	20.00000	20.0000	0.0000	0.00011	2.02
25	25.00003	25.0000	0.0000	0.00012	2.02
50	49.99996	50.0000	0.0000	0.00013	2.01
100	100.00002	100.0000	0.0000	0.00017	2.00
120	120.00002	120.0000	0.0000	0.00021	2.00
150	149.99998	150.0000	0.0000	0.00023	2.00
200	200.00004	200.0000	0.0000	0.00029	2.00

บริษัท ดีเคเอส อีเซีย จำกัด  
2533 สุขุมวิท 101/1 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certification-thailand

#### The End of Certificate

Delivering Growth - In Asia and Beyond.

CAL-FM-C01-14; 12 Sep 20



## Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, 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. T230022

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 : 13 January 2023

Calibrated By : ( Site Calibration Manager )

Approved By : Chai Suriyawong (Site Calibration Manager)

Date of Issue : 24 JAN 2023

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-L14118/31-08-64



**Metrological Center**  
SCI ECO Services Company Limited

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



NSC-TISI-TIS 17025  
CALIBRATION 0244

Certificate No. T230022

Page 2 of 4

## Calibration Report

**Equipment** : Chamber (Cooling Room)  
**Date of Calibration** : 18 January 2023  
**Environment** : Temperature : 25.0-27.2 °C  
Line Voltage : 221.9-227.3 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	TN141-TN150	T222123	5 October 2023
TC	TYPE T	TN151-TN160	T222123	5 October 2023
DATA LOGGER	34970A	T150	T222123	5 October 2023

### 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 2 Hour 8 Minute At 3 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

### 5. Adjustment :

( ) without adjustment ( X ) after adjustment

Approved By-



**Metrological Center**  
SCI ECO Services Company Limited

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

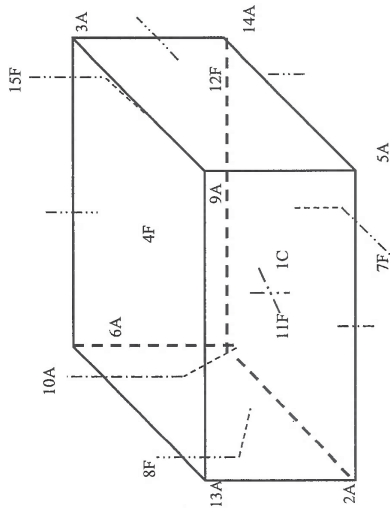


NSC-TISI-TIS 17025  
CALIBRATION 0244

Certificate No. T230022

Page 3 of 4

## Calibration Report



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

1C	=	TN141
2A	=	TN142
3A	=	TN143
4F	=	TN144
5A	=	TN145
6A	=	TN146
7F	=	TN147
8F	=	TN148
9A	=	TN149
10A	=	TN150

11F	=	TN151
12F	=	TN152
13A	=	TN153
14A	=	TN154
15F	=	TN155

Approved By-



# Calibration Report

# Certificate of Calibration

### Measurement Results:

Average Standard Reading at each position (°C)										
Calibration Point	TN141	TN142	TN143	TN144	TN145	TN146	TN147	TN148	TN149	TN150
3	2.93	2.77	2.79	2.26	3.04	3.39	2.91	3.05	3.54	2.95
	TN151	TN152	TN153	TN154	TN155					
	3.32	3.28	3.00	2.96	2.90					

Chamber (Cooling Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability ( $\pm$ °C)	Uniformity (°C)	Uncertainty ( $\pm$ °C)	Coverage Factor <i>k</i>
	Min, Max	Average					
3.0	2.9, 3.1	3.0	3.01	0.47	1.04	0.98	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 \_\_\_\_\_

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 Metrological Center.

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

น.6/24

FM-L15 I17/15-05-63

FM-L14118/31-08-64



Metrological Center  
SCI ECO Services Company Limited

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



Metrological Center  
SCI ECO Services Company Limited

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

Certificate No. T230121

Page 2 of 4

## Calibration Report

Equipment : Chamber ( Cooling Room )  
Date of Calibration : 30 January 2023  
Environment : Temperature : 25.0-27.2 °C  
Line Voltage : 221.9-227.3 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	TN141-TN150	T222123	5 October 2023
TC	TYPE T	TN151-TN160	T222123	5 October 2023
DATA LOGGER	34970A	T150	T222123	5 October 2023

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 1 Hour 30 Minute At 3 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

5. Adjustment :  
( ) without adjustment ( X ) after adjustment

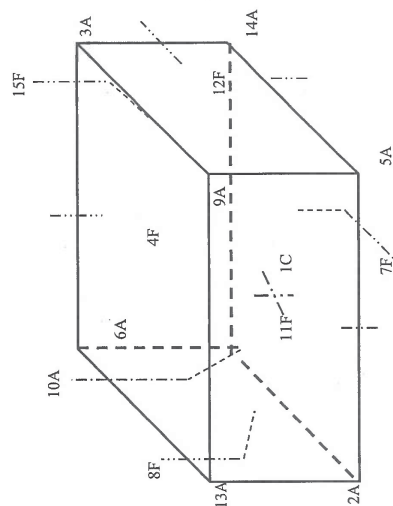
Approved By



Certificate No. T230121

Page 3 of 4

## Calibration Report



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

1C =	TN141
2A =	TN142
3A =	TN143
4F =	TN144
5A =	TN145
6A =	TN146
7F =	TN147
8F =	TN148
9A =	TN149
10A =	TN150

11F =	TN151
12F =	TN152
13A =	TN153
14A =	TN154
15F =	TN155

Approved By





Metrological Center  
SCIECO Services Company Limited

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



NSC-TISI-TIS 17025  
CALIBRATION 0244

Certificate No. T230121

Page 4 of 4

## Calibration Report

### Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)											
	TN141	TN142	TN143	TN144	TN145	TN146	TN147	TN148	TN149	TN150		
	3	2.84	2.89	3.01	3.07	3.13	3.19	3.04	2.99	3.15	2.94	
	TN151	TN152	TN153	TN154	TN155							
	2.99	2.99	3.14	2.85	2.88							

Chamber (Cooling Room)		Temperature Distribution					
		Reading (°C)		Average (°C)		Stability (± °C)	
		Min, Max	Average			Uniformity (°C)	
3.0	2.8, 3.1	3.0	3.01	0.48		0.93	
						0.99	
						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



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

FM-L15 11/7/15-05-63

u.6/26



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

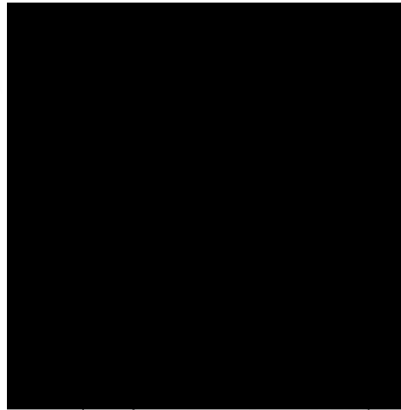


CERTIFICATE No : 23T6749  
REFERENCE No : 69853-3

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 :  
CALIBRATION DATE :  
APPROVED BY :  
ISSUED DATE : 17-Jul-23  
RECEIVED DATE : 10-Jul-23

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 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 :-

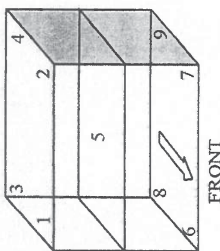
INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE  
1) DATA LOGGER WITH RTD HYDRA 2635A 7301307 22T7508 10-Aug-23  
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

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

Controller Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
	#1	#2	#3	#4	#5	#6	#7	#8	#9	
43.5	43.5	43.72	43.78	43.73	44.22	43.86	44.17	44.06	44.34	0.36
54.5	54.5	54.75	54.78	54.76	55.30	54.83	55.27	55.07	55.47	0.36
57.5	57.5	57.67	57.74	57.62	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

CERTIFICATE No : 23T1387  
REFERENCE No : 68174-5

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 110  
SERIAL No : D415.0802  
No : EQL-190  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD., SAMAEADAM,  
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY :  
CALIBRATION DATE :

APPROVED BY :

ISSUED DATE : 14-Feb-23  
RECEIVED DATE : 13-Feb-23



# 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



# 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



CERTIFICATE No : 23TI387

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 110  
ID No : EQL-190  
RECEIVED DATE : 13-Feb-23  
AMBIENT TEMPERATURE : 24 °C ± 1 °C

S/N : D415.0802  
CALIBRATION DATE : 13-Feb-23  
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

### CONDITION OF THIS RESULTS OF CALIBRATION

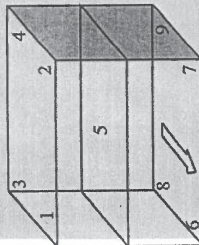
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD PH100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND 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.

### REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE  
1) DATA LOGGER WITH RTD HYDRA 2635A 6635300 22TI7509 10-Jul-23  
2) THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
3) THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

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



FRONT

### CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
37.0	37.0	37.0	36.93	0.07	0.16	0.26
44.0	44.0	44.0	44.17	0.07	0.22	0.27

### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
	#1	#2	#3	#4	#5	#6	#7	#8	#9	
37.0	36.97	36.95	36.94	36.96	36.94	36.92	36.91	36.90	36.84	0.25
44.0	44.21	44.23	44.09	44.23	44.23	44.13	44.21	44.15	44.07	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 : 23TI386  
REFERENCE No : 68174-4

## Certificate of Calibration

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
SERIAL No : D518.0082  
No : EQL-205  
CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : TEST TECH CO., LTD.  
30.32 RAMA II SOI 63, RAMA II RD., SAMAEADAM,  
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY :  
CALIBRATION DATE :

APPROVED BY :  
ISSUED DATE : 14-Feb-23  
RECEIVED DATE : 13-Feb-23



## QUALITY CALIBRATION CO.,LTD.

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Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584



## QUALITY CALIBRATION CO.,LTD.

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Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584  
www.qcalibration.com



CERTIFICATE No : 23T1386

PAGE : 2 OF 2

### Calibration Report

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
ID No : EQL-205  
RECEIVED DATE : 13-Feb-23  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
S/N : D518.0082  
CALIBRATION DATE : 13-Feb-23  
RELATIVE HUMIDITY : 50 %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 6635300 23T17509 10-Jul-23

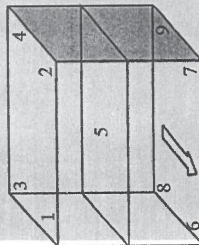
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

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



FRONT

#### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 2

Overall Line Voltage (V) variation : 9

Instrument Condition : Normal

Chamber Size (W\*H\*L) : 56\*40\*72 cm

#### CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.0	35.0	34.99	0.02	0.14	0.20
36.0	36.0	36.0	36.00	0.03	0.14	0.22
41.5	41.5	41.5	41.46	0.05	0.10	0.19

#### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
	#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
35.0	34.91	34.94	34.93	34.93	34.98	35.03	35.08	35.01	35.08	0.25
36.0	35.93	35.95	35.95	35.94	36.00	36.05	36.10	36.01	36.10	0.25
41.5	41.46	41.47	41.41	41.47	41.50	41.47	41.45	41.43	41.49	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

COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

### Certificate of Calibration

CERTIFICATE No : 23T1385  
REFERENCE No : 68174-3

EQUIPMENT : INCUBATOR

MANUFACTURER : MEMMERT

MODEL : IF 160

SERIAL No : D518.0240

Id No : EQL-218

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : TEST TECH CO., LTD.

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

CALIBRATED BY

CALIBRATION DATE

APPROVED BY

ISSUED DATE

RECEIVED DATE

14-Feb-23

13-Feb-23



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



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 : 23T1385

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
ID No : EQL-218  
RECEIVED DATE : 13-Feb-23  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
SN : D518.0240  
CALIBRATION DATE : 13-Feb-23  
RELATIVE HUMIDITY : 50 %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 6653300 22T7509 10-Jul-23  
2) THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

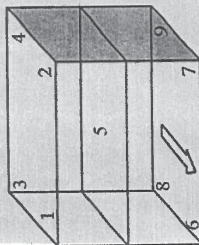
3. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

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



FRONT

CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.0	35.0	35.00	0.05	0.15	0.26
36.0	36.0	36.0	36.00	0.04	0.16	0.26

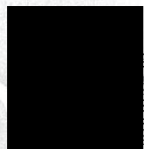
TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
	#1	#2	#3	#4	#5	#6	#7	#8	#9	
35.0	34.94	34.98	34.93	34.97	35.07	35.10	34.94	35.04	35.05	0.25
36.0	35.94	35.97	35.92	35.96	36.07	36.11	35.95	36.05	36.05	0.25

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 : 02

CERTIFICATE No : 23T1384  
REFERENCE No : 68174-2

Certificate of Calibration

EQUIPMENT : INCUBATOR

MANUFACTURER : MEMMERT

MODEL : IF 160

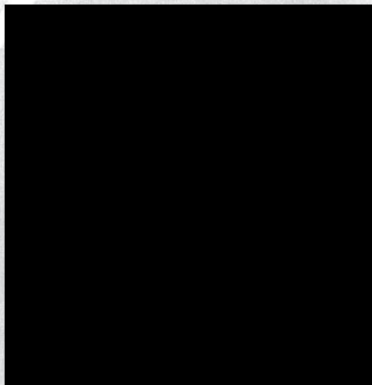
SERIAL No : D519.0140

ID No : EQL-231

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : TEST TECH CO., LTD.

30.32 RAMA II SOI 63, RAMA II RD., SAMAEADAM,  
BANGKHUNTHIAN, BANGKOK 10150



CALIBRATED BY :

CALIBRATION DATE :

APPROVED BY :

ISSUED DATE : 14-Feb-23

RECEIVED DATE : 13-Feb-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 : 02



# 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



# 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 : 23TI384

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
ID No : EQL-231  
RECEIVED DATE : 13-Feb-23  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
SN : D519.0140  
CALIBRATION DATE : 13-Feb-23  
RELATIVE HUMIDITY : 50 %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 :-

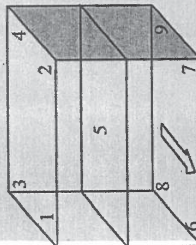
INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE  
HYDRA 2635A 6635300 22T7509 10-Jul-23  
1) DATA LOGGER WITH RTD  
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

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



FRONT

### CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.0	35.0	35.03	0.08	0.17	0.32
37.0	37.0	37.0	37.02	0.08	0.22	0.32
41.5	41.5	41.5	41.54	0.04	0.13	0.20

### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
	#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
35.0	34.92	35.02	34.99	35.01	35.04	35.03	35.06	35.09	35.10	0.25
37.0	37.00	36.99	36.95	36.95	37.00	37.02	37.09	37.11	37.11	0.25
41.5	41.52	41.51	41.47	41.49	41.54	41.53	41.62	41.58	41.56	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 M COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

## Certificate of Calibration

CERTIFICATE No : 23T8796

REFERENCE No : 70515-4

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

CALIBRATION DATE

APPROVED BY

ISSUED DATE

RECEIVED DATE

16-Aug-23

16-Aug-23

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



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

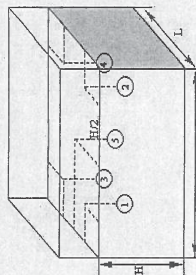
### CONDITION OF THIS RESULTS OF CALIBRATION

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 :-

- 1) DATA LOGGER WITH RTD  
MODEL 2625A SERIAL No 6603614 CERTIFICATE No 23T6642 DUE DATE 19-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



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 MULTIPLYING COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

CERTIFICATE No : 23T6748  
REFERENCE No : 69853-2

## 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., SAMAEDAM,  
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY :  
CALIBRATION DATE :

APPROVED BY :  
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.



CERTIFICATE No : 23T6748

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT	: WATER BATH	MODEL	: WPE 45
MANUFACTURER	: MEMMERT	SERIAL NUMBER	: L711.0024
ID NUMBER	: EQL-147	CALIBRATION DATE	: 10-Jul-23
RECEIVED DATE	: 10-Jul-23	RELATIVE HUMIDITY	: 53 %RH ± 10 % RH
AMBIENT TEMPERATURE	: 24 °C ± 1 °C		

### CONDITION OF THIS RESULTS OF CALIBRATION

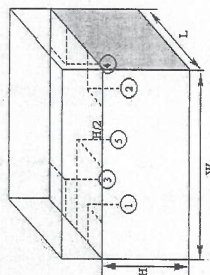
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE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

2. REFERENCE STANDARD INSTRUMENTS :-

- INSTRUMENT
- | MODEL | SERIAL No | CERTIFICATE No | DUE DATE  |
|-------|-----------|----------------|-----------|
| 2625A | 6603614   | 22T7514        | 05-Aug-23 |
- 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 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) : 1.4

Overall Variation of Line Voltage (V) : 3

Instrument Condition : Normal

Bath Inner Size (W\*L\*H) : 59\*35\*22 cm

### BATH PERFORMANCE

Calibrate Point (°C)	Temperature Stability (±°C)	Average All Location (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
41.5	0.03	41.49	0.03	0.02	0.07
44.5	0.04	44.50	0.02	0.01	0.11

### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
	#1	#2	#3	#4	Ref. 5	
41.5	41.5	41.50	41.49	41.51	41.48	0.14
44.5	44.5	44.51	44.50	44.49	44.51	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 COVERAGE FACTOR k = 2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

CERTIFICATE No : 23T6747

REFERENCE No : 69853-1

## Certificate of Calibration

EQUIPMENT : WATER BATH

MANUFACTURER : N/A

MODEL : N/A

SERIAL No : N/A

ID No : EQL-046

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY :

TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,  
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY :

CALIBRATION DATE :

APPROVED BY :

ISSUED DATE : 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.



CERTIFICATE No : 23TG747

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT	:	WATER BATH	MODEL	:	N/A
MANUFACTURER	:	N/A	SERIAL NUMBER	:	N/A
ID NUMBER	:	EQL-046	CALIBRATION DATE	:	10-Jul-23
RECEIVED DATE	:	10-Jul-23	RELATIVE HUMIDITY	:	53 %RH ± 10 % RH
AMBIENT TEMPERATURE	:	24 °C ± 1 °C			

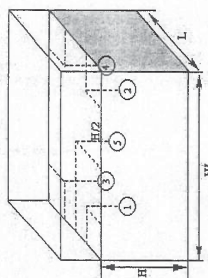
### CONDITION OF THIS RESULTS OF CALIBRATION

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   | 2277514        | 05-Aug-23 |
- 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 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) : 2.3
Overall Variation of Line Voltage (V) : 10
Instrument Condition : Normal
Bath Inner Size (W*L*H) : 45*33*13 cm

#### BATH PERFORMANCE

Calibrate Point (°C)	Temperature Stability (±°C)	Average All Location (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
44.5	0.04	44.52	0.01	0.02	0.08
45.0	0.01	45.04	0.01	0.02	0.03
50.0	0.06	49.99	0.01	0.02	0.14

#### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
	#1	#2	#3	#4	Ref. 5	
44.5	44.52	44.52	44.52	44.52	44.52	0.14
45.0	45.04	45.04	45.04	45.04	45.04	0.14
50.0	49.99	49.99	49.98	49.98	49.99	0.15

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 COVERAGE FACTOR k = 2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



CERTIFICATE No : 23TI1391  
REFERENCE No : 68175-1

## Certificate of Calibration

EQUIPMENT	:	AUTOCCLAVE
MANUFACTURER	:	HIRAYAMA
MODEL	:	HVE-50
SERIAL No	:	30612085166
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  
CALIBRATION DATE

APPROVED BY

ISSUED DATE

RECEIVED DATE

14-Feb-23

13-Feb-23

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



## QUALITY CALIBRATION CO., LTD.

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

CERTIFICATE No : 23T1391

PAGE : 2 OF 2

### Calibration Report

EQUIPMENT : AUTOCLAVE  
MANUFACTURER : HIRAYAMA  
ID NUMBER : EOL-155  
RECEIVED DATE : 13-Feb-23  
AMBIENT TEMPERATURE : 30° C ± 1° C

MODEL : HVE-50  
SERIAL NUMBER : 30612083166  
CALIBRATION DATE : 13-Feb-23  
RELATIVE HUMIDITY : 50 %RH ± 10 % RH

#### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON BS 2646 : Part 5 : 1993 BY COMPARISON WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON FIVE LOCATIONS AS SHOWN IN THE PICTURE. TWO PROBES WERE PLACES NEAR TOP AND BOTTOM WALL AND EACH PROBE WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE THIRD PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE INSTRUMENT CHAMBER. PROBE NUMBER 4 WAS ATTACHED TO THE LOAD TEMPERATURE PROBE, IF FITTED, WITHIN 20 mm OF ITS TIP. PROBE NUMBER 5 WAS PLACED IN THE CHAMBER DRAIN OR VENT WITHIN 100 mm OF ITS CONNECTION TO THE CHAMBER.

#### 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE  
DATA LOGGER VALPROBE S350, DV35, DN94 23T0883 27-Jan-24

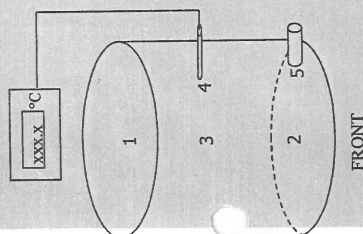
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

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 Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)	Pressure (MPa)	Holding time (min)	Operating Cycle time (min)
116	116.48	0.09	0.10	0.27	0.090	15	60
122	122.43	0.09	0.13	0.27	0.130	15	60

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

Cont Temp	Ind Temp	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	#5	
116	116	116.45	116.50	116.53	116.45	116.45	0.59
122	122	122.40	122.46	122.50	122.39	122.39	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 MULTIPLY FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



Bara Scientific Co., Ltd.  
988 U Chu Liang Building Floor7 Rama4 Road  
Silom Bangkok Bangkok Thailand 10500  
Tel : 02-6324300 Fax : 02-6375496-7  
www.barascientific.com

Bara Scientific  
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## Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-163/23  
Equipment UV/Vis Spectrophotometer  
Model UV-1900i  
Manufacturer Shimadzu  
Serial No. A12535780311ML  
ID No. EQL-233  
Date of receipt 27 April 2023  
Date of calibration 27 April 2023  
Date of issue 8 May 2023

Customer name Test Tech Co., Ltd.

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

Temperature (23.5-24.4) °C (On site)  
Humidity (50.8-48.2) %RH (On site)

Equipment condition Good Operation

Calibration Location Clean Room Circubond

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01

Traceability  
Wavelength Accuracy is traceable to certificate No. 96367 and 96366  
Photometric Accuracy is traceable to certificate No. 99925 and 96363  
Stray Light is traceable to certificate No. 96346  
The above certificate are traceable to SI unit through Siama Scientific Ltd.  
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr.Poomjai Korsawaivorakul

Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced  
except in full, without written approval of the Bara Scientific Co., Ltd.



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988 U Chu Liang Building Floor7 Rama4 Road  
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# Certificate of Calibration

Certificate No.

BSCC-UV-163/23

Number of Page(s)

2 of 3

Calibration Results:

## 1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
279.44	279.17	-0.27	0.18
418.53	418.45	-0.08	0.18
536.52	536.58	0.06	0.18
684.50	684.62	0.12	0.18
879.41	879.43	0.02	0.18

## 2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	CNR	CNR	CNR	CNR
257	CNR	CNR	CNR	CNR
313	0.0000	0.0000	0.0000	0.0075
350	0.8552	0.8532	-0.0020	0.0075
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	0.0000	0.0001	0.0001	0.0075
	0.6349	0.6336	-0.0013	0.0075

\*CNR = Customer not request

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www.barascientific.com



# Certificate of Calibration

Certificate No.

BSCC-UV-163/23

Number of Page(s)

3 of 3

Calibration Results:

## 3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5472	0.5485	0.0013	0.0042
	0.7637	0.7637	0.0000	0.0042
	1.0480	1.0494	0.0014	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5371	0.5384	0.0013	0.0042
	0.7457	0.7457	0.0000	0.0042
	1.0233	1.0247	0.0014	0.0042
465.0	CNR	CNR	CNR	0.0042
	CNR	CNR	CNR	0.0042
	CNR	CNR	CNR	0.0042
	CNR	CNR	CNR	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5006	0.5017	0.0011	0.0042
	0.6961	0.6954	-0.0007	0.0042
	0.9563	0.9565	0.0002	0.0042
590.0	CNR	CNR	CNR	0.0042
	CNR	CNR	CNR	0.0042
	CNR	CNR	CNR	0.0042
	CNR	CNR	CNR	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5137	0.5147	0.0010	0.0042
	0.6907	0.6900	-0.0007	0.0042
	0.9533	0.9536	0.0003	0.0042

\*CNR = Customer not request

## 4. Stray Light\*

Standard cut-off wavelength (nm)	Wavelength (nm)	Transmission (%)	Absorbance (A)
200.91±0.1nm	200.55	0.9670	2.0147

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

\*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

\*\*\*End of Certificate\*\*\*

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
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# Certificate of Calibration

**Equipment:** SPECTROPHOTOMETER  
**Model:** DR6000  
**Serial No. (or ID.):** 1693421 (EQL-197)  
**Manufacturer:** HACH  
**Condition:** In Condition

**Customer:** TEST TECH CO., LTD.  
30,32 Rama II Soi 63, Rama II Rd.,  
Samaedam, Bangkhuntien Bangkok 10150 Thailand

**Environment Condition:** Temperature 25.3 °C ± 0.2 °C  
Humidity 48.9 %RH ± 1.7 %RH

**Calibration Place:** TEST TECH CO., LTD. (แบบนำดี)  
30,32 Rama II Soi 63, Rama II Rd.,  
Samaedam, Bangkhuntien Bangkok 10150 Thailand

**Calibration By:** Mr. Atchai Ngamchanat  
**Calibration Date:** 21 April 2023

**The Method used:** This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.  
**Traceability:** The standard for Wavelength Certificate No. 93907 and 93914  
The standard for Photometric Certificate No. 94010 and 93900  
The standard for Stray light Certificate No. 93903 and 93902  
The standard for Spectral resolution Certificate No. 103140

**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 laboratories.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

บริษัท เทคโนโลยี จำกัด  
DKSH Technology Limited  
2533 สุขุมวิท ถนน, กรุงเทพฯ, ประเทศไทย 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C06-15: 12 Sep 2022



Certificate No.: C06230165 Page 2 of 3

## 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	637.9	0.08	0.13	
748.48	748.7	-0.22	0.13	
807.03	807.5	-0.47	0.13	
Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5816	0.580	0.0016	0.0045
	0.7130	0.712	0.0010	0.0045
	1.0151	1.013	0.0021	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5649	0.563	0.0019	0.0045
	0.7012	0.699	0.0022	0.0045
	0.9982	0.996	0.0022	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5249	0.524	0.0009	0.0045
	0.8621	0.861	0.0011	0.0045
	0.9420	0.939	0.0030	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5214	0.520	0.0014	0.0045
	0.6982	0.697	0.0012	0.0045
	0.9947	0.992	0.0027	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5549	0.553	0.0019	0.0045
	0.7736	0.771	0.0026	0.0045
	1.1041	1.101	0.0031	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5621	0.561	0.0011	0.0045
	0.7630	0.761	0.0020	0.0045
	1.0890	1.086	0.0030	0.0045

บริษัท เทคโนโลยี จำกัด  
DKSH Technology Limited  
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### Calibration Results: Without Adjustment

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000 0.7440	0.000 0.737	0.0000 0.0070	0.0080 0.0080
257 nm	0.0000 0.8635	0.000 0.855	0.0000 0.0085	0.0080 0.0080
313 nm	0.0000 0.2902	0.000 0.288	0.0000 0.0022	0.0080 0.0080
350 nm	0.0000 0.6409	0.000 0.634	0.0000 0.0069	0.0080 0.0080
Stray light*				
Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)	
260.51 +/- 0.11 nm	260.5	0.7	2.155	
391.84 +/- 0.11 nm	391.8	1.2	1.921	

Spectral Resolution *				
Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength ( nm )	268.73	266.77	1.35	2.00
UUC: Wavelength (nm)	268.6	266.6		
Std Absorbance ( A )	0.4237	0.2591		
Absorbance ( A )	0.385	0.285		

\* Calibration Marked " Not TISI Accredited " In this Certificate have been Included for completeness.

### The End of Certificate

บริษัท ดีเคเอสเอ เอเชีย (ประเทศไทย) จำกัด  
DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Phraklang, Bangkok 10260  
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CAL-FM-C06-15: 12 Sep 2022

การดูแลบำรุงรักษาเชิงป้องกัน

## Preventive Maintenance



บริษัท ดีเคเอสเอ เอเชีย (ประเทศไทย) จำกัด

ฝ่ายบริการหลังการขาย

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ฝ่ายขายและการตลาด

โทร 0 2 639 7000 E-Mail : marketing.asia@dksh.com

Website : www.dksh.co.th/technology/scientific-thailand



## เงื่อนไขการให้บริการ Preventive Maintenance

บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้บริการตามขอบข่ายของบริการ เฉพาะ ในวันและเวลา ราชการ หากมี  
ความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักชดเชย) บริษัทฯ  
จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

### ขอบข่ายการบริการ

- ตรวจสอบสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายการผลการตรวจสอบเครื่องมือ

### หมายเหตุ

- ราคาดังกล่าวบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน  
ในกรณีที่ผู้รับบริการผู้มอบเขตพื้นที่ให้บริการ บริษัทฯ จำเป็นต้องตัดค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง  
เป็นต้น
- บริษัทฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงราคา โดย ไม่แจ้งให้ทราบล่วงหน้า

## ช่องทางการติดต่อ



DKSH Technology Limited (บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด)  
เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260  
เลขประจำตัวผู้เสียภาษี 010-555-001-4547 (สำนักงานใหญ่)



Call center 02 639 7000



DKSH Scientific



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[marketing.bec.th@dksh.com](mailto:marketing.bec.th@dksh.com)



@dkshscientific



# Preventive Maintenance Contract

จำนวนใบการที่สัญญาบริการ .....1..... ครั้ง ต่อ ปี  
 ครั้งที่/1 วันที่.....28 Mar 2023.....

## รายละเอียดผู้ให้บริการ

หน่วยงาน	บริษัท เทสท์ เทคโนโลยี จำกัด		
ที่อยู่	30.32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2 แขวงสามเสน กรุงเทพมหานคร 10150		
โทรศัพท์	0-2893-4211-7	แฟกซ์	0-2893-4218

## ผู้ติดต่อ

ชื่อ - นามสกุล	คุณปริศนา วิเศษสังข์		
ตำแหน่ง	หัวหน้าส่วน		
โทรศัพท์	0-2893-4211-7	มือถือ	0-2893-4218
E-mail	Lab_center@lesstech.co.th		

## รายละเอียดผู้ให้บริการ

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่) เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260 โทรศัพท์ 0 2 693 7000 Email: stripom.s@dksh.com Line ID : stripom3007 เจ้าหน้าที่ประสานงาน : คุณศิริพร อุดทองสุข โทรศัพท์ 090 678 6924 ,02 301 7467			
เจ้าหน้าที่ผู้ให้บริการ	นายจิรายุส สดอาด		
ตำแหน่ง	Specialist, Technical Service.		
โทรศัพท์	093818736	แฟกซ์	-
E-mail	Jirayut.js@dksh.com		

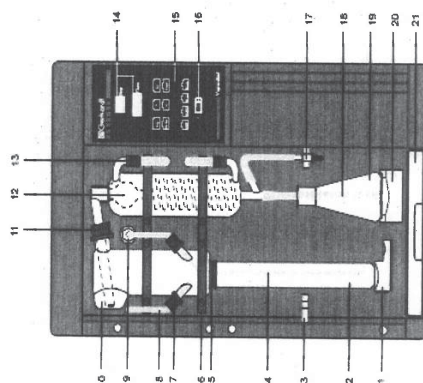
ลงนามผู้ให้บริการ	ลงนามผู้ให้บริการ
ตัวจริง	ตัวจริง
ตำแหน่ง	ตำแหน่ง
วันที่ / ประทับตราบริษัท	วันที่ / ประทับตราบริษัท

JOB No: lsp2302591..... MODEL: Vap30..... SN: 003718.....

## Part : Operational Qualification (OQ)

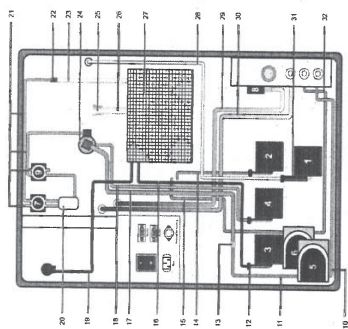
ตรวจสอบสภาพเครื่อง

FRONT



	Pass	Fail	N/A	Remark
1. Quick clamping device with wedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Kjeldatherm digestion tube	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. Holder for steam inlet tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. PTFE-Inlet tubing, steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. Viton-cone	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. Clamping for glassware	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7. Screw cap GL18 with silicone seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. PTFE-Inlet tubing, NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9. PP-Distributor with PP-threaded joint	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10. Distribution head, glass	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11. Screw cap GL32 with silicone seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12. Distillation condenser	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13. Screw cap GL14 with plastic screw connection	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14. Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15. Keyboard, chemical-resistant	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16. Main switch, green	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17. Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18. Distillate outlet tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
19. Erlenmeyer flask	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20. Platform	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
21. Drip tray	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

REAR



	Pass	Fail	N/A	Remark
1. Diaphragm pump NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
2. Diaphragm pump $H_2BO_3$	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	vap 40 only
3. Diaphragm pump $H_2O$ for steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
4. Diaphragm pump $H_2O$ for sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	vap 30,40 only
5. Peristaltic pump for suction sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	vap 30,40 only
6. Peristaltic pump for suction receiver	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	option
7. Pinch-solenoid valve, steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
8. Magnetic valve with pressure control	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
9. Pinch-solenoid valve, shut-off	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
10. Verprene-tubing 4x8 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
11. Verprene-tubing 4x8 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	vap 30,40 only
12. Non-return valve for diaphragm pumps	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
13. Tubing reduction PP 51x10x5 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	vap 30,40 only
14. Silicone tubing 4x7 mm.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	vap 40 only
15. Silicone tubing 4x7 mm.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	option
16. Silicone tubing 4x7 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
17. Verprene-tubing 8x12 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	vap 30,40 only
18. Verprene tubing 4x7 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	vap 30,40 only
19. Silicone tubing 4x7 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
20. Ventilation glass	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
21. Novoprene-tubing 4.8x8 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
22. Tubing reduction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
23. Silicone tubing 6x10 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
24. PP-distributor with PP-thread	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
25. SKT-valve (built in with brass fitting)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
26. Silicone tubing 8x16x80 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
27. Steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
28. PTFE-inlet tubing NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
29. Silicone tubing 8x16 for cooling water inlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
30. Silicone tubing 8x16 for cooling water outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
31. Viton-tubing 6x12*50 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
32. Silicone tubing 4x7 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	option

## รายละเอียดการตรวจสอบ

### ขั้นตอนการบริการ

#### ตรวจสอบระบบไฟฟ้า (Electrical Test)

- ความดันทางไฟฟ้าของเครื่องกับกราวด์
- กระแสไฟฟ้าที่ใช้งาน

#### ตรวจสอบสภาพเครื่อง (Optical Test)

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

#### ตรวจสอบ Function การทำงาน (The Function Test)

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

รายงานผลการปฏิบัติการ

1. TECHNICAL DATA

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

Pass ☒ Fail ☐ N/A ☐  
Remark .....  
6 a .....

1.1 COOLING WATER BATH

Temperature 15-20 °C  
Cooling Water Outlet  
Control Temperature

Pass ☒ Fail ☐ N/A ☐  
Remark .....  
.....  
.....

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 ☐ N/A ☐  
Remark .....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

2. SYSTEM COOLING WATER INLET

Cooling Water Inlet  
Cooling Water Outlet  
Magnetic valve

Pass ☒ Fail ☐ N/A ☐  
Remark .....  
.....  
.....

3. SYSTEM CONTROL

Key Board  
Display  
Program  
Adding H<sub>2</sub>O  
Adding NaOH  
Adding H<sub>2</sub>BO<sub>3</sub>  
Suction Sample

Pass ☒ Fail ☐ N/A ☐  
Remark .....  
.....  
.....  
vap 30,40 only  
.....  
vap 40 only  
vap 30,40 only

4. SYSTEM DISTILLATION

Boiler  
Level Sensor  
Novoprene-Tubing  
Solenoid Valve Shut-Off  
Solenoid Valve Steam  
Excess Pressure Detector  
Ventilation Valve  
Heater

Pass ☒ Fail ☐ N/A ☐  
Remark .....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

5. PUMP

Pump H<sub>2</sub>O Steam  
- Non-Return Valve  
Pump H<sub>2</sub>O Sample  
- Non-Return Valve  
Pump NaOH  
- Non-Return Valve  
Pump H3BO3  
- Non-Return Valve  
Pump Suction

Pass ☒ Fail ☐ N/A ☐  
Remark .....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

6. The Following Program Run :

Addition H<sub>2</sub>O 0-99 sec.  
Addition NaOH 0-99 sec.  
Addition H<sub>2</sub>BO<sub>3</sub> 0-99 sec.  
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

Pass ☒ Fail ☐ N/A ☐  
Remark .....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

Remark :  
.....  
.....

Part : ข้อมูลสนับสนุนด้านเทคนิค (General Technical Support)  
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  $H_2BO_3$     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.

### Error Code


The micro-processor continually surveys all the functions of the distillation system. As soon as an error arises it is shown on the display and accompanied by an acoustic signal.

Error message	Measures
No tap water	Check cooling water inlet for blockages. Ensure the tap is turned on 
No sample tube	Insert tube 
Check chemicals	Check set of tanks 
Low water Press Enter	Check the water inlet distilled $H_2O$ 
Filling Steam generator	This message disappears as soon as steam generator is filled

After the above mentioned errors are corrected, the following message is displayed.

Error message	Measures
Stop Prog.No. x continue=Enter	Enter = continue of interrupted program Reset = Standby-mode

Other error messages

Error message	Measures
Wait for steam	Message disappears as soon as stand-by is reached
Add sol. > 1ml n Continue=Enter	Check programming Enter=continue of interrupted program Reset=Standby-mode
Program undefined	Check programming 
Excess steam pressure	Switch the system off and call service
Sensor error	Switch the system off and call service