

ภาคผนวก ฉ

สำเนาเอกสารรับรองเครื่องมือการตรวจวัด



Metrology

SCI ECO Services Company Limited

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

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

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

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



Certificate No. T240070

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cooling Room)
Manufacturer : -
Model : -
Serial No. : -
Customer Code : EQL-167
ID No. : T1447A1
Customer : Test Tech Co.,Ltd
30, 32 Rama II Sol 63, Rama II Rd., Samaedam,
Bangkhunthian Bangkok 10150

Customer Location : LABORATORY FLOOR 3

Date of Receipt : 12 January 2024

Calibrated By : Sujjar Naknakred (Site Calibration Manager)

Approved By : [Redacted] / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 24 JAN 2024

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

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

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ใบรับรองการสอบเทียบ "ห้องเย็น"
(Calibration Certificate of Cool Room)



Metrology

SCI ECO Services Company Limited

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



Certificate No. T240070

Page 2 of 4

Calibration Report

Equipment : Chamber (Cooling Room)

Date of Calibration : 16 January 2024

Environment : Temperature : 19.4-24.1 °C

Line Voltage : 221.3-226.1 V

Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

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

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

2. Reference Standard Instrument :

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

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

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

5. Adjustment :

() without adjustment (X) after adjustment

Approved By _____

FM-L15 11W/18-08-66



Metrology

SCI ECO Services Company Limited

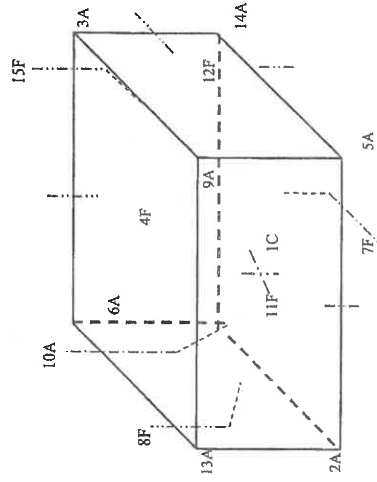
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T240070

Page 3 of 4

Calibration Report



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

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

11F	=	TN161
12F	=	TN162
13A	=	TN163
14A	=	TN164
15F	=	TN165

Approved By _____

FM-L15 11W/18-08-66



Metrology

SCI ECO Services Company Limited

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



Certificate No. T240070

Calibration Report

Page 4 of 4

Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)									
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170
	3.17	3.11	3.11	3.33	2.94	3.06	2.95	3.17	2.86	2.59
3	TN161	TN162	TN163	TN164	TN165					
	2.74	2.95	2.75	2.95	2.85					

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

*The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

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

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

Approved By. _____

FM-L15 11/8-08-66



Metrology

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhroi, 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. T240161

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cooling Room)

Manufacturer : -

Model : -

Serial No. : -

Customer Code : EQL-181

ID No. : T0399A5

Customer : Test Tech Co.,Ltd

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

Customer Location : LABORATORY FLOOR 4

Date of Receipt : 24 January 2024

Calibrated By : Preecha Phisassutthikul (Temperature Calibration Manager)

Approved By : _____ / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 31 JAN 2024

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

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

FM-L14 11/918-08-66



Metrology

SCI ECO Services Company Limited

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



Certificate No. T240161

Page 2 of 4

Calibration Report

Equipment : Chamber (Cooling Room)
Date of Calibration : 29 January 2024
Environment : Temperature : 25.4-27.9 °C
Line Voltage : 223.4-227.1 V
Relative Humidity : 45 - 49 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 15 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986) .

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

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T230773	10 April 2024
TC	TYPE T	TN171-TN180	T230773	10 April 2024
DATA LOGGER	34970A	T149	T230773	10 April 2024

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

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

5. Adjustment :

(X) without adjustment

() after adjustment

Approved By _____

FM-L15 118/18-08-66



Metrology

SCI ECO Services Company Limited

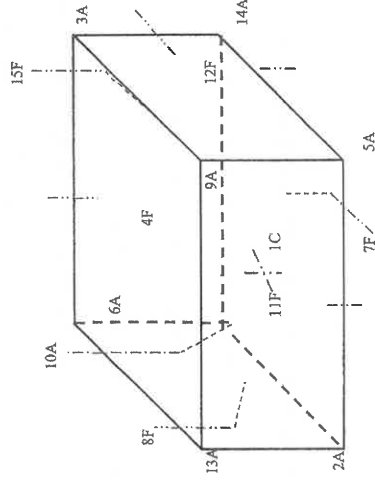
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Certificate No. T240161

Page 3 of 4

Calibration Report



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

1C = TN161	12F = TN172
2A = TN162	13A = TN173
3A = TN163	14A = TN174
4F = TN164	15F = TN175
5A = TN165	
6A = TN166	
7F = TN167	
8F = TN168	
9A = TN169	
10A = TN170	
11F = TN171	

Approved By _____

FM-L15 118/18-08-66



Metrology

SCI ECO Services Company Limited

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



NSC-TISI-TS 17025
CALIBRATION 0244

Certificate No. T240161

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170
3.0	2.81	3.01	2.99	2.87	2.92	3.08	3.04	2.93	3.31	3.10
	TN171	TN172	TN173	TN174	TN175					
	3.08	3.10	3.40	3.00	3.24					

Chamber (Cooling Room)		Temperature Distribution			
		Reading (°C)	Average (°C)	Stability (±°C)	Uniformity (°C)
Setting (°C)	Min, Max	Coverage Factor k			
	Average				
3.0	2.8, 3.1	3.0	3.06	0.40	0.92
					1.07
					2.00

* The Annotated uncertainty exclude "uniformity"
The calibration result apply only the above calibrated item.
The result of test was found accurate as shown on date and place of test only.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By. _____

FM-L15 118/18-08-66



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาภิไธย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
80-82 Prachathipitai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawan@thaiunique.com, Website : www.thaiunique.com

ATOMIC ABSORPTION SPECTROMETER TEST CERTIFICATE

Certificate No : SY231021414
Instrument Type : Atomic Absorption Spectrometer
Model : AA240FS
Serial Number : EL08043418
Organization : Test Tech Co., Ltd.
Address : 30.32 Soi 66 Rama II Rd., Samaedam Bangkhuntien, Bangkok 10150
Date : 25 Oct 2023

Hollow cathode lamps used

Element	Lamp number	Comments
Arsenic	56-101003-00	
Copper	56-101014-00	
Potassium	56-101042-00	
Iron	56-101027-00	
Manganese	56-101337-00	

Test description	Specification	Result	Comments
Light throughput (%Gain) or (EHT)			
Cu at 324.8 nm	≤ 64 % or 380 V	32 %	Pass
As at 193.7 nm	≤ 80 % or 540 V	55 %	Pass
K at 766.5 nm*	≤ 84 % or 540 V	64 %	Pass
Fe at 248.3 nm	≤ 80 % or 540 V	59 %	Pass
Mn at 279.5 nm	≤ 64 % or 380 V	46 %	Pass
Photometric noise Cu BGC off			
STDV @ 0 Abs	≤ 0.0001	0.0001	Pass



บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาวิทย์ แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
80-82 Prachathipatay Rd., Bangkokkhunprom, Pranakom, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thauunique@thauunique.com, Website : www.thauunique.com

Wavelength accuracy			
Cu at 324.8 nm	323.0 nm - 326.0 nm	324.8 nm	Pass
As 193.7 nm	192.0 nm - 195.0 nm	193.7 nm	Pass
K at 766.5 nm*	765.0 nm - 768.0 nm	766.6 nm	Pass
Fe at 248.3 nm	246.8 nm - 249.8 nm	248.3 nm	Pass
Mn at 279.5 nm	278.0 nm - 281.0 nm	279.5 nm	Pass
High solids nebulizer setting**			
Uptake rate	7.2 - 10.6 ml/min	9.8 ml/min	Pass
Max Abs	≥ 0.75 Abs	0.81 Abs	Pass
Precision(%RSD)	≤ 0.5 %	0.2 %	Pass
Zeeman Background Correction Accuracy (%)* **			
BCA @ Au 242.8 nm	< 3.7 %	***	***
Zeeman Magnetic Sensitivity Ratio (%)***			
MSR @ Cu 324.7 nm	> 70 %	***	***
Characteristic mass and sensitivity ****			
Sensitivity	≥ 0.21 Abs	***	****
Precision (%RSD)	≤ 4.0 %	****	****

* for Wideband PMT (Wavelength 190nm - 900nm)

** for Flame system

*** for Zeeman system

**** for Graphite furnace system

CALIBRATED BY:

Signature:

Engineer : Suriva Nacharoen

Date : 25 / Oct / 2023



APPROVED BY:

Signature:

Engineer : Suchai Sanguankiatichai

Date : 25 / Oct / 2023



Bara Scientific
Division of Bara

Bara Scientific Co., Ltd.

908 U Chu Liang Building Floor7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375486-7
www.barascientific.com



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, Bangkokhuan, 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 Stama Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr.Poomjai Korsawatvorakul

Approved by

Mr.Kanchit Choothep
Technical Manager

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



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



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 (\pm 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
664.50	664.62	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 (\pm A)
235	CNR	CNR	CNR	CNR
257	0.0000	0.0000	0.0000	0.0075
313	0.8552	0.8532	-0.0020	0.0075
350	CNR	CNR	CNR	CNR
	0.0000	0.0001	0.0001	0.0075
	0.6349	0.6336	-0.0013	0.0075

*CNR = Customer not request

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.

FM-UV-708-02 Rev.01 (230163)



Bara Scientific Co., Ltd.
988 U Chu Liang Building Floor7 Rama4 Road
Sliom Bangrak Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
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 (\pm 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
	1.0490	1.0494	0.0004	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)	Unit Under Calibration(UUC) Transmission (%T)	Absorbance (A)
200.91 \pm 0.1nm	200.55	0.9670	2.0147

The Stray light transmission reference is less than 1.0% 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.
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.

FM-UV-708-02 Rev.01 (230163)



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. 0-2719-9464



NSC-TS1-TS17025
CALIBRATION 0008

Cert.No.: 24CH59
Page.: 1 of 3

Certificate of Calibration

Equipment :	Conductivity Meter
Manufacturer :	TOA
Model :	CM-41X
Serial No. :	842572
ID No. :	EQL-211
Condition As-Received:	Used Item
Received Date :	11 January 2024
Calibration Date :	15 January 2024
Reference :	2401-0300DN-1
Submitted by :	TEST TECH CO.,LTD. (HEAD Office) 30, 32 Rama II Sol 63, Rama II Rd., Samaedam, Bangkhunthian, Bangkok 10150
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure:	In -house method : - CP-CH6 by direct measurement with certified reference material (CRM) - CP-CH8 by comparison with standard thermometer

Calibrated by :

Warakorn Lengagatrakul

Approved by :

Approved Signatory

(✓) Sathip Meangmai

() Warakorn Lengagatrakul

() Porpan Palpim

Issue Date :

17 January 2024

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.

๗2

ใบรับรองการสอบเทียบ "เครื่องวัดความนำไฟฟ้า"
(Calibration Certificate of Conductivity Meter)

A 0062587



Cert.No.: 24CH59

Page.: 2 of 3

Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	1963878	130RC095	23H051	05 Sep 2024
2) Ref. Std. Thermometer	4982054	110RC044	23I908	26 Jul 2024

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :-

- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Conductivity Solution	Manufacturer	Lot No.	Exp. date
147.0 $\mu\text{S/cm}$	CPA Chem	913595	14 July 2024
1.413 mS/cm	CPA Chem	931955	30 Sep 2024
12.880 mS/cm	CPA Chem	913597	14 July 2024

- Control Conductivity calibration solution temperature by Water bath (25 \pm 0.1) $^{\circ}\text{C}$
3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration results

Function : Conductivity Measurement

(*) After Adjustment at 147.0, 1413.0, 12880 $\mu\text{S/cm}$

Conductivity Electrode Serial No.: 806F0005

Standard Conductivity Solution	After Adjustment UUC* Reading	Uncertainty of Measurement (\pm)	Coverage factor k
147.0 $\mu\text{S/cm}$	147.1 $\mu\text{S/cm}$	0.99 $\mu\text{S/cm}$	2.00
1.413 mS/cm	1.413 mS/cm	0.0092 mS/cm	2.00
12.880 mS/cm	12.88 mS/cm	0.086 mS/cm	2.00

Remark - UUC* = Unit Under Calibration

- Adjustment Cell constant = 147.0 $\mu\text{S/cm}$ 96.8 m^{-1} , 1.413 mS/cm = 98.0 m^{-1} , 12.880 mS/cm = 99.4 m^{-1}



a 1197672



Cert.No.: 24CH59

Page.: 3 of 3

Calibration Results

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : CT-58101B

- Serial No. : 806F0005

Dimension of probe;

- Length : 114 mm

- Diameter : 12 mm

- Immersion Depth : 100 mm

Calibration Point ($^{\circ}\text{C}$)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of Measurement (\pm $^{\circ}\text{C}$)	Coverage factor k
25.0	25.003	25.0	-0.003	0.13	2.00

Remark :- UUC* = Unit Under Calibration

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

-o0o-



a 1197671



CERTIFICATE No : 23T8796
REFERENCE No : 70515-4

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
MODEL : WNE 45
SERIAL No : L720.0266
ID No : EQL-241
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 16-Aug-23

APPROVED BY : 
PONGSAK J.
ISSUED DATE : 16-Aug-23
RECEIVED DATE : 16-Aug-23

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



CERTIFICATE No : 23T8796

PAGE : 2 OF 2

Calibration Report

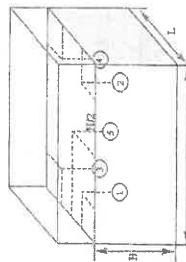
EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : EQL-241
RECEIVED DATE : 16-Aug-23
AMBIENT TEMPERATURE : 25 °C ± 1 °C
MODEL : WNE 45
SERIAL NUMBER : L720.0266
CALIBRATION DATE : 16-Aug-23
RELATIVE HUMIDITY : 50 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

- INSTRUMENT : MODEL : 2625A SERIAL No : 6603614 CERTIFICATE No : 23T6642 DUE DATE : 19-Jul-24
- 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) : 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	
83.0	83.0	83.08	83.09	83.06	83.11	0.15
92.0	92.0	92.11	92.13	92.10	92.16	0.19

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

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

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

END OF CALIBRATION REPORT



Certificate of Calibration

Equipment: TURBIDIMETER
Model: 2100N
Serial No. (or ID.): 970400003415 (EQL-024)
Manufacturer: HACH
Condition: In Condition
Customer: TEST TECH CO., LTD.
30,32 Rama II Soi 63, Rama II Rd.,
Samaedam, Bangkokhuentien Bangkok 10150 Thailand

Environment Condition: Temperature 23 °C ± 2 °C
Humidity 50 %RH ± 15 %RH

Calibration Place: Environment Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangkok,
Phrahanong, Bangkok 10260 Thailand

Calibration By: Miss.Orawan Khlaiphloi
Calibration Date: 14 September 2023
The Method used: In house method, CAL-WI-23, base on Hach Manufacturer Method 8195
Traceability: This certificate is traceable to Primary standard Fromazin and Stab/Cal accepted by United States Environmental Protection Agency (EPA) through Hach Company
Certificate No. A1075 , A1074 , A1091 , A1074 , A1074

Person in charge
(Miss Orawan Khlaiphloi)

Authorized signatory
(Mr. Nitinun Srihawan)

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

Person in charge
(Miss Orawan Khlaiphloi)

Authorized signatory
(Mr. Nitinun Srihawan)

Delivering Growth – In Asia and Beyond.

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Phrahanong, Bangkok 10260
Phone: +66 2639 7700 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

CAL-FM-C08-08; 20 Jul 2022



Certificate No.: C08230153 Page 2 of 2

Calibration Results:

Before Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.050	0.088	-0.038	0.0	0.070
20.40	19.1	1.30	0.0	1.0
205.0	195	10.0	0.5	10
1028.0	952	76.0	0.9	50
4068.0	3942	126.0	0.9	200

After Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.050	0.084	-0.034	0.0	0.070
20.40	20.4	0.00	0.0	1.0
205.0	205	0.0	0.5	10
1028.0	1028	2.0	0.5	50
4068.0	4063	5.0	0.5	200

The End of Certificate

Delivering Growth – In Asia and Beyond.

CAL-FM-C08-08; 20 Jul 2022



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



CERTIFICATE No : 23T8799
REFERENCE No : 70515-7

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 : CHAICHARN CH.
CALIBRATION DATE : 11-Sep-23

APPROVED BY :
ISSUED DATE : 15-Sep-23
RECEIVED DATE : 11-Sep-23

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

F-G010 REV : 03



QUALITY CALIBRATION CO.,LTD.
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Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 23T8799

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UFE 500
ID No : EQL-161
RECEIVED DATE : 11-Sep-23
AMBIENT TEMPERATURE : 24 °C ± 1 °C
S/N : G512.2005
CALIBRATION DATE : 11-Sep-23
RELATIVE HUMIDITY : 51 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TIAS G-20 BY COMPARISON WITH CALIBRATED RTD 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 : DATA LOGGER WITH RTD
MODEL : HYDRA 2635A
SERIAL No : 7301307
CERTIFICATE No : 23T6636
DUE DATE : 10-Jul-24

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

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

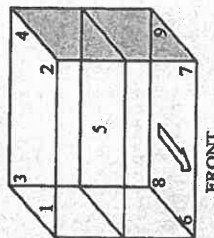
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 1
Overall Line Voltage (V) variation : 10
Instrument Condition : Normal
Chamber Size (W*L*H): 36*40*48 cm



CHAMBER PERFORMANCE

Calibrate Point (°C)	Average All Position Temp. (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	103.96	0.14	0.58	0.73
180.0	179.55	0.22	0.93	1.47

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
104.0	104.0	104.16	104.13	103.98	103.76	103.76	103.76	104.06	103.71	103.93	0.38
180.0	180.0	179.73	179.89	180.04	179.54	179.30	178.98	179.75	178.97	179.77	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



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CERTIFICATE No : 23T8798
REFERENCE No : 70515-6

PAGE : 1 OF 2

Certificate of Calibration

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

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

APPROVED BY :
ISSUED DATE : 15-Sep-23
RECEIVED DATE : 11-Sep-23

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

F-G010 REV : 03



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CERTIFICATE No : 23T8798

PAGE : 2 OF 2

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IAS 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 : DATA LOGGER WITH RTD
MODEL : HYDRA 2635A
SERIAL No : 7301307
CERTIFICATE No : 23T6636
DUE DATE : 10-Jul-24

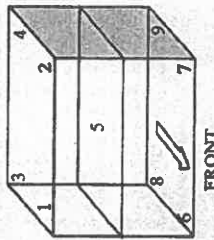
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

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

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 1
Overall Line Voltage (V) variation : 10
Instrument Condition : Normal
Chamber Size (W*L*H): 56*40*48 cm

CHAMBER PERFORMANCE

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

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.46	104.13	104.45	104.28	104.57	104.67	104.60	104.58	104.67	0.38
180.0	180.0	180.27	179.85	180.41	179.93	180.19	180.54	180.41	180.51	180.13	1.1

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

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

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

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

F-G010 REV : 03



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www.qcalibration.com



CERTIFICATE No : 23M6754
REFERENCE No : 69854-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
MODEL : BP210S
SERIAL No : S0736477
ID No : EQL-008
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 : PRASERT D.
CALIBRATION DATE : 13-Jul-23

APPROVED BY :
ISSUED DATE : 17-Jul-23
RECEIVED DATE : 13-Jul-23

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
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F-G010 REV 03



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CERTIFICATE No : 23M6754

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
MODEL : BP210S
ID No : EQL-008
SERIAL No : S0736477
RECEIVED DATE : 13-Jul-23
AIR PRESSURE : 1011 mbar \pm 1 mbar
AMBIENT TEMPERATURE : 23°C \pm 1°C
RELATIVE HUMIDITY : 50 %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 ADJUSTED USING INTERNAL WEIGHT TO ADJUST. 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. THE INTERNAL WEIGHT WAS CHECKED BY USING 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT

1) STANDARD WEIGHT SET
E2

2) STANDARD WEIGHT
E2

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 CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

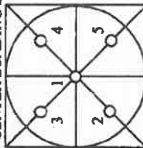
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (±g)
0.0	0.0000	0.0000	0.000082
0.1	0.1000	0.0000	0.000083
0.2	0.2000	0.0000	0.000083
0.5	0.5000	0.0000	0.000083
1.0	1.0000	0.0000	0.000084
2.0	2.0000	0.0000	0.000084
5.0	5.0000	0.0000	0.000086
10.0	10.0000	0.0000	0.000089
20.0	20.0001	-0.0001	0.000094
50.0	49.9999	0.0001	0.00012
100.0	99.9999	0.0001	0.00019
200.0	199.9997	0.0003	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	99.9998
2	99.9997
3	99.9998
4	99.9998
5	99.9998
OFF-CENTER LOADING	0.0001

6. INTERNAL WEIGHT ERROR -0.00049999999988177 g

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 MULTIPLIED BY A

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

END OF CALIBRATION REPORT

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-2484



Certificate of Calibration

Certificate No. : 23H2216
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer : Barigo
Model :
Serial No. :
ID No. : EQL-064
Condition As-Received: Used Item
Received Date: 12 October 2023
Calibration Date: 17 October 2023
Reference: 2310-0447DN
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

Submitted by: TEST TECH CO.,LTD. (HEAD Office)
30, 32 Rama II Soi 63, Rama II Rd.,
Samaedam, Bangkhunthien, Bangkok 10150

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

Condition of this result of calibration
1. Reference standards instruments :
Instrument Model Serial No. Certificate No. Due Date
1) Handheld Thermometer With Sensor 1523 3240078 23305 15 Mar 2024
2) Dew Point Hygrometer Opildew 401 164756 TH-0158-22 13 Dec 2023
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This Certification is traceable to the International System of Unit maintained through:-
-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008
-National Institute of Metrology Thailand (NIMT)

Calibrated by : Surasit Phansudol
Issue Date : 28 October 2023
Approved Signatory :
[] Chakrit Waiwarijua
[] Pornthippa Tanayakul
[x] Viporn Tantayawutti

B 0327545



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

Result of Calibration:-		Humidity Measurement		Without Adjustment	
Function:					
Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)	
25.0	30.1	30.0	-0.1	1.5	
25.0	40.1	39.0	-1.1	1.5	
25.0	50.1	48.0	-1.1	1.7	
25.0	60.0	59.0	-1.0	1.7	
25.0	75.2	75.5	0.3	1.8	

Result of Calibration:-		Temperature Measurement		Without Adjustment	
Function:					
Reference Temperature (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)	
15.046	15.0	15.0	-0.046	0.72	
19.975	20.0	20.0	0.025	0.72	
25.022	25.0	25.0	-0.022	0.72	
30.000	30.0	30.0	0.000	0.72	

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

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www.qcalibration.com



CERTIFICATE No : 24T1185
REFERENCE No : 72116-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 160
SERIAL No : D518.0082-
ID No : EQL-205
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 09-Feb-24

APPROVED BY : PONGSAK J.
ISSUED DATE : 12-Feb-24
RECEIVED DATE : 09-Feb-24

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

F-G010 REV : 03



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CERTIFICATE No : 24T1185

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 160
ID No : EQL-205
RECEIVED DATE : 09-Feb-24
AMBIENT TEMPERATURE : 25 °C ± 1 °C
S/N : D518.0082
CALIBRATION DATE : 09-Feb-24
RELATIVE HUMIDITY : 53 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

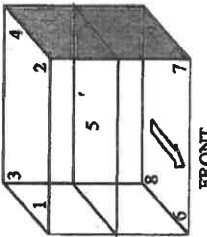
2. REFERENCE STANDARD INSTRUMENTS :-

- INSTRUMENT : DATA LOGGER WITH RTD
MODEL : HYDRA-2635A
SERIAL No : 7301307
CERTIFICATE No : 2376636
DUE DATE : 10-Jul-24
- 1) 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): 56*40*72 cm



CHAMBER PERFORMANCE

Calibrate Point (°C)	Average All Position Temp. (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.03	0.05	0.09	0.16
36.0	36.05	0.07	0.08	0.19
41.5	41.45	0.08	0.13	0.20

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	
35.0	35.0	34.98	35.01	35.00	35.00	35.02	35.08	35.07	35.04	35.10	0.25
36.0	36.0	36.00	36.03	36.03	36.02	36.04	36.09	36.10	36.04	36.12	0.25
41.5	41.5	41.45	41.45	41.39	41.46	41.46	41.47	41.43	41.44	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 MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.
END OF CALIBRATION REPORT

F-G010 REV : 03



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



Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-166/24
Equipment UV/Vis Spectrophotometer
Model UV-1900i
Manufacturer Shimadzu
Serial No. A12535780311 ML
ID No. EOL-233
Date of receipt 26 April 2024
Date of calibration 26 April 2024
Date of issue 30 April 2024
Customer name Test Tech Co., Ltd.
Address 30.32 Rama II Soi 63, Rama II Road, Samae Dam, Bang Khun Thian, Bangkok 10150

Temperature (24.9 - 25.4) °C (On site)
Humidity (49.4 - 51.1) %RH (On site)

Equipment condition Good Operation

Calibration Location Water Room

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

Traceability
Wavelength Accuracy is traceable to certificate No. 106372 and 106371
Photometric Accuracy is traceable to certificate No. 106364 and 111398
Stray Light is traceable to certificate No. 106377
The above certificate are traceable to SI unit through Starna Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr. Wanchana Janboey

Approved by

Mr. Sonthi Temboonsakdi
Service Manager

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

Number of Page(s) 2 of 3

Certificate No. BSCC-UV-166/24

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (nm)
279.44	279.18	-0.26	0.18
418.53	418.46	-0.07	0.18
536.52	536.54	0.02	0.18
684.50	684.53	0.13	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
	0.0000	0.0000	0.0000	0.0075
	0.8354	0.8333	-0.0021	0.0075
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	-0.0001	-0.0001	0.0075
	0.6199	0.6190	-0.0009	0.0075

*CNR = Customer not request

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www.barascientific.com



NSC-ONSC 17703
CALIBRATION

Certificate of Calibration

Certificate No. BSCC-UV-16624
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
	0.5761	0.5781	0.0030	0.0042
	0.7119	0.7132	0.0013	0.0042
	1.0189	1.0221	0.0032	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5610	0.5636	0.0026	0.0042
	0.7001	0.7012	0.0011	0.0042
	1.0026	1.0052	0.0028	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5249	0.5260	0.0011	0.0042
	0.6975	0.6971	-0.0004	0.0042
	1.0009	1.0012	0.0003	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5666	0.5673	0.0007	0.0042
	0.7620	0.7611	-0.0009	0.0042
	1.0982	1.0976	-0.0006	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
200.85±0.11nm	200.76	2.0091

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 based 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 mentioned 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.



Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR6000
Serial No. (or ID.): 1693421 (EQL-197)
Manufacturer: HACH
Condition: In Condition
Certificate No.: C06240153
Issued Date: 18 April 2024
Job No.: WO-00024683
Page: 1 of 3

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

Environment Condition: Temperature 29.8 °C ± 0.1 °C
Humidity 45.7 %RH ± 6.9 %RH

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

Calibration By: Miss Kaewkan Suradech
Calibration Date: 18 April 2024

The Method used: In house method, CAL-WI-24, based 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. 118106 and 118118
The standard for Photometric Certificate No. 118123 and 118113
The standard for Stray light Certificate No. 118110 and 118112
The standard for Spectral resolution Certificate No. 118104

Person in charge
(Miss Kaewkan Suradech)

Authorized signatory
(Mr. Nilinun Srihawan)

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

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

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

DKSH Technology Limited

2533 Sukhumvit Road, Bangkok, Thailand 10110
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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	748.6	-0.12	0.13
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
	0.5772	0.576	0.0012	0.0045
	0.7198	0.719	0.0008	0.0045
440 nm	1.0394	1.039	0.0004	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5808	0.580	0.0008	0.0045
465 nm	0.7062	0.705	0.0012	0.0045
	1.0189	1.018	0.0009	0.0045
	0.0000	0.000	0.0000	0.0045
546.1 nm	0.5214	0.521	0.0004	0.0045
	0.6852	0.684	0.0012	0.0045
	0.9577	0.957	0.0007	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5192	0.518	0.0012	0.0045
	0.6907	0.689	0.0017	0.0045
635 nm	0.9949	0.993	0.0019	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5530	0.551	0.0020	0.0045
	0.7555	0.753	0.0025	0.0045
	1.0761	1.073	0.0031	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5604	0.559	0.0014	0.0045
	0.7418	0.739	0.0028	0.0045
	1.0467	1.044	0.0027	0.0045

บริษัท ดีเคเอส อีซี จำกัด
DKSH Technology Limited
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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

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CAL-FN-C06-16: 11 Mar 2024



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
	0.7533	0.748	0.0053	0.0080
257 nm	0.0000	0.000	0.0000	0.0080
	0.8745	0.869	0.0055	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2926	0.293	-0.0004	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6486	0.644	0.0046	0.0080

Stray light *

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%)	Absorbance (A)
260.95 +/- 0.11 nm	261.0	0.9	2.046
392.04 +/- 0.11 nm	392.0	1.3	1.886

Spectral Resolution *

Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	268.74	266.81	1.29	2.00
UUC: Wavelength (nm)	268.6	266.6		
Std Absorbance (A)	0.5137	0.3473		
UUC: Absorbance (A)	0.463	0.359		

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

The End of Certificate

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CAL-FN-C06-16: 11 Mar 2024

Certificate of Calibration

Date of Issue : 21 August 2023
Certificate No. : 231872/ME
Customer Company : Test Tech Co., Ltd.
30,32 Rama II Soi 63, Rama II Rd., Samaedam,
Bangkhunthian, Bangkok 10150
Instrument Manufacturer : Metrohm
Instrument Type : pH meter
Model : 781
Instrument Serial Number : 1781001011219 (ID : EQL-131)
Calibration Place : Laboratory, Test Tech Co., Ltd.
30,32 Rama II Soi 63, Rama II Rd., Samaedam,
Bangkhunthian, Bangkok 10150
Environment Status : Temperature : 22.65°C ± 0.15°C
Humidity : 63.25% ± 2.75%
Date of Receipt : 18 August 2023
Date of Calibration : 18 August 2023
Job Number : CAL230577/ME
Condition of Calibration Item : Used Item
Result of Calibration : [X] Without Adjustment [] Adjustment
Calibrated By : Mr. Monton Tontun
Approved By : [REDACTED]

Authorized Signatory

[] Mr. Kowit Photang
[X] Mr. Patipon Musigapala
[] Mr. Teerayut Cheepdamrong

The uncertainties are for a confidence probability of approximately 95%

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Calibration Report

Certificate No: 231872/ME

1. Reference Standards

Item	Description/Model	Serial No.	Manufacturing	Certificate No.	Due Date
1	Digital Multimeter 34401A	MY41054280	Agilent	EIU231457	25 Mar 2024
2	Multifunction Calibrator MC3	30328644	Beamex	CAL0252-22P0214	15 Nov 2023
3	Temperature and Humidity Logger	62225348	Ebro	L202209318-001	28 Sep 2023

2. The measurement standards are traceable to International system of units (SI) by mean of an unbroken chain of calibration via accredited calibration laboratory, National or International metrology institute.

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

4. The results of test were found accurate as shown on date and place of test only.

5. Procedure Used :

On-site method WI-02 by substitute measurement with digital multimeter (DC Voltage)

On-site method WI-02 based on BS 3145 : 1978 (pH)

On-site method WI-02 based on CEI IEC 751 : 1983 (Temperature)

6. The calibration results apply only accuracy of display unit pH meter. User shall be electrode test and calibrate pH meter with traceability standard buffer.

Calibration Report

Certificate No: 231872/ME

1. Input I (DC Voltage)

Range (mV)	¹ STD Setting (mV)	² Tolerance (mV)	³ UUC Reading (mV)	Uncertainty (± mV)
2 V	0.00	-1.0 to 1.0	0.1	0.092
	300.00	299.0 to 301.0	300.0	0.12
	600.00	599.0 to 601.0	599.9	0.14
	900.00	899.0 to 901.0	899.9	0.15
	1900.00	1899.0 to 1901.0	1899.7	0.19
	-1900.00	-1901.0 to -1899.0	-1899.7	0.19

2. Input I (pH)*

¹ STD Setting (mV)	Nominal Value (pH)	² Tolerance (pH)	³ UUC Reading (pH)	Uncertainty (± pH)
414.12	0	-0.017 to 0.017	0.001	0.0019
354.96	1	0.983 to 1.017	1.001	0.0018
295.80	2	1.983 to 2.017	2.000	0.0015
236.64	3	2.983 to 3.017	3.000	0.0013
177.48	4	3.983 to 4.017	4.000	0.0011
118.32	5	4.983 to 5.017	5.000	0.0009
59.16	6	5.983 to 6.017	5.999	0.0008
0.00	7	6.983 to 7.017	7.000	0.0010
-59.16	8	7.983 to 8.017	7.999	0.0008
-118.32	9	8.983 to 9.017	8.999	0.0009
-177.48	10	9.983 to 10.017	9.999	0.0011
-236.64	11	10.983 to 11.017	10.998	0.0013
-295.80	12	11.983 to 12.017	11.998	0.0015
-354.96	13	12.983 to 13.017	12.998	0.0017
-414.12	14	13.983 to 14.017	13.997	0.0019

Reference Temperature : 25° C

Calibration Report

Certificate No: 231872/ME

3. Temperature PT-1000 (385)

¹ STD Setting (Ω)	Nominal Value (°C)	² Tolerance (°C)	³ UUC Reading (°C)	Uncertainty (± °C)
1000.0	0	-0.5 to 0.5	0.0	0.18
1077.9	20	19.5 to 20.5	20.0	0.18
1097.3	25	24.5 to 25.5	24.9	0.18
1116.7	30	29.5 to 30.5	30.0	0.18
1194.0	50	49.5 to 50.5	50.0	0.22
1385.1	100	99.5 to 100.5	99.9	0.22

Remark:

- ¹ STD = Standard Equipment.
- ² Tolerance according to manufacturer specification and service manual.
- ³ UUC = Unit Under Calibration.
- The result as per (*) marked are not TISI Accreditation Scope.

End of data

การดูแลบำรุงรักษาเชิงป้องกัน Preventive Maintenance



บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
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เงื่อนไขการให้บริการ Preventive Maintenance

Type text here

บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้บริการตามขอบเขตของการบริการ เฉพาะ ในวันและเวลา ราชการ หากมีความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักชดเชย) บริษัทฯ จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

ขอบข่ายการบริการ

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- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายงานผลการตรวจตรวจสอบเครื่องมือ

หมายเหตุ

- ราคาไม่รวมถึงค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้ใช้บริการอยู่นอกเขตพื้นที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าบริการให้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง เป็นต้น
- บริษัทฯ ขอสงวนสิทธิ์ ในการเปลี่ยนแปลงราคา โดยไม่แจ้งให้ทราบล่วงหน้า



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

ช่องทางการติดต่อ



Call center 0 2 639 7000



DKSH Scientific



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Preventive Maintenance Contract

จำนวนใบการทำสัญญาบริการ ...ครั้ง ต่อปี
ครั้งที่ 1 วันที่ 19/04/2024.....

รายละเอียดผู้รับบริการ

หน่วยงาน	บริษัท เทค จำกัด
ที่อยู่	30,32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2 แขวงแสนคำเขตบางขุนเทียน กรุงเทพมหานคร 10150
โทรศัพท์	0-2893-4211-7 แฟกซ์ 0-2893-4218

ผู้ติดต่อ

ชื่อ - นามสกุล	คุณกรกนก ขุนพิทักษ์
ตำแหน่ง	หัวหน้าส่วน
โทรศัพท์	087 398 9274 เบอร์ติดต่อ - แฟกซ์ -
E-mail	lab_center@sestech.co.th

รายละเอียดผู้ให้บริการ

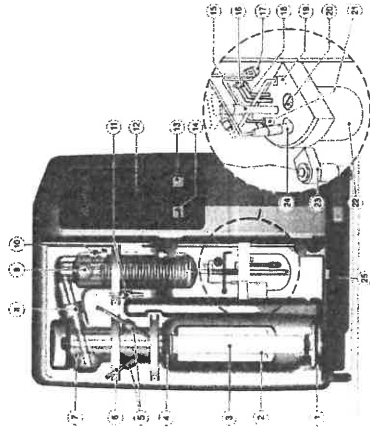
บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่)
เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260
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เจ้าหน้าที่ประสานงาน : คุณสุภาวรัตน์ สิริรัตน โทรศัพท์ 090 678 6925

เจ้าหน้าที่ผู้ให้บริการ	นายธีรายุทธ สมทอด
ตำแหน่ง	Specialist, Technical Service.
โทรศัพท์	0938138736 แฟกซ์ -
E-mail	jirayut.js@dksh.com

ลงนามผู้รับบริการ	ภาพลง ขุนพิทักษ์	ลงนามผู้ให้บริการ	จิว
ตัวจริง	(ลงลายมือชื่อ ขุนพิทักษ์...)	ตัวจริง	(นาย ธีรายุทธ สมทอด)
ตำแหน่ง	หัวหน้าส่วนเทคนิค	ตำแหน่ง	Specialist, Technical Service.
วันที่ / ประทับตราบริษัท	19/04/2024	วันที่ / ประทับตราบริษัท	19/04/2024

JOB No: LSPR2402440.....MODEL: VAP300.....S/N: GER5300210095
Operational Qualification (OQ)
ตรวจสอบคุณภาพเครื่อง

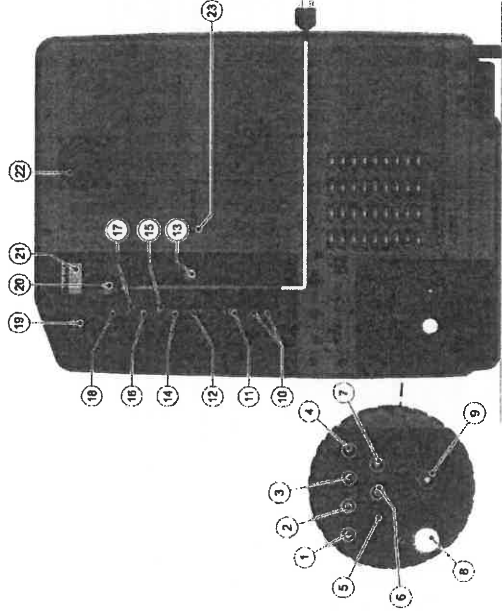
FRONT



No		PASS	FAIL	N/A
1	Quick clamping device with clamping block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Digestion tube 250/300 ml	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	PTFE steam inlet tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Connection stopper, Viton	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Screw cap GL18	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	PTFE-inlet tubing NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Distribution head made of glass	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Screw cap GL32	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Distillation condenser made of glass	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Screw cap GL14	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Control panel	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Operating Button	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	USB interface (with protective cap)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Silicone tubing 8/10 for distillate discharge **	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
16	Verprene tubing 4/8, receiver suction **	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17	Cable duct for electrode cable + titration tube**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
18	Silicone tubing 4/7 , boric acid inlet**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
19	Sensor for level monitoring including connector**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
20	Agitator motor with propeller**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
21	Titration acid inlet tube **	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
22	Receiver glass**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
23	Holder for pH electrode , removable**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
24	pH electrode (combined electrode)**	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
25	Drip tray PP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

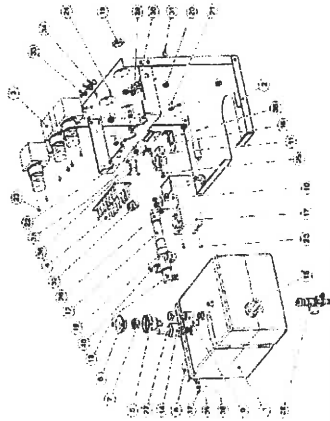
** only VAP 450

REAR



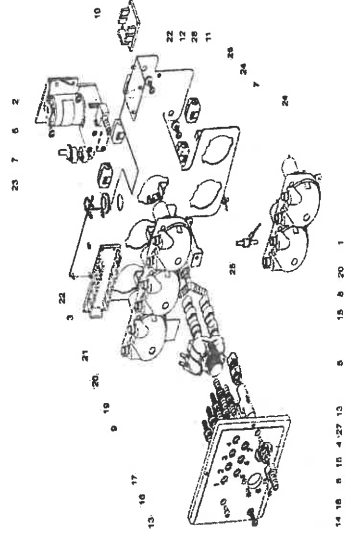
No		PASS	FAIL	N/A
1	Tube connection for sample H3BO3 supply	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Tube connection for sample H2O supply	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Tube connection for steam generator H2O supply	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Tube connection for NaOH supply	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Tube connection for receiver glass extraction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Tube connection for sample waste extraction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Tube connection , overpressure steam outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Connection for cooling water supply (with cleaning sieve)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Tube connection for cooling water outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	4 X USB interface	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	1 X RS-232 Interface	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	LAN Interface	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Screw cap for Perspex cover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Connection socket for sample waste tank level monitoring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
15	Connection (not used)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Connection socket for H2O tank level monitoring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Connection socket for H3BO3 tank level monitoring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	Connection socket for NaOH tank level monitoring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Overcurrent circuit breaker	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Apparatus socket (mains cable connection)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Rating plate with serial number	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Exhaust air fan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	Excess temperature switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Inside Steam generator



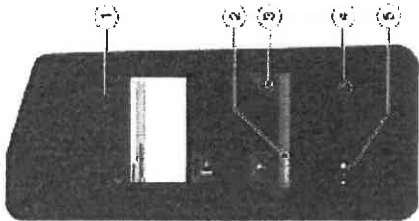
No		PASS	FAIL	N/A
1	Steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Steam generator traverse	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Pinch valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Circuit board distributor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Valve tubing connection	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Housing safety valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Safety valve SKT	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Excess temperature protection, steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Safety valve G 1/8 0.5 bar	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Ventilation glass pinch valve VAPODEST	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Hose clamp for ventilation clamp	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Distributor PP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Angle connection PP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Pressure transmitter	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Level switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Fixing bracket steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Relay HT+	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	VA Hexagon nut 1/2"	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Angle connection 1/8"	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Bushing nipple 6-10-14	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	VA Lens head screw M5 X 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Grounding connection, 2-pole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	VA Lens head screw M4 X 6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	Spacer bolt 5 mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	VA Lens head screw M4 X 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26	Tubing connection	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	Hose clamp 14.5 mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28	Module ball valve with nozzles	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29	Cross manifold with spout	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30	Seal copper G 1/8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31	Locking screw 1/8"	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32	Pin strip	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33	Bundle clamp 12 H 4500	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34	Bundle clamp 12 H 4502	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35	Temperature switch 80°C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36	VA Lens head screw M3 X 6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37	VA Hexagon nut M4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38	Line head screw M4 X 8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39	VA Spring washer	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40	Angle connection, reduced, 1/8" PP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Module Pump holder VAP200 - 450 V3



No		PASS	FAIL	N/A
1	Peristaltic pump	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Diaphragm pump NaOH, with non return valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Circuit board	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Tubing connection module	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Flow controller	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Lens head screw M5 x 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Bushing nozzle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Screw in socket	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Magnetic valve 2/2 way	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Circuit board distributor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Bushing nozzle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Screw 5 x 25	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Cylinder screw	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Screw 5 x 20	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Seal EPDM 15 x 4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Tubing connection piece 51x10x6.5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Tubing connection piece 51x10x10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	Screw M4x10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Clamp	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Clamp	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Y-tube connector	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Spacer bolt 5 mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	Bundle clamp	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	Bundle clamp	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	Retrofit earthing pump/v	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26	Snap ferrite	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	Nut G 3/8"	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28	Pump holder plate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Control panel



No		PASS	FAIL
1	Title bar	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Status bar	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Navigation button	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Smart switch with multiple functions	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	USB interface	<input checked="" type="checkbox"/>	<input type="checkbox"/>

- 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
 - ระบบการคืนน้ำเข้าสู่ Sample Tube
 - ระบบการเติม Na OH
 - ระบบการเติม H3BO3

รายงานผลการให้บริการ

1. TECHNICAL DATA

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

Pass ☒ ☒ Fail ☐ ☐ N/A ☐ ☐ Remark
.....
...8a.....

1.1 COOLING WATER BATH

Temperature 15-20 °C
Cooling Water Outlet
Control Temperature

Pass ☒ ☒ ☒ Fail ☐ ☐ ☐ N/A ☐ ☐ Remark
.....
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1.2 OPTICAL TEST VAP300

Screw cap GL14
Screw cap GL18
Screw cap GL32
Distillation Head
Condensor
Viton Cone
Ventilation Valve BV
Micro Switch Sample
Agitator motor for propeller

Pass ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ Fail ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☒ N/A ☐ Remark
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2. SYSTEM COOLING WATER INLET

Cooling Water Inlet
Cooling Water Outlet
Flow control valve

Pass ☒ ☒ ☒ Fail ☐ ☐ ☐ N/A ☐ Remark
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3.SYSTEM CONTROL

Display
Program
Adding NaOH
Adding H2O
Adding H3BO3
Suction Sample
Suction Receiver

Pass ☒ ☒ ☒ ☒ ☒ ☐ ☐ Fail ☐ ☐ ☐ ☐ ☐ N/A ☐ Remark
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4.SYSTEM DISTILLATION

Boiler
Level Sensor
Novopen
Solenoid Valve Shut-Off
Solenoid Valve Steam
Solenoid Valve soft steam
Ventilation Valve Premount
Excess Pressure Detector
Heating Element

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

Pump H₂O Steam
- Non-Return Valve
Pump H₂O Sample
- Non-Return Valve
Pump NaOH
- Non-Return Valve
Pump H3BO3
- Non-Return Valve
Pump suction
Pump suction receiver

Pass ☒ ☒ ☒ ☒ ☒ ☐ ☐ ☐ Fail ☐ ☐ ☐ ☐ ☐ ☐ ☒ ☒ ☒ N/A ☐ ☐ ☐ ☐ ☐ ☐ ☐ Remark
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6. The Following Program Run :

Addition H2O 0-999 ml.
Addition NaOH 0-999 ml.
Addition H3BO3 0-999 ml.
Reaction Time 0-108 min
Distillation Time 0-108 min
Steam Capacity 10%-100%
Suction Sample
Suction Receiver

Pass ☒ ☒ ☐ ☒ ☒ ☒ ☒ ☒ ☒ Fail ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ N/A ☐ ☐ ☒ ☐ ☐ ☐ ☐ ☒ Remark
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7. Measured pumps

Pump NaOH
Pump H2O
Pump H3BO3

Volume :20.40.....ml
Volume :19.09.....ml
Volume :ml
Remark
.....
.....
.....

Remark :
.....

การบำรุงรักษาทั่วไป (Basic maintenance)

Clearing program

Glass parts and tubes must be flamed carefully before starting analysis in order to prevent clogging by crystallizing chemicals.

The following settings are recommended for GPC:

Test method	Volume
H ₂ O addition	120 ml
NaOH addition	0 ml
Dilution time	7 min
Stirring power	100 %
Reaction time	0 s
Reaction sample	30 s

Insert a deposition tube (without sample) and start the program.

- All liquid carrying parts are cleaned, in the case of sintering, approx. 10 ml of sulphuric acid can also be added to the deposition tube.

General error message

[illegible]

Analytical errors

[illegible]



PerkinElmer
For the Better

ICPWO-02834138

MAINTENANCE AND IPV TEST CERTIFICATE MODEL OPTIMA 8000

Customer : บริษัท เอนเนอร์ยี่ เทคโนโลยี จำกัด	Date Tested: May 14, 2024
Address : 30,32 หมู่ 63 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10150	Recommendation Recertification Period 12 Months
User Name : คุณสุวิทย์ วัฒนศิริ	Recertification Due: May 14, 2025
Phone: 02-893-4211-17	Date Last Certified: May 18, 2023
Fax: lab_center@testtech.co.th	Visit Number: 1 of 1
	PerkinElmer Phone: 02-719-6420 ext 206
	PerkinElmer Fax: 02-318-5597

CONFIGURATION TESTED

MODEL	SERIAL NUMBER	SOFTWARE
OPTIMA 8000 (EOL-180)	078S141171C	ICP WinLab32 version 5
TESTED EQUIPMENT IPV Methods	CALIBRATION NUMBER	EXPIRATION
TEST STANDARD USED Multielement Standard Instrument Cal. STD4	PART NUMBER N069-1579 N930-0221	EXPIRATION DATE Dec 30, 2024 Nov 30, 2024
CUSTOMER SUPPLIED 2 % HNO3 10 % HNO3	COMMENTS	CUSTOMER INITIALS



PerkinElmer
For the Better


MAINTENANCE AND IPV TEST CERTIFICATE MODEL OPTIMA 8000

SERIAL NUMBER: 078S141171C	DATE TESTED: May 14, 2024
1. MECHANICAL CHECKS	
A. Inspect and clean all fans and filters.	<input type="checkbox"/> OK
B. Inspect and replace as necessary, all torch components including the RF coil.	<input type="checkbox"/> OK
C. Inspect all tubing for sign of clacking or leaking.	<input type="checkbox"/> OK
D. Adjust water and gas pressure regulator settings.	<input type="checkbox"/> OK
E. Inspect and leak check pneumatics drawers.	<input type="checkbox"/> OK
F. Clean the exterior of the instrument.	<input type="checkbox"/> OK
2. OPTICAL CHECKS	
A. Inspect and clean all optical components.	<input type="checkbox"/> OK
B. As required, check and replace all purge filters.	<input type="checkbox"/> OK
C. Recheck optical alignment.	<input type="checkbox"/> OK
3. COOLING SYSTEM CHECKS	
A. Perform preventive maintenance on chiller.	<input type="checkbox"/> OK
B. Flush out the chiller every six months.	<input type="checkbox"/> OK
4. PERFORMANCE CHECKS	
A. Torch View Alignment.	<input type="checkbox"/> OK
B. Wavelength Calibration.	<input type="checkbox"/> OK

MAINTENANCE AND IPV TEST CERTIFICATE MODEL
OPTIMA 8000

SERIAL NUMBER: 078S1411171C	DATE TESTED: May 14, 2024	
PARAMETER	SPECIFICATION	FINAL VALUE
Spectral Resolution : UV		
As 193.696 nm	≤ 0.009 nm	0.00735 nm
Ni 231.604 nm	≤ 0.011 nm	0.00913 nm
Ni 341.476 nm	≤ 0.015 nm	0.01386 nm
Spectral Resolution : VIS		
Ba 455.403 nm	≤ 0.020 nm	0.01721 nm
Precision		
Zn 206.200 nm	% RSD ≤ 1.0 %	0.35 %
Mg 280.271 nm	% RSD ≤ 1.0 %	0.27 %
Mg 285.243 nm	% RSD ≤ 1.0 %	0.46 %
Ba 455.403 nm	% RSD ≤ 1.0 %	0.48 %
Detection Limits : Axial		
Tl 190.801 nm	3(ed) ≤ 10.0 ppb	1.00 ppb
As 193.696 nm	3(ed) ≤ 10.0 ppb	3.32 ppb
Se 196.026 nm	3(ed) ≤ 5.0 ppb	3.88 ppb
Pb 220.353 nm	3(ed) ≤ 3.0 ppb	1.45 ppb
Detection Limits : Radial		
As 193.696 nm	3(ed) ≤ 60.0 ppb	3.41 ppb
Zn 213.857 nm	3(ed) ≤ 2.0 ppb	0.30 ppb
Mn 257.610 nm	3(ed) ≤ 1.0 ppb	0.03 ppb
La 379.478 nm	3(ed) ≤ 3.0 ppb	0.27 ppb
Ba 455.403 nm	3(ed) ≤ 0.3 ppb	0.05 ppb
Ba 493.408 nm	3(ed) ≤ 0.6 ppb	0.06 ppb
BEC : Axial (IB X 1000)/(S-IB)		
Mn 257.610 nm	≤ 30 ppb	10.70 ppb
BEC : Radial (IB X 1000)/(S-IB)		
Mn 257.610 nm	≤ 30 ppb	21.54 ppb

MAINTENANCE AND IPV TEST CERTIFICATE MODEL
OPTIMA 8000

SERIAL NUMBER: 078S1411171C	DATE TESTED: May 14, 2024
Remarks : Commissioning follow as commissioning performance sheets.	
<div><input checked="" type="checkbox"/> meets</div> <div><input type="checkbox"/> does not meet</div>	
This is to certify that the above tests have been performed and the configuration tested the PerkinElmer Specifications listed on this certificate.	
This certificate does not modify PerkinElmer's standard terms and condition of sale, including warranty terms.	
Service Department PerkinElmer Scientific (Thailand)Co.,Ltd.	
Customer Service Engineer:	( Narong Wajanakit) Service Engineer