

ภาคผนวก ช.

เอกสารรับรองเครื่องมือการตรวจวัด

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Certificate of Calibration

Page : 1 of 2

Certificate No. : 65-400499-2  
Submitted by : M Green Group Co., Ltd.  
188/46 Wisetukulakhon 25, Pracha-Utd Rd., Thungku Bangkok 10140 Thailand

Equipment : Air Chamber (Oven)  
Manufacturer : Memmert  
Range : N/A °C  
Model : UF110  
Resolution : 0.1 °C  
Serial No. : B419,1092  
ID No. : N/A

Environment : On site calibration was carried out at the Laboratory, M Green Group Co., Ltd.  
Ambient Temperature : (30.0 to 31.0) °C  
Relative Humidity : (45 to 50) %  
Line Voltage : (229.0 to 232.0) V

Date of Received : 21 September 2022  
Date of Calibration : 21 September 2022  
Date of Issue : 23 September 2022

Calibrated by : Permpon Chanpu  
Calibration Method : CAL-M4004, TLAS G-20

Reference Standard Instruments : The temperature scale used was based on ITS-90  
Standard Digital Thermometer with Thermocouple probe  
ID No. Cert. No. Due Date Traceability  
400029 & 400030 65-400272-1 24 Nov 2022 National Institute of Metrology Thailand (NIMT)

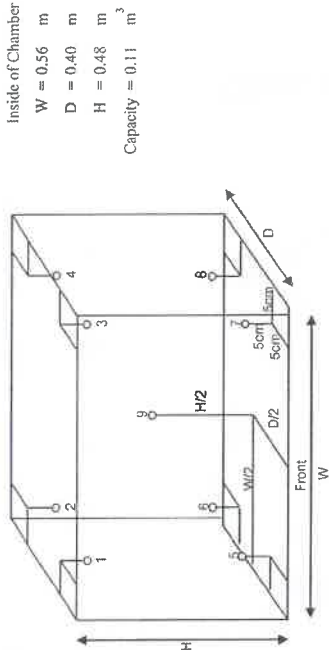
Approved by  
Supervisor

Page : 2 of 2

Certificate No. : 65-400499-2

Result of Calibration : Without Adjustment  
UUC Condition As-Received : Good  
Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
104.0	104.0	104.0	103.8	103.4	104.6	104.0	104.1	103.8	104.2	103.4	104.1	0.71
180.0	180.0	180.0	179.5	179.1	181.4	179.9	180.3	179.5	181.0	179.0	180.3	0.96
Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)			Measured Stability (°C)			Overall Variation (°C)			
			Uniformity			Stability						
			Temperature			Temperature						
104.0	104.0	104.0	0.8			0.2			1.4			
180.0	180.0	180.0	1.4			0.3			2.7			

Remark: The uncertainty is not combine uniformity of the air chamber  
This result of calibration was found accurate as shown on date and place of calibration only.  
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2 ,  
providing a level of confidence of approximately 95%

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## Certificate of Calibration

**Certificate No. :** 65-400499-3

**Submitted by :** M Green Group Co., Ltd.

**Equipment :** Water Bath

**Date of Received :** 21 September 2022

**Date of Calibration :** 21 September 2022

**Date of Issue :** 23 September 2022

**Calibrated by :** Permpon Champu

**Calibration Method :** This instrument was calibrated by In-house method CAL-M4006 based on ASTM E715-80

**Environment :** On site calibration was carried out at the Laboratory, M Green Group Co., Ltd.

**Ambient Temperature :** (30.0 to 31.0) °C

**Relative Humidity :** (45 to 50) %

**Line Voltage :** (229.0 to 232.0)V

**Manufacturer :** Memmert

**Model :** WNB29

**Range :** N/A °C

**Resolution :** 0.1 °C

**Serial No. :** L619.0037

**ID No. :** N/A

**Reference Standard Instruments :** This certification is traceable to the International System of Units

**Standard Digital Thermometer with RTD probe**

**ID.No.** **Cert.No.** **Due Date** **Traceability**

400029 & 400031 65-400273-1 23 Nov 2022 National Institute of Metrology Thailand (NIMT)

Approved by \_\_\_\_\_  
 (Signature)

Supervisor

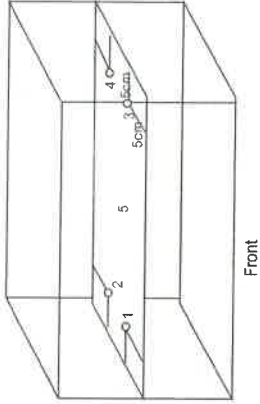
## Certificate of Calibration

**Certificate No. :** 65-400499-3

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good

**Function :** Temperature measurement



Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.					Uncertainty (± °C)	Measured Uniformity (°C)	Measured Stability (°C)
			1	2	3	4	5			
85.0	85.0	85.0	84.65	84.57	84.77	84.70	84.74	0.19	0.25	0.06

**Remarks** The uncertainty is not combine uniformity of the water bath

This result of calibration was found accurate as shown on date and place of calibration only.

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

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Certificate of Calibration

Certificate No. : 65-420076-1

Page : 1 of 2

Submitted by : M Green Group Co.,Ltd.  
188/46 Wisatesukhakhon 25, Pracha-Utd Rd., Thungkru Bangkok 10140 Thailand

Equipment : pH Meter with electrode  
pH meter

Manufacturer : Eutech                      Model : pH 700  
Range : N/A    pH                      Resolution : 0.01    pH  
Serial No. : 2884323                      ID No. : N/A

Electrode  
Model : N/A                      Serial No. : 40417  
On site calibration was carried out at the Laboratory, M Green Group Co.,Ltd.  
Ambient Temperature : (25.4 to 26.0) °C  
Relative Humidity : (56 to 60) %

Date of Received : 21 September 2022  
Date of Calibration : 21 September 2022  
Date of Issue : 24 September 2022  
Calibrated by : Bunjerd Masri

Calibration Method : In-house method CAL-M4201 direct measurement by using standard voltage calibrator and using certified reference material (CRM)

Reference Standard Instruments : This certification is traceable to the International System of Units

1. Multiproduct Calibrator

ID No.	Cert. No.	Due Date	Traceability
400005	SG-E-00473/64	27 Aug 2023	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61235182	795894	14 Feb 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.985	61243095	809356	21 Apr 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.008	61244986	795895	25 Feb 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by  
(Bunjerd Masri)  
Supervisor

The Uncertainties are for a confidence probability of approximately 95%  
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Certificate of Calibration

Certificate No. : 65-420076-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement  
pH meter

Performing standard curve by Multiproduct Calibrator at pH (4,7,10)

Adjustment Curve at nominal pH	Applied Voltage ( mV )	Nominal Value ( pH )	UUC Reading		Correction ( mV )	Uncertainty ( ± mV )
			( pH )	( mV )		
4, 7, 10	177.4800	4	4.00	177.5	0.0	0.12
	0.0000	7	7.00	0.1	-0.1	0.086
	-177.4800	10	10.00	-177.4	-0.1	0.12

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

Adjustment Curve at nominal pH	Standard Buffer ( pH )	UUC Reading ( pH )	Correction ( pH )	Uncertainty ( ± pH )
4, 7, 10	4.008	4.01	0.00	0.010
	6.985	7.00	-0.01	0.011
	10.008	10.01	0.00	0.014

Remark

UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.  
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2,  
providing a level of confidence of approximately 95%

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## Certificate of Calibration

**Certificate No. : 65-410112-1**

Page : 1 of 2

Submitted by : M Green Group Co., Ltd.

M Green Group Co., Ltd.  
188/46 Wisatesuknakhon 25, Pracha-Utthid Rd.,

Thungkru, Bangkok 10140 Thailand

**Equipment :** Digital Thermo-Hygrometer

Digital Thermo-Hygrometer	
Manufacturer :	Digicon
Model :	TH-02A
Range Temperature :	0 °C to 50 °C
Resolution :	0.1 °C
Range Humidity :	20 %R.H. to 99 %R.H.
Resolution :	1 %R.H.
Serial No. :	1819A0771796
ID No. :	N/A

Environment : Ambient Temperature :  $(23 \pm 2)^\circ\text{C}$

Ambient Temperature :  $(23 \pm 2)^\circ\text{C}$   
Relative Humidity :  $(50 \pm 15)\%$

**Date of Received :** 21 September 2022

Date of Calibration : 22 September to 24 September 2022

Date of Issue : 24 September 2022

Calibrated by: Chortip Samchusri

**Calibration Method :** This instrument was calibrated by In-house method comparison technique CAL-M4013 by compared with standard probe sensor humidity/temperature into humidity/temperature chamber.

**Reference Standard Instruments :** This certification is traceable to the International System of Units

### Digital Indicator with Standard Probe Temp&Hum

ID No.	Cert. No.	Due Date	Traceability
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400034 & 400035 SG-H-00713/65 07 Jan 2023 Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268

Approved

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

Certificate No. : 65-410112-1

Page : 2 of 2

UUC Condition As-Received : Good

**Result of Calibration :** Without Adjustment

**Function :** Temperature measurement

Reference Humidity @ 50 %R.H.

Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
20.04	19.8	0.2	0.46
24.99	24.7	0.3	0.46
30.03	29.7	0.3	0.46

**Result of Calibration :** Without Adjustment

**Function :** Humidity measurement

Reference Temperature @ 25 °C

Standard Humidity (%R.H.)	UUC Reading (%R.H.)	Correction (%R.H.)	Uncertainty ( $\pm$ %R.H.)
40.00	39	1	2.2
60.01	58	2	2.3

Remark

UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.

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

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## Certificate of Calibration

**Certificate No. :** 65-200300-1 **Page : 1 of 2**

**Submitted by :** M Green Group Co., Ltd.  
 188/46 Wisetukulakhon 25, Pracha-Ud Rd., Thungkru, Bangkok 10140 Thailand

**Equipment :** Electronic Balance  
**Manufacturer :** SHIMADZU **Model :** AP225WD  
**Serial No. :** D316300690  
**Capacity :** 220 g **Resolution :** 0.00001g/102g, 0.0001g/220g

**Environment :** On site calibration was carried out at the Laboratory, M Green Group Co., Ltd.  
**Ambient Temperature :** (26.1 to 26.3) °C  
**Relative Humidity :** (62.1 to 64.5) %  
**Air Pressure :** 1007.0 mbar

**Date of Received :** 21 September 2022  
**Date of Calibration :** 21 September 2022  
**Date of Issue :** 24 September 2022  
**Calibrated by :** Akaradath Thippichai

**Calibration Method :** In-house method CAL-M2001 based on UKAS Publication ref: LAB 14  
 Edition 5, July 2015

**Reference Standard Instruments :** This certification is traceable to the International System of Units

ID No.	Cert. No.	Due Date	Traceability
E261-E2624	C02213103	18 Nov 2022	National Institute of Metrology (Thailand), (NIMT)

Approved by :   
 (Surachai Promthong)  
 Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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## Certificate of Calibration

**Certificate No. :** 65-200300-1 **Page : 2 of 2**

**Result of Calibration :** Without Adjustment

**UUC Condition As-Received :** Good  
 Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty ± (g)
0.001	0.00001	0.000012
0.01	0.00000	0.000014
0.1	0.00001	0.000018
1	0.00000	0.000026
10	0.00000	0.000053
20	-0.00001	0.000071
50	0.00001	0.00011
100	-0.00008	0.00020
150	-0.0001	0.00038
200	-0.0001	0.00038

This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2.15 providing a level of confidence of approximately 95%

Eccentric error	Load test : 50 g	A	B	C	D	E
		0.00001	0.00006	0.00004	-0.00006	0.00000 g

Repeatability	Load test : 200 g	Sidev. : 0.000053 g
		-0.0000



## Certificate of Calibration

**Certificate No. :** 65-210457-1 **Page : 1 of 2**

**Submitted by :** M Green Group Co., Ltd.  
188/46 Wisituknakon25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

**Equipment :**

<b>Weight</b>	<b>Material :</b> Stainless Steel
<b>Manufacturer :</b> N/A	
<b>Weight size :</b> 1 g	
<b>ID No. :</b> 63-210391-1	
<b>Assumed density of weight :</b> 7950 kg / m <sup>3</sup>	
<b>Assumed Air density :</b> 1.2 kg / m <sup>3</sup>	
<b>Ambient Temperature :</b> (20 ± 2) °C	
<b>Relative Humidity :</b> (50 ± 10) %	
<b>Air Pressure :</b> 1001.1 mbar	

**Date of Received :** 21 September 2022  
**Date of Callbration :** 28 September 2022  
**Date of Issue :** 28 September 2022  
**Calibrated by :** Wutichai Swatphong

**Calibration Method :** In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)

**Reference Standard Instruments :** This certification is traceable to the International System of Units

Standard Weights			
ID No.	Cert. No.	Due Date	Traceability
E221-E2210	MM-0042-22	21 Mar 2025	National Institute of Metrology (Thailand), (NIMT)

Approved by : ( Surachai Promthong )  
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%  
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## Certificate of Calibration

**Certificate No. :** 65-210457-1 **Page : 2 of 2**

**Result of Calibration :** Without Adjustment  
**UUC Condition As-Received :** Good

No.	Nominal Value	Id Mark	Conventional mass Value	Measuring Uncertainty
1	1 g	none	1 g -0.016 mg	± 0.023 mg

This result of calibration was found accurate as shown on date and place of calibration only.  
 This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%

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## Certificate of Calibration

Certificate No. : 65-210457-2 Page : 1 of 2

Submitted by : M Green Group Co., Ltd.  
188/46 Wisutuknakon25, Pracha-Utd Rd., Thungkm, Bangkok 10140 Thailand

Equipment : Weight  
Manufacturer : N/A Material : Stainless Steel

Weight size : 100 g  
ID No. : 63-210391-2  
Assumed density of weight : 7950 kg / m<sup>3</sup>  
Assumed Air density : 1.2 kg / m<sup>3</sup>

Environment : Ambient Temperature : (20 ± 2) °C  
Relative Humidity : (50 ± 10) %  
Air Pressure : 1001.8 mbar

Date of Received : 21 September 2022

Date of Calibration : 28 September 2022

Date of Issue : 28 September 2022

Calibrated by : Wutichai Swapthong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E221-E2210	MM-0042-22	21 Mar 2025	National Institute of Metrology (Thailand), (NIMT)

Approved by :  
( Surachai Promthong )  
Laboratory Manager

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

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## Certificate of Calibration

Certificate No. : 65-210457-2 Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Id.Mark	Conventional mass Value	Measuring Uncertainty
1	100 g	none	100 g -0.17 mg	± 0.11 mg

This result of calibration was found accurate as shown on date and place of calibration only.

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

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Certificate of Calibration

Certificate No. : 65-210457-3      Page : 1 of 2

Submitted by : M Green Group Co., Ltd.  
188/46 Wisutuknakhon25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment :  
Weight  
Manufacturer : N/A      Material : Stainless Steel  
Weight size : 200 g  
ID No. : 63-210391-3  
Assumed density of weight : 7950 kg / m<sup>3</sup>  
Assumed Air density : 1.2 kg / m<sup>3</sup>  
Environment :  
Ambient Temperature : ( 20 ± 2 ) °C  
Relative Humidity : ( 50 ± 10 ) %  
Air Pressure : 1001.8 mbar

Date of Received : 21 September 2022  
Date of Calibration : 28 September 2022  
Date of Issue : 28 September 2022  
Calibrated by : Wuttichai Swaphong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)  
Reference Standard Instruments : This certification is traceable to the International System of Units  
Standard Weights  
ID No.      Cert. No.      Due Date      Traceability  
E221-E2210      MM-0042-22      21 Mar 2025      National Institute of Metrology (Thailand), (NIMT)

Approved by :  
( Surachai Promthong )  
Laboratory Manager

Certificate of Calibration

Certificate No. : 65-210457-3      Page : 2 of 2

Result of Calibration : Without Adjustment  
UUC Condition As-Received : Good

No.	Nominal Value	Id.Mark	Conventional mass Value	Measuring Uncertainty
1	200 g	none	200 g +0.09 mg	± 0.17 mg

This result of calibration was found accurate as shown on date and place of calibration only.  
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%

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## Certificate of Calibration

**Certificate No. :** 65-400500-1 **Page : 1 of 2**

**Submitted by :** M Green Group Co.,Ltd.  
188/46 Wisatesakhaikhon 25, Pracha-Utd Rd., Thungkru Bangkok 10140 Thailand

**Equipment :** Digital Thermometer with Thermistor probe  
Temperature Indicator

**Manufacturer :** Eutech **Model :** pH 700  
**Range :** N/A °C **Resolution :** 0.1 °C  
**Serial No. :** 2884323 **ID No. :** N/A  
**Thermistor probe**

**Model :** N/A **Sheath Material :** Stainless  
**Diameter :** 3.2 mm. **Length :** 100 mm.  
**Serial No. :** PH5TEM01P **ID No. :** N/A

**Environment :** On site calibration was carried out at the Laboratory, M Green Group Co.,Ltd.

**Date of Received :** 21 September 2022  
**Date of Calibration :** 21 September 2022  
**Date of Issue :** 24 September 2022  
**Calibrated by :** Bunjerd Masri

**Calibration Method :** This instrument was calibrated by In-house method comparison technique CAL-M4003 by compared with PRT in the dry-well calibrator at the constant controlled temperature.

The temperature scale used was based on ITS-90

**Reference Standard Instruments :** This certification is traceable to the International System of Units

ID No.	Cert. No.	Due Date	Traceability
400002	TT-0074-22	20 Jun 2024	National Institute of Metrology Thailand (NIMT)
ID No.	Cert. No.	Due Date	Traceability
400033	22E569	22 Feb 2024	National Institute of Metrology Thailand (NIMT)

Approved by  
( Bunjerd Masri )  
Supervisor

The Uncertainties are for a confidence probability of approximately 95%  
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## Certificate of Calibration

**Certificate No. :** 65-400500-1 **Page : 2 of 2**

**Result of Calibration :** Without Adjustment  
**UUC Condition As-Received :** Good  
**Function :** Temperature measurement

Immersion Depth ( mm. )	Standard Reading ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ± °C )
100	25.004	24.9	0.1	0.19

**Remark**

**UUC : Unit Under Calibration**

This result of calibration was found accurate as shown on date and place of calibration only.  
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2$  ,  
providing a level of confidence of approximately 95%

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Certificate of Calibration

Certificate No. : 65-400503-1

Page : 1 of 2

Submitted by : M Green Group Co., Ltd.  
188/46 Wisatsuknakhon 25, Pracha-Utd Rd.,  
Thungkru, Bangkok 10140 Thailand

Equipment : Liquid in Glass Thermometer  
Manufacturer : N/A Model : N/A  
Range : 0 °C to 100 °C Resolution : 1 °C  
Serial No. : N/A Immersion : Total  
ID No. : 94-49747

Environment : Ambient Temperature : (23 ± 2) °C  
Relative Humidity : (50 ± 15) %  
Line Voltage : (220 ± 22) VAC

Date of Received : 21 September 2022  
Date of Calibration : 23 September to 26 September 2022  
Date of Issue : 26 September 2022  
Calibrated by : Chortip Samchusri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4001 based on ASTM E77-07 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)			Traceability
ID No.	Cert.No.	Due Date	National Institute of Metrology Thailand (NIMT)
400001	TT-0016-22	07 Feb 2024	
2. Standard Digital Thermometer			Traceability
ID No.	Cert.No.	Due Date	National Institute of Metrology Thailand (NIMT)
400003	21E1850	14 Jun 2023	
400004	21E1850	14 Jun 2023	National Institute of Metrology Thailand (NIMT)

Approved

Supervisor

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Certificate of Calibration

Certificate No. : 65-400503-1

Page : 2 of 2

Result of Calibration : Without Adjustment  
UUC Condition As-Received : Good  
Function : Temperature measurement

Ice point check : UUC\* reading 0 °C Standard reading 0.0327 °C

Standard Reading ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ± °C )
39.7131	40	-0.3	0.31

Remark

UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.  
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2 ,  
providing a level of confidence of approximately 95%

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Certificate of Calibration

Certificate No. : 65-300541-1

Page : 1 of 2

Submitted by : M Green Group Co.,Ltd.  
188/46 Wisatsuknakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Volumetric Flask  
Manufacturer : GLASSCO  
Capacity : 100 ml  
Class : A  
ID No. : VF100/01/19

Environment : Ambient Temperature : ( 23 ± 2 ) °C  
Relative Humidity : ( 50 ± 15 ) %  
Air Pressure : 1007.5 mbar.

Date of Received : 21 September 2022  
Date of Calibration : 26 September 2022  
Date of Issue : 26 September 2022  
Calibrated by : Arcerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

Reference Standard Instruments : This certification is traceable to the International System of Units

Electronic Balance			
ID.No.	Cert.No.	Due Date	Traceability
241005	65-200172-4	02 Dec 2022	National Institute of Metrology (Thailand) (NIMT)

Approved by :  
( Wipa Tovadee )  
Supervisor

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 Calibratech Co.,Ltd.



Certificate No. : 65-300541-1

Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C

UUC Condition As-Received : Good

Nominal Volume ( ml )	Measuring Volume ( ml )
100	100.081

Uncertainty of measurement with in ± 0.018 ml

This result of calibration was found accurate as shown on date and place of calibration only.

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

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## Certificate of Calibration

**Certificate No. :** 65-300541-2 **Page : 1 of 2**

**Submitted by :** M Green Group Co.,Ltd.  
188/46 Wisatsuknakhon 25, Pracha-Uttd Rd., Thungku, Bangkok 10140 Thailand

**Equipment :** Volumetric Flask

**Manufacturer :** GLASSCO **Class :** A

**Capacity :** 250 ml

**ID No. :** VF250/01/19

**Environment :** Ambient Temperature : ( 23 ± 2 ) °C

Relative Humidity : ( 50 ± 15 ) %

Air Pressure : 1007.4 mbar.

**Date of Received :** 21 September 2022

**Date of Calibration :** 26 September 2022

**Date of Issue :** 26 September 2022

**Calibrated by :** Areerat Sombun

**Calibration Method :** In-house method CAL-M3001 based on ASTM E 542-01

**Reference Standard Instruments :** This certification is traceable to the International System of Units

Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241002	65-200172-1	02 Dec 2022	National Institute of Metrology (Thailand) (NIMT)

**Approved by :**  ( Wipa Tovadee )  
Supervisor

## Certificate of Calibration

**Certificate No. :** 65-300541-2 **Page : 2 of 2**

**Result of Calibration :** This result of true Volume is referred to standard temperature at 20 °C

**UUC Condition As-Received :** Good

Nominal Volume ( ml )	Measuring Volume ( ml )
250	250.11

Uncertainty of measurement with in ± 0.049 ml

This result of calibration was found accurate as shown on date and place of calibration only.

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

-o0o-



## Certificate of Calibration

Certificate No. : 65-300541-3 Page : 1 of 2

Submitted by : M Green Group Co.,Ltd.  
188/46 Wisatsukhakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

Equipment : Volumetric Flask  
Manufacturer : GLASSCO Class : A  
Capacity : 1000 ml  
ID No. : VF1000/01/19


Environment : Ambient Temperature :  $(23 \pm 2)$  °C  
Relative Humidity :  $(50 \pm 15)$  %  
Air Pressure : 1007.4 mbar.

Date of Received : 21 September 2022  
Date of Calibration : 26 September 2022  
Date of Issue : 26 September 2022  
Calibrated by : Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

Reference Standard Instruments : This certification is traceable to the International System of Units

Electronic Balance  
ID No. Cert. No. Due Date Traceability  
241002 65-200172-1 02 Dec 2022 National Institute of Metrology (Thailand) (NIMT)

Approved by :  
  
( Wipa Tovadee )  
Supervisor

## Certificate of Calibration

Certificate No. : 65-300541-3 Page : 2 of 2

Result of Calibration : This result of true Volume is referred to standard temperature at 20 °C  
UUC Condition As-Received : Good

Nominal Volume ( ml )	Measuring Volume ( ml )
1000	1000.47

Uncertainty of measurement with in  $\pm$  0.14 ml  
This result of calibration was found accurate as shown on date and place of calibration only.  
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2.00$  ,  
providing a level of confidence of approximately 95%

-o0o -



### Certificate of Calibration

Certificate No. :

65-300541-4

Submitted by :

M Green Group Co.,Ltd.

Page : 1 of 2

188/46 Wisatsukunakhon 25, Pracha-Uth Rd., Thungkru, Bangkok 10140 Thailand

Equipment :

Cylinder

Manufacturer :

GLASSCO

Capacity :

250 ml

Class :

A

Graduation :

2 ml

ID No. :

CY25001/19

Environment :

Ambient Temperature : ( 23 ± 2 ) °C

Relative Humidity :

( 50 ± 15 ) %

Air Pressure :

1007.4 mbar.

Date of Received :

21 September 2022

Date of Calibration :

26 September 2022

Date of Issue :

26 September 2022

Calibrated by :

Areerat Sombun

Calibration Method : In-house method CAL-M3001 based on ASTM E 542-01

Reference Standard Instruments : This certification is traceable to the International System of Units

Electronic Balance

ID No.

241002

Cert. No.

65-200172-1

Due Date

02 Dec 2022

Traceability

National Institute of Metrology (Thailand) (NIMT)

Approved by :

( Wipa Tovadee )

Supervisor

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 Calibratech Co.,Ltd.

### Certificate of Calibration

Certificate No. :

65-300541-4

Result of Calibration :

This result of true Volume is referred to standard temperature at 20 °C

Page : 2 of 2

UUC Condition As-Received : Good

Nominal Volume ( ml )	Measuring Volume ( ml )
150	151.08
250	251.34

Uncertainty of measurement with in ± 0.087 ml

This result of calibration was found accurate as shown on date and place of calibration only.

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

- o0o -



## Certificate of Calibration

**Certificate No. :** 65-300541-5 **Page : 1 of 2**

**Submitted by :** M Green Group Co.,Ltd.  
188/46 Wisetuknakhon 25, Pracha-Utid Rd., Thungkru, Bangkok 10140 Thailand

**Equipment :** Measuring Pipette  
**Manufacturer :** GLASSCO **Class :** A  
**Capacity :** 10 ml **Graduation :** 0.1 ml  
**ID No. :** MP10/01/19

**Environment :** Ambient Temperature : (23 ± 2) °C  
Relative Humidity : (50 ± 15) %  
Air Pressure : 1002.7 mbar.

**Date of Received :** 21 September 2022  
**Date of Calibration :** 26 September 2022  
**Date of Issue :** 26 September 2022  
**Calibrated by :** Arcerat Sombun

**Calibration Method :** In-house method CAL-M3001 based on ASTM E 542-01

**Reference Standard Instruments :** This certification is traceable to the International System of Units

Electronic Balance

ID No.	Cert.No.	Due Date	Traceability
241005	65-200172-4	02 Dec 2022	National Institute of Metrology (Thailand) (NIMT)

**Approved by :**   
( Wipa Tovadee )  
Supervisor

## Certificate of Calibration

**Certificate No. :** 65-300541-5 **Page : 2 of 2**

**Result of Calibration :** This result of true Volume is referred to standard temperature at 20 °C

**UUC Condition As-Received :** Good

**Delivery Time :** 12.14 sec.

Nominal Volume ( ml )	Measuring Volume ( ml )
2	1.9942
5	4.9827
10	9.9888

Uncertainty of measurement with in ± 0.0039 ml

This result of calibration was found accurate as shown on date and place of calibration only.

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

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## Certificate of Calibration

**Certificate No. :** 65-300541-6 **Page : 1 of 2**

**Submitted by :** M Green Group Co.,Ltd.  
188/46 Wisetuekukhakhon 25, Pracha-Utd Rd., Thungkru, Bangkok 10140 Thailand

**Equipment :** Measuring Pipette  
**Manufacturer :** GLASSCO **Class :** A  
**Capacity :** 25 ml **Graduation :** 0.1 ml  
**ID No. :** MP25/01/19

**Environment :** **Ambient Temperature :** (23 ± 2) °C  
**Relative Humidity :** (50 ± 15) %  
**Air Pressure :** 1002.7 mbar.

**Date of Received :** 21 September 2022  
**Date of Calibration :** 26 September 2022  
**Date of Issue :** 26 September 2022  
**Calibrated by :** Areerat Sombun

**Calibration Method :** In-house method CAL-M3001 based on ASTM E 542-01

**Reference Standard Instruments :** This certification is traceable to the International System of Units  
Electronic Balance

ID No.	Cert. No.	Due Date	Traceability
241005	65-200172-4	02 Dec 2022	National Institute of Metrology (Thailand) (NIMT)

**Approved by :**  
( Wipa Tuvahee )  
Supervisor

## Certificate of Calibration

**Certificate No. :** 65-300541-6 **Page : 2 of 2**

**Result of Calibration :** This result of true Volume is referred to standard temperature at 20 °C

**UUC Condition As-Received :** Good

**Delivery Time :** 12.14 sec.

Nominal Volume ( ml )	Measuring Volume ( ml )
5	5.0254
15	15.0847
25	25.0413

Uncertainty of measurement with in ± 0.0067 ml

This result of calibration was found accurate as shown on date and place of calibration only.

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

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S K SALES AND SERVICE CO.,LTD.  
104/56, 104/57 Thadtham Rd, Samsat Dam  
Bang Kluai Thuan Bangkok 10150  
Tel : 02-417-2144 Fax : 02-417-2155



## Certificate of Calibration

Reference No. : 3484/2209-049  
Customer : M GREEN GROUP CO.,LTD  
Equipment : 188/46 Pracha-Utd Rd., Thungkru,  
Manufacturer : Bangkok 10140 Thailand  
Model : Incubator  
Serial No. : BIOBASE  
ID No. : KYP1502202003  
Received Date : 14 September 2022  
Calibrated Date : 14 September 2022  
Issued Date : 16 September 2022  
Environment :

	Minimum Value	Maximum Value
Ambient Temperature (°C)	25.1	25.8
Relative Humidity (% RH)	54	55
AC Line Voltage (VAC)	223	225

Place Of Calibration : Temperature Calibration Room  
Calibrated by : Mr. Teerasak Chaiyaporn

### Calibration Method

In-house method : SK-WI-23 base on Thai Laboratory Accreditation Scheme Publication Reference G-20

### Condition of this result of calibration

1. Reference standard instrument

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Data acquisition/Switch unit	34972A	MY44021731	L2205-1241	27 Nov 22
2) Multiplexer Module	34901A	MY41085938	L2205-1241	27 Nov 22

2. This result of calibration was found accurate as shown on date and place of calibration only

3. This certificate can be traceable to International System of Unit :

- Through Thailand Institute of Scientific and Technological Research (TISTR)

Approved by :

☒ Mr. Suphachai Saksi ☐ Mr. Phayak Toit ☐ Miss Tantaraporn Peitong

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

This certificate may not be reproduced other than in full except with the prior written approval of the S K Sales And Service Company Limited.

Certificate No. : S2209-3148

Page 2 of 2

Table1 General Information

Working Area (W*L*H)	45*42*84 cm
Fresh Air	OFF

Table2 Chamber Performance

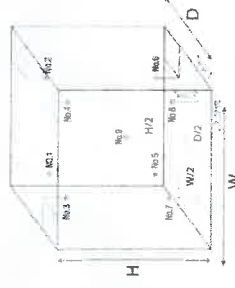
Setting Temperature (°C)	Average Indicating Temperature (°C)	Measured Stability (± °C)	Measured Uniformity (°C)	Overall Variation (°C)
20.0	20.0	0.96	0.55	1.92

Table3 Temperature Distribution

Setting Temperature (°C)	Average Standard Reading (°C)									Uncertainty (± °C)
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	
20.0	19.78	19.72	19.84	19.70	19.80	19.63	19.79	19.66	19.82	1.3

Resolution : 0.1 (°C)

\* Probe No. 9 is Reference Probe



- Notes :
1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.
  2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time
  3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.
  4. The reported uncertainty of measurement were excluded Uniformity and Stability

\*\* End of Calibration Report \*\*



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SIUANLUANG, SIUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-4384



Cert.No.: 22CG4889  
Page.: 1 of 2

## Certificate of Calibration

Equipment : Burette  
Capacity : 25 mL  
Serial No. :  
ID. No. : 2212-0344-2  
Manufacturer : Glassco  
Made in :  
Submitted by : M GREEN GROUP CO., LTD.  
188/46 Precha-Uthid Rd., Thungkru  
Bangkok 10140 Thailand  
Ambient Temperature :  $(20 \pm 2.5) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 10) \%$   
Barometric Pressure : 759 mmHg  
Calibration Procedure : ASTM E 542 - 01  
Calibrated by : Panward Pramkiam

Approved by :

( ) Pornthippa Tameyakul  
( ) Malee Butkruea  
( ) Ponpan Paipim  
( ) Srisuda Khamtha

Issue Date : 16 December 2022

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.



Equipment : Burette  
Received Date : 13 December 2022  
Condition As-Received : New Item  
Calibration Date : 15 December 2022  
Reference : 2212-0344WN-2

Cert.No.: 22CG4889  
Page.: 2 of 2

### Condition of this result of calibration

#### 1. Reference Standard Instruments :

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
1) Balance	MS204TS	C226356983	140RC010	TH2068-012	METTLER	29 Sep 2023
2) Thermo-Hygrograph	THDX-CE	00016540	140EC001	22H1243	NIST NIMT	09 June 2023
3) Thermometer	-	1594592	140EC010	22H181	NIMT	10 Feb 2023

This certification is traceable to SI Unit

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

3. True value is converted to true volume at the standard temperature of  $20 ^\circ\text{C}$

#### Calibration result :

Nominal capacity ( mL )	Reading ( mL )	Uncertainty ( $\pm$ mL )	k Factor
25	24.9569	0.0065	2.00

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

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 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
53/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL: 0-2717-3000-27 FAX: 0-2719-9484



Cert.No.: 22CG4888  
Page.: 1 of 2

## Certificate of Calibration

Equipment : Burette  
Capacity : 10 mL  
Serial No. : -  
ID. No. : 2212-0344-1  
Manufacturer : Glassco  
Made in : -  
Submitted by : M GREEN GROUP CO., LTD.  
188/46 Precha-Utid Rd., Thungkru  
Bangkok 10140 Thailand  
Ambient Temperature :  $(20 \pm 2.5) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 10) \%$   
Barometric Pressure : 759 mmHg  
Calibration Procedure : ASTM E 542 - 01  
Calibrated by : Panward Pramklam

Approved by :

( ) Pornthippa Tameyakul  
( ) Malee Bulkruea  
( ) Ponpan Paipim  
( ) Srisuda Khamtha

Issue Date :

16 December 2022

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.



Equipment : Burette  
Received Date : 13 December 2022  
Condition As-Received : New Item  
Calibration Date : 15 December 2022  
Reference : 2212-0344WN-1  
Cert.No.: 22CG4888  
Page.: 2 of 2

### Condition of this result of calibration

1. Reference Standard Instruments :
- | Instruments          | Model   | Serial No. | ID. No.  | Certificate No. | Traceability | Due date     |
|----------------------|---------|------------|----------|-----------------|--------------|--------------|
| 1) Balance           | MS204TS | C226356983 | 140RC010 | TH2068-012      | METTLER      | 29 Sep 2023  |
| 2) Thermo-Hygrograph | THDX-CE | 00016540   | 140EC001 | 22H1243         | NIST,NIMT    | 09 June 2023 |
| 3) Thermometer       | -       | 1594592    | 140EC010 | 221181          | NIMT         | 10 Feb 2023  |
- This certification is traceable to SI Unit
2. The certificate is valid only to the item calibrated on date and place of calibration.
3. True value is converted to true volume at the standard temperature of  $20 ^\circ\text{C}$

### Calibration result :

Nominal capacity ( mL )	Reading ( mL )	Uncertainty ( $\pm$ mL )	$k$ Factor
10	9.9867	0.0038	2.00

Remark mL =  $\text{cm}^3$

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 %.

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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  
ID No : EQL-190  
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 P.  
CALIBRATION DATE : 13-Feb-23

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



CERTIFICATE No : 23T1387

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

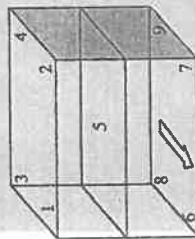
### CONDITION OF THIS RESULTS OF CALIBRATION

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.

### 2. REFERENCE STANDARD INSTRUMENTS :-

- INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE :  
1) DATA LOGGER WITH RTD : HYDRA 2635A : 6635300 : 22T7509 : 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 : 5  
Overall Line Voltage (V) variation : 8  
Instrument Condition : Normal  
Chamber Size (W\*H\*D) : 56\*40\*48 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)
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

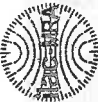
Controller Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
	#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
37.0	36.97	36.95	36.94	36.96	36.94	36.92	36.91	36.90	36.84	0.25
44.0	44.21	44.23	44.09	44.23	44.23	44.13	44.21	44.15	44.07	0.36

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 : 23T1386  
REFERENCE No : 68174-4

PAGE : 1 OF 2

## 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 : PRASERT P.  
CALIBRATION DATE : 13-Feb-23

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



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  
SN : D518.0082  
CALIBRATION DATE : 13-Feb-23  
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

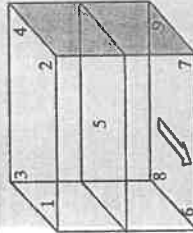
### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ILS 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 :-

- 1) DATA LOGGER WITH RTD : MODEL : HYDRA 2655A : SERIAL No : 6635300 : CERTIFICATE No : 22T7509 : DUE DATE : 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



### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 2
Overall Line Voltage (V) variation : 9
Instrument Condition : Normal
Chamber Size (W*L*H): 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)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations										Uncertainty (± °C)
		#1	#2	#3	#4	#5	#6	#7	#8	#9		
35.0	35.0	34.91	34.94	34.93	34.93	35.03	35.08	35.01	35.08	35.08		0.25
36.0	36.0	35.93	35.95	35.95	35.94	36.00	36.05	36.10	36.01	36.10		0.25
41.5	41.5	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 MULTIPLIED BY A COVERAGE FACTOR k = 2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



CERTIFICATE No : 23T1385  
REFERENCE No : 68174-3

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
SERIAL No : D518.0240  
No : EQL-218  
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 P.  
CALIBRATION DATE : 13-Feb-23

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



CERTIFICATE No : 23T1385

PAGE : 2 OF 2

## Calibration Report

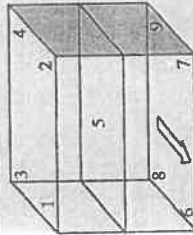
EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
ID No : EQL-218  
RECEIVED DATE : 13-Feb-23  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
SN : D518.0240  
CALIBRATION DATE : 13-Feb-23  
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

### 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 :-

- 1) DATA LOGGER WITH RTD : HYDRA 2653A  
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 CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.  
RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 2  
Overall Line Voltage (V) variation : 12  
Instrument Condition : Normal  
Chamber Size (W\*L\*H): 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	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	35.10	34.94	35.04	35.05	35.05	0.25
36.0	35.94	35.97	35.92	35.96	36.11	35.95	36.05	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





CERTIFICATE No : 23T1384  
REFERENCE No : 68174-2

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
SERIAL No : D519,0140  
ID No : BQL-231

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 P.  
CALIBRATION DATE : 13-Feb-23

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



CERTIFICATE No : 23T1384

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : IF 160  
ID No : BQL-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

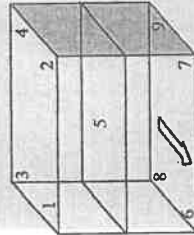
### CONDITION OF THIS RESULTS OF CALIBRATION

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.

### 2-REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER WITH RTD HYDRA 2635A
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 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	34.92	35.02	34.99	35.01	35.04	35.03	35.06	35.09	35.10	0.25
37.0	37.0	37.00	36.99	36.95	36.95	37.00	37.02	37.09	37.07	37.11	0.25
41.5	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 MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



CERTIFICATE No : 23T1391  
REFERENCE No : 68175-1

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : AUTOCLAVE  
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 : PRASERT P.  
CALIBRATION DATE : 13-Feb-23

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.



CERTIFICATE No : 23T1391

PAGE : 2 OF 2

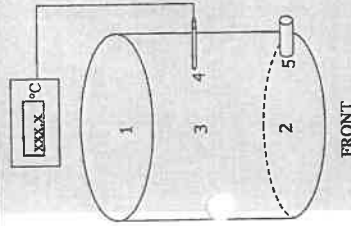
## Calibration Report

EQUIPMENT : AUTOCLAVE  
MANUFACTURER : HIRAYAMA  
ID NUMBER : EQL-155  
RECEIVED DATE : 13-Feb-23  
AMBIENT TEMPERATURE : 30° C ± 1° C  
MODEL : HVE-50  
SERIAL NUMBER : 30612085166  
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. A. REFERENCE STANDARD INSTRUMENTS :
  - 1) DATA LOGGER VALPROBE S350, DV35, DN94
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

FRONT

### TEMPERATURE MEASUREMENT ACCURACY TEST(° C)

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

END OF CALIBRATION REPORT



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



REC-18-18-18-18-18  
CALIBRATION 1000

## Certificate of Calibration

Certificate No. : 23M259  
Page : 1 of 2

Equipment : Standard Weight

Manufacturer: LS

Model :

Serial No.:

ID No.: EQL-121

Condition As-Received: Used Item

Received Date: 02 February 2023

Calibration Date: 07 February 2023

Reference: 2302-0080DN

Ambient Temperature: ( 23 ± 2 ) °C

Relative Humidity: ( 50 ± 16 ) %

Atmospheric Pressure: 1008.9 mbar

Procedure used:

Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method against standard weights on the basis of weighings at an average air density of 1.2 kg/m<sup>3</sup> and a temperature of 23.4 °C material density of weight is 8000 kg/m<sup>3</sup>.

Condition of this result of calibration

1. Reference standards instruments :

Instrument

Model

Serial No.

Certificate No.

Due Date

1) Standard weight Set (E2)

YCS31-712-00

50202965

MM-0109-22

11 Jul 2024

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Chaowalit Ritirak  
Issue Date : 08 February 2023

Approved Signatory :

[ ] Phalinee Prabpaipal

[x] Sura Suwanmasri

[ ] Chaowalit Ritirak



Result of calibration Without adjustment

Nominal Value	Conventional mass	Uncertainty of Measurement (±)	Maximum Permissible error (±)
50 g	50.00015 g	0.10 mg	0.30 mg

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

-o0o-



CERTIFICATE No : 22T7648  
REFERENCE No : 65843-2


PAGE : 1 OF 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 : PRASERT P.  
CALIBRATION DATE : 14-Jul-22

APPROVED BY :   
ISSUED DATE : 15-Jul-22  
RECEIVED DATE : 14-Jul-22

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



CERTIFICATE No : 22T7648

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
ID NUMBER : EQL-147  
RECEIVED DATE : 14-Jul-22  
AMBIENT TEMPERATURE : 24 °C ± 1 °C  
MODEL : WPE 45  
SERIAL NUMBER : L711.0024  
CALIBRATION DATE : 14-Jul-22  
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  
INSTRUMENT MODEL 2625A  
SERIAL No 6603614  
CERTIFICATE No 22T7514  
DUE DATE 05-Jul-23

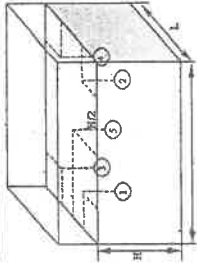
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

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



PROBE INSTALLATION  
POSITION IN THE BATH

### BATH PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
41.5	41.5	41.5	41.54	0.05	0.03	0.12
44.5	44.5	44.5	44.50	0.07	0.02	0.15

### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations				Uncertainty (± °C)
		#1	#2	#3	#4	
41.5	41.5	41.54	41.55	41.52	41.55	0.14
44.5	44.5	44.48	44.51	44.50	44.50	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 QC 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





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



NIST-TEST/1625  
CALIBRATION MARK

## Certificate of Calibration

Certificate No. : 23M260  
Page : 1 of 2

Equipment: Standard Weight  
Manufacturer: -  
Model: -  
Serial No.: -  
ID No.: EQL-258  
Condition As-Received: Used Item  
Received Date: 02 February 2023  
Calibration Date: 07 February 2023

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.

Reference: 2302-0080DN  
Submitted by: TEST TECH CO.,LTD. (HEAD Office)  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Atmospheric Pressure: 1012 mbar  
30, 32 Rama II Soi 63, Rama II Rd.,  
Samaedam, Bangkhuntian, Bangkok 10150

Procedure used: Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method  
against standard weights on the basis of weightings at an average air density of 1.2 kg/m<sup>3</sup> and a temperature  
of 23.6 °C material density of weight is 8000 kg/m<sup>3</sup>.

### Condition of this result of calibration

1. Reference standards instruments :

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

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Chaowalit Ritirak  
Issue Date : 08 February 2023

Approved Signatory :

[ ] Phalinee Prebpaipat  
[x] Sura Suwamasri  
[ ] Chaowalit Ritirak

B 0307756

a 1146232



Cert No.: 23M260  
Page: 2 of 2

### Result of calibration

Without adjustment

Nominal Value	Conventional mass	Uncertainty of Measurement ( ± )	Maximum Permissible error ( ± )
2 kg	2.0000034 kg	3.0 mg	10 mg

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

-o0o-



# Metrological Center

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



NSC-TISI-TIS 17025  
CALIBRATION 0244

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 : Sujjar Naknakred ( Site Calibration Manager )  
Approved By : [Redacted] onchai Suriyawong (Site Calibration Manager)  
Date of Issue : [Redacted]

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

FM-L15117/15-05-63



Metrological Center  
SCI ECO Services Company Limited  
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Sarabun 18110, Thailand.

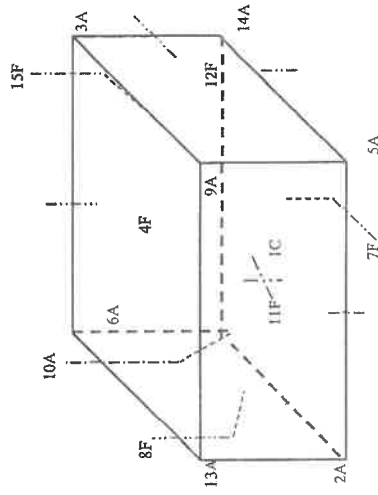


NSC-TIS/ITS 17025  
CALIBRATION 0244

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



FM-L15 11/15-05-63



Metrological Center  
SCI ECO Services Company Limited  
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Sarabun 18110, Thailand.



NSC-TIS/ITS 17025  
CALIBRATION 0244

Certificate No. T230022

Page 4 of 4

## Calibration Report

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 (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	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



FM-L15 11/15-05-63



## Metrological Center

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



NSC-TISI-TIS 17025  
CALIBRATION 0244

Certificate No. T230121

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., Sanaedam,

Bangkhunthian Bangkok 10150

Customer Location : LABORATORY FLOOR 4

Date of Receipt : 26 January 2023

Calibrated By : Sujjar Naknakred ( Site Calibration Manager )

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

Date of Issue : \_\_\_\_\_

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. 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	TI150	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

FM-L15117/15-05-63

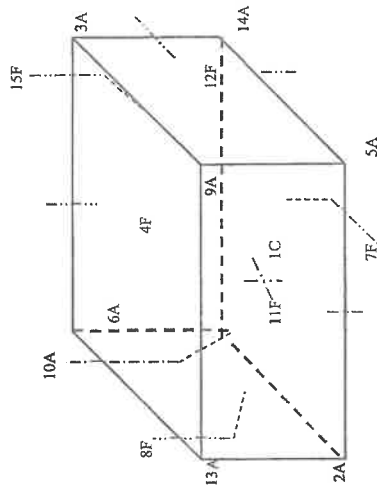




Certificate No. T230121

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



FM-L15 11/715-05-63



Certificate No. T230121

Page 4 of 4

## Calibration Report

### Measurement Results:

Average Standard Reading at each position (°C)										
Calibration Point	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				
S g (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min, Max	Average					
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



FM-L15 11/715-05-63



## Certificate of Calibration

Certificate No. : 22H2187  
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer  
Manufacturer: Barigo  
Model :  
Serial No.:  
ID No.: EQL-064  
Condition As-Received: Used item  
Received Date: 17 October 2022  
Calibration Date: 25 October 2022  
Reference: 2210-0461DN  
Ambient Temperature: ( 25 ± 3 ) °C  
Relative Humidity: ( 50 ± 20 ) %

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.

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

30, 32 Rama II Soi 63, Rama II Rd.,  
Samaedam, Bangkokkhunthian, 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) Chilled-Mirror Hygrometer	Dew Master	41282	19848	03 Nov 2022
2) Handheld Thermometer With Sensor	1523	3240076	221249	02 Mar 2023

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

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

- National Institute of Standards and Technology (NIST) , The United States of America
- National Institute of Metrology Thailand (NIMT)

Calibrated by : Surasit Phansudnol  
Issue Date : 01 November 2022

Approved Signatory :

[✓] Chakrit Waiwanjua  
[ ] J Porntippa Tameyakul  
[ ] Vipom Tantiyawutti



Cert. No.: 22H2187  
Page.: 2 of 2

Result of Calibration:-  
Function:

Reference Temperature (°C)	Humidity Standard (%R.H.)	Without Adjustment UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	30.1	29.0	-1.1	1.5
25.0	40.1	39.0	-1.1	1.5
25.0	50.1	50.0	-0.1	1.7
25.0	60.0	61.0	1.0	1.7
25.0	75.2	76.5	1.3	1.7

Result of Calibration:-  
Function:

Standard Temperature (°C)	Without Adjustment UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
15.013	15.0	-0.013	0.72
20.023	20.0	-0.023	0.72
25.019	25.0	-0.019	0.72
30.009	30.0	-0.009	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%.

-000-




CERTIFICATE No : 22M9915  
REFERENCE No : 66549-2

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE  
MANUFACTURER : SARTORIUS  
MODEL : BP2108  
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 P.  
CALIBRATION DATE : 15-Sep-22  
APPROVED BY :   
ISSUED DATE : 21-Sep-22  
RECEIVED DATE : 15-Sep-22

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



CERTIFICATE No : 22M9915

PAGE : 2 OF 2

## Calibration Report

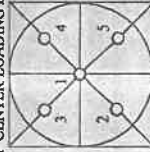
EQUIPMENT : DIGITAL BALANCE  
MANUFACTURER : SARTORIUS  
MODEL : BP2108  
ID No : EQL-008  
AIR PRESSURE : 101 Inbar ± 1 inbar  
AMBIENT TEMPERATURE : 21° C ± 1° C  
RELATIVE HUMIDITY : 51 %RH ± 10 % RH  
CONDITION OF THIS RESULTS OF CALIBRATION  
1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT  
STANDARD WEIGHT. THE BALANCE WAS 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 MODEL SERIAL No CERTIFICATE No DUE DATE  
1) STANDARD WEIGHT SET E2 QK-4-151 C02210415 09-Feb-23  
2) STANDARD WEIGHT E2 15843 C02210419 10-Feb-23  
3) STANDARD WEIGHT E2 QK-4-349 M21032358 26-Mar-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

- ZERO SETTING FUNCTION : NORMAL
- TARE FUNCTION : NORMAL
- REPEATABILITY OF READING AT 200 g WAS 0.000063 g
- DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (± g)
0.00	0.0000	0.0000	0.000090
0.10	0.1000	0.0000	0.000090
0.20	0.2000	0.0000	0.000090
0.50	0.5000	0.0000	0.000091
1.00	1.0000	0.0000	0.000091
2.00	2.0000	0.0000	0.000092
5.00	5.0000	0.0000	0.000093
10.00	10.0000	0.0000	0.000095
20.00	19.9999	0.0001	0.00010
50.00	49.9998	0.0002	0.00012
100.00	99.9998	0.0002	0.00019
200.00	199.9993	0.0007	0.00032

### 5. OFF-CENTER LOADING ERROR



POINT	READING (g)
1	99.9997
2	99.9996
3	99.9995
4	99.9997
5	99.9998
OFF-CENTER LOADING	0.0002

6. INTERNAL WEIGHT ERROR -0.000066666666666667 g  
NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT PRODUCTION AREA  
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY  
COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.  
END OF CALIBRATION REPORT



CERTIFICATE No : 22T9917  
REFERENCE No : 66549-4

PAGE : 1 OF 2

## Certificate of Calibration

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

CALIBRATED BY : CHAICHARN CH.  
CALIBRATION DATE : 15-Sep-22

APPROVED BY :   
ISSUED DATE : 21-Sep-22  
RECEIVED DATE : 15-Sep-22

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



CERTIFICATE No : 22T9917

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : HOT AIR OVEN  
MANUFACTURER : MEMMERT  
MODEL : UFE 500  
ID No : EQL-128  
RECEIVED DATE : 15-Sep-22  
AMBIENT TEMPERATURE : 25 °C ± 1 °C  
S/N : G508.0791  
CALIBRATION DATE : 15-Sep-22  
RELATIVE HUMIDITY : 51 %RH ± 10 %RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLA5 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 PROBE AT THE SAME TIME.

### 2. REFERENCE STANDARD INSTRUMENTS :-

- INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE
- 1) DATA LOGGER WITH RTD HYDRA 2635A 6635300 22T7509 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

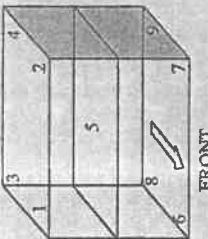
#### GENERAL INFORMATION

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\*48 cm



#### CHAMBER PERFORMANCE

Calibrate Point (°C)	Average All Position Temp. (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	104.32	0.15	0.62	1.02
180.0	180.09	0.29	1.23	1.86

#### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Indicating		Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	#5	#6	#7	#8	#9	
Temp (°C)	Temp (°C)	104.23	103.89	104.54	104.02	104.33	104.63	104.42	104.48	104.39	0.38
180.0	180.0	180.16	179.13	180.46	179.35	179.79	180.66	180.36	180.29	180.61	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





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



CERTIFICATE No : 22T9918  
REFERENCE No : 66549-5

PAGE : 1 OF 2

## Certificate of Calibration

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

CALIBRATED BY : CHAICHARN CH.  
CALIBRATION DATE : 15-Sep-22

APPROVED BY :   
ISSUED DATE : 21-Sep-22  
RECEIVED DATE : 15-Sep-22

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, Lakson, Bangkok, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 22T9918

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : HOT AIR OVEN  
MANUFACTURER : MEMMERT  
MODEL : UFE 500  
ID No : EQL-161  
RECEIVED DATE : 15-Sep-22  
AMBIENT TEMPERATURE : 25 °C ± 1 °C  
SERIAL No : G512.2005  
CALIBRATION DATE : 15-Sep-22  
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.

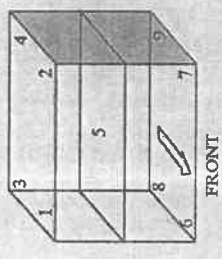
REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER WITH RTD  
2) HYDRA 2635A  
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 (°C) variation : 1  
Overall Line Voltage (V) variation : 8  
Instrument Condition : Normal  
Chamber Size (W\*L\*H): 56\*40\*48 cm



CHAMBER PERFORMANCE				Temperature Uniformity				Overall Variation (°C)
Calibrate Point (°C)	Average All Position Temp. (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	
104.0	103.98	0.12	0.91	0.12	0.91	0.12	0.91	1.00
120.0	119.98	0.13	1.06	0.13	1.06	0.13	1.06	1.13
140.0	140.09	0.13	1.35	0.13	1.35	0.13	1.35	1.39
150.0	150.03	0.14	1.38	0.14	1.38	0.14	1.38	1.49

### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Indicating Temp (°C)		Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
104.0	104.0	104.07	104.09	104.21	103.93	103.58	103.79	103.99	103.78	104.56	0.38
120.0	120.0	120.03	120.13	120.34	119.94	119.53	119.69	119.71	120.48	120.48	0.38
140.5	140.5	140.15	140.15	140.44	140.10	139.56	139.74	140.03	139.80	140.72	0.46
150.5	150.5	150.04	150.25	150.54	150.35	149.46	149.55	149.83	149.60	150.67	0.46

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 of Calibration

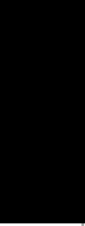
Equipment: TURBIDIMETER  
Model: 2100N  
Serial No. (or ID.): 970400003415 (EQL-024)  
Manufacturer: HACH  
Condition: In Condition  
Certificate No.: C08220157  
Issued Date: 21 September 2022  
Job No.: KSPR2211615  
Page: 1 of 2

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

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

Calibration Place: Environment Laboratory, DKSH Technology Limited.  
1194 Soi Wachirathansathit 57, Sukhumvit 101/1 Rd.,  
Bangchak, Prakhonong, Bangkok 10260 Thailand

Calibration By: Mr.Wasan Nuchmahee  
Calibration Date: 21 September 2022  
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 StabCal accepted by United States Environmental Protection Agency (EPA) through Hach Company Certificate No. A1075 , A1074 , A1091 , A1074 , A1074



(Mr. Wasan Nuchmahee)  
Person in charge  
(Mr. Thalemgkeat Pongngam)  
Authorized signatory

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.

DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok, Thailand 10260  
Phone: +66 2838 7000 Email: info@dksh.com Website: www.dksh.com

Delivering Growth - in Asia and Beyond.

CAL-FM-C08-08: 20 Jul 2022



Certificate No.: C08220157

Page 2 of 2

### Calibration Results:

#### Before Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.060	0.048	0.012	0.0004	0.070
20.40	20.1	0.30	0.05	1.0
206.0	204	2.0	0.5	10
1020.0	1013	7.0	1.2	50
4065.0	3875	190.0	1.8	200

#### After Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.060	0.057	0.003	0.0015	0.070
20.40	20.5	-0.10	0.04	1.0
206.0	206	0.0	0.5	10
1020.0	1018	2.0	0.5	50
4065.0	4064	1.0	0.5	200

The End of Certificate



DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok, Thailand 10260  
Phone: +66 2838 7000 Email: info@dksh.com Website: www.dksh.com

Delivering Growth - in Asia and Beyond.

CAL-FM-C08-08: 20 Jul 2022

## การดูแลบำรุงรักษาเชิงป้องกัน

### Preventive Maintenance



๗15

ใบรับรองการทวนสอบ “เครื่องกลั่นในโตรเจน”  
(Calibration Certificate of Distillation Unit VAPODEST  
VAP20, VAP30s)



บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด

ฝ่ายบริการหลังการขาย

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## เงื่อนไขการให้บริการ Preventive Maintenance

บริษัทฯ จะส่งวิศวกรชำนาญ เพื่อให้บริการตามขอบข่ายของการบริการ เฉพาะ ในวันและเวลา ราชการ หากมีความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์-อาทิตย์ หรือวันหยุด นักชดเชย) บริษัทฯ จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

### ขอบข่ายการบริการ

- ตรวจสอบสภาพการทำงานต่างๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายการผลการตรวจสอบเครื่องมือ

### หมายเหตุ

- ราคาไม่รวมถึงค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้รับบริการอุดหนุนออกเช็คคืนที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าจ้าง ขนส่งคืน ได้แก่ ค่าเดินทาง เป็นต้น
- บริษัทฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงราคา โดย ไม่แจ้งให้ทราบล่วงหน้า

## ช่องทางการติดต่อ



DKSH Technology Limited (บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด)  
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เลขประจำตัวผู้เสียภาษี 010-555-001-4547 (สำนักงานใหญ่)



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@dkshscientific



JOB No: Lsp2302591..... MODEL: Vap30..... SN: 003718

Preventive Maintenance Contract

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

รายละเอียดผู้ให้บริการ

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

ผู้ติดต่อ

ชื่อ - นามสกุล	คุณปริษา วิเศษสังข์		
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โทรศัพท์	0-2893-4211-7	เบอร์ติดต่อ	แฟกซ์ 0-2893-4218
E-mail	Lab_center@testtech.co.th		

รายละเอียดผู้ให้บริการ

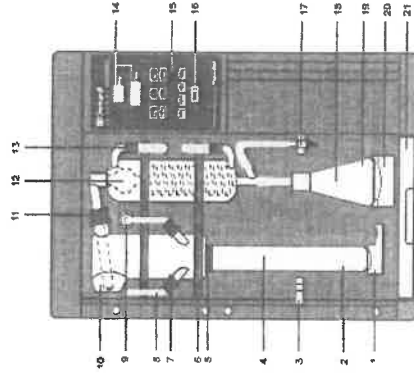
บริษัท ลีเคอซอช เทคโนโลยีส์ จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่) เลขที่ 2533 ถนนสุขุมวิท แขวงบางนา เขตพระโขนง กรุงเทพฯ 10260 โทรศัพท์ 0 2 693 7000 Email: siriporn.sv@dksh.com Line ID : siriporn3007 เจ้าหน้าที่ประสานงาน : อุมสรวร อุทุมมจุฑา โทรศัพท์ 090 678 6924, 02 301 7467			
เจ้าหน้าที่ให้บริการ	นายจิรายุช ผลธาด		
ตำแหน่ง	Specialist, Technical Service.		
โทรศัพท์	0938138736	แฟกซ์	-
E-mail	Jirayut.j@dksh.com		

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

Part : Operational Qualification (OQ)

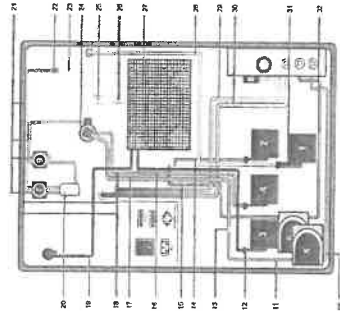
ตรวจสอบสภาพเครื่อง

FRONT



Pass	Fail	N/A	Remark
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	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. PTFP-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. PTFP-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

REAR



	Pass	Fail	N/A	Remark
1. Diaphragm pump NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
2. Diaphragm pump H <sub>2</sub> BO <sub>3</sub>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	vap 40 only
3. Diaphragm pump H <sub>2</sub> O for steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
4. Diaphragm pump H <sub>2</sub> O for sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input 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 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"/>	vap 30,40 only
11. Verprene-tubing 4x8 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
12. Non-return valve for diaphragm pumps	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	vap 30,40 only
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 checked="" 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 type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	option

## รายละเอียดการตรวจสอบ

### ขั้นตอนการบริการ

#### ตรวจสอบระบบไฟฟ้า (Electrical Test)

- ความดันพ่นทางไฟฟ้าของเครื่องกับกราวด์
- กระแสไฟฟ้าที่ใช้งาน

#### ตรวจสอบสภาพเครื่อง (Optical Test)

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

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

- ระบบสร้างและควบคุมความดันของ Steam
- ระบบการเติมน้ำ Sample Tube
- ระบบการเติม Na OH
- ระบบการ Suction ค้าง Sample Tube และ Receiver

แบบทดสอบการใช้งาน

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 .....  
.....  
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.....  
.....  
.....  
.....  
.....

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>3</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 H<sub>3</sub>BO<sub>3</sub>

- Non-Return Valve

Pump Suction

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

6. The Following Program Run :

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

Addition NaOH 0-99 sec.

Addition H<sub>3</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 .....  
.....  
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.....  
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.....  
.....

Remark :

.....  
.....

Part : ข้อมูลสนับสนุนเทคนิค (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 continuously surveys all the functions of the distillation system. As soon as an error is detected it is shown on the display and accompanied by an acoustic signal.

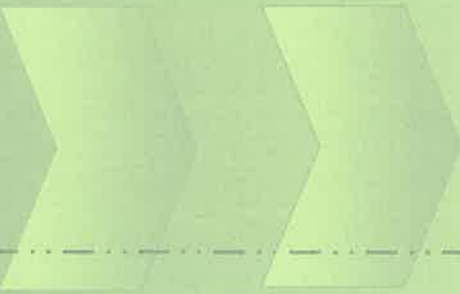
Error message	Measures
No tap water	Check cooling water inlet for blockages. Ensure the tap is turned on
No sample tube	Insert tube
Check chemicals	Check set of tanks
Low water Press Enter	Check the water inlet distilled $H_2O$
Filling Steam generator	This message disappears as soon as steam generator 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. > 1 min 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



ภาคผนวก ซ.

กฎหมายที่เกี่ยวข้อง