

ภาคผนวกที่ 4

---

สรุปเอกสารสอบเทียบอุปกรณ์เครื่องมือ

เอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำ

## Certificate of Calibration

**Certificate No. :** 67-420018-1

**Page : 1 of 2**

**Submitted by :** C.E.M Technology (Thailand) Co., Ltd.

219/43 Moo.12 Petchkasem Rd, Omnoi, Krathumban, Samutsakorn 74130 (Head Office)

**Equipment :** pH Meter with electrode

pH meter

Manufacturer : Thermo Scientific Model : VERSA STAR PRO

Range : N/A pH Resolution : 0.01 pH

Serial No. : 12260 ID No. : WW-03-001

Electrode

Model : 9156BNWP Serial No. : VV1-15843

ID No. : WW-03-001

**Environment :** On site calibration was carried out at the Laboratory, C.E.M Technology (Thailand) Co., Ltd.

Ambient Temperature : (23.0 to 24.0)°C

Relative Humidity : (50 to 55) %

**Date of Received :** 10 February 2024

**Date of Calibration :** 10 February 2024

**Date of Issue :** 15 February 2024

**Calibrated by :** Permpoon Chanpu

**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-00307/66	23 Aug 2025	National Institute of Metrology Thailand (NIMT)

### 2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61293328	944535	27 Nov 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.986	61281486	944537	17 Nov 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
9.997	61281073	944536	17 Nov 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :

( Surachai Promthong )

Laboratory Manager

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. : 67-420018-1**

**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	177.4	0.1	0.12
	0.0000	7	7.00	0.0	0.0	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	0.0097
	6.986	7.00	-0.01	0.011
	9.997	10.01	-0.01	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%

- 000 -





## Certificate of Calibration

**Certificate No. :** 67-400074-1

**Page : 1 of 2**

**Submitted by :** C.E.M Technology (Thailand) Co.,Ltd.  
219/43 Moo.12 Petchkasem Rd, Omnoi, Krathumban, Samutsakorn 74130 (Head Office)

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

Manufacturer : Thermo Scientific Model : VERSA STAR PRO

Range : N/A °C Resolution : 0.1 °C

Serial No. : 12260 ID No. : WW-03-001

Thermistor probe

Model : N/A Sheath Material : Stainless

Diameter : 6.5 mm. Length : 120 mm.

Serial No. : PT1-18812 ID No. : WW-03-001

**Environment :** On site calibration was carried out at the Laboratory, C.E.M Technology (Thailand) Co., Ltd.

Ambient Temperature : (23.0 to 24.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (224.5 to 226.0) VAC

**Date of Received :** 10 February 2024

**Date of Calibration :** 10 February 2024

**Date of Issue :** 15 February 2024

**Calibrated by :** Permpon Chanpu

**Calibration Method :** This instrument was calibrated by In-house method comparison technique CAL-M4003 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)

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

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400033	22E569	22 Feb 2024	National Institute of Metrology Thailand (NIMT)

Approved by :



( Surachai Promthong )

Laboratory Manager

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. : 67-400074-1**

**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 )
120	25.002	25.0	0.0	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%

- ๐0๐ -

AD



## Certificate of Calibration

**Certificate No. :** 67-420018-3

**Page : 1 of 2**

**Submitted by :** C.E.M Technology (Thailand) Co., Ltd.

219/43 Moo.12 Petchkasem Rd, Omnoi, Krathumban, Samutsakorn 74130 (Head Office)

**Equipment :** pH Meter with electrode

pH meter

Manufacturer : Apera

Model : PC 910

Range : N/A

pH

Resolution : 0.01 pH

Serial No. : PC910X1220811001

ID No. : WW-03-002

Electrode

Model : LabSen 211

Serial No. : 2110009/213

ID No. : WW-03-002

**Environment :** On site calibration was carried out at the Laboratory, C.E.M Technology (Thailand) Co., Ltd.

Ambient Temperature : (23.0 to 24.0)° C

Relative Humidity : (50 to 55) %

**Date of Received :** 10 February 2024

**Date of Calibration :** 10 February 2024

**Date of Issue :** 15 February 2024

**Calibrated by :** Permpon Chanpu

**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

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
400005	SG-E-00307/66	23 Aug 2025	National Institute of Metrology Thailand (NIMT)

### 2. Standard Buffer Solution

<u>pH</u>	<u>Cert. No.</u>	<u>Lot No.</u>	<u>Exp. Date</u>	<u>Traceability</u>
4.008	61293328	944535	27 Nov 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.986	61281486	944537	17 Nov 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
9.997	61281073	944536	17 Nov 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :

( Surachai Promthong )

Laboratory Manager

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. : 67-420018-3**

**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	0	0.59
	0.0000	7	7.00	0	0	0.58
	-177.4800	10	10.00	-178	1	0.59

**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	4.00	0.00	0.010
	6.986	7.00	-0.01	0.011
	9.997	10.01	-0.01	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 measurment was based on a standard uncertainty multiplied by a coverage factor  $k = 2$  ,  
providing a level of confidence of approximately 95%

- 000 -



## Certificate of Calibration

**Certificate No. :** 67-400074-2

**Page : 1 of 2**

**Submitted by :** C.E.M Technology (Thailand) Co.,Ltd.

219/43 Moo.12 Petchkasem Rd, Omnoi, Krathumban, Samutsakorn 74130 (Head Office)

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

Manufacturer : Apera Model : PC 910

Range : N/A °C Resolution : 0.1 °C

Serial No. : PC910X1220811001 ID No. : WW-03-002

Thermistor probe

Model : N/A Sheath Material : Stainless

Diameter : 4.8 mm. Length : 100 mm.

Serial No. : N/A ID No. : WW-03-002

**Environment :** On site calibration was carried out at the Laboratory, C.E.M Technology (Thailand) Co., Ltd.

Ambient Temperature : (23.0 to 24.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (224.5 to 226.0) VAC

**Date of Received :** 10 February 2024

**Date of Calibration :** 10 February 2024

**Date of Issue :** 15 February 2024

**Calibrated by :** Permpoon Chanpu

**Calibration Method :** This instrument was calibrated by In-house method comparison technique CAL-M4003 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)

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

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400033	22E569	22 Feb 2024	National Institute of Metrology Thailand (NIMT)

Approved by :



( Surachai Promthong )

Laboratory Manager

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. :** 67-400074-2

**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	25.005	25.1	-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%

- o0o -







## Certificate of Calibration

<b>Equipment:</b>	Cooled Incubator	<b>Certificate No.:</b>	C31240373
<b>Model:</b>	KB 240	<b>Issued Date:</b>	16 February 2024
<b>Serial No.(or ID):</b>	20180000012164(WW-16-001)	<b>Job No.:</b>	WO-00017098
<b>Manufacturer:</b>	Binder	<b>Page:</b>	1 of 3
<b>Condition:</b>	In Condition	<b>Ventilation Valve:</b>	None
<b>Shelves(pc.):</b>	3		

**Customer:** C.E.M Technology (Thailand) Co., Ltd.  
31/8 Moo 13, Tambon Raikhing,  
Amphur Sampran, Nakhonpathom 73210 Thailand.

**Environment Condition:** Temperature: 24 °C ± 1.1 °C  
Humidity: 63 %RH ± 5.9 %RH  
Voltage: 229 VAC ± 1.2 VAC

**Calibration Place:** C.E.M Technology (Thailand) Co., Ltd. ( Laboratory Room )  
219/43 Moo 12 Petchkasam Road,  
Omnoi Krathum Baen, Samut Sakhon 74130 Thailand

**Calibration By:** Mr. Ampol Srisumphan

**Calibration Date:** 14 February 2024

**The Method used:** In house method, CAL-WI-16, base on TLAS-G20

**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10240001



(Mr. Ampol Srisumphan)

Person in charge



(Mr. Udon Srichana)

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.

## Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

### Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ( $w = 0$ ), Specific Risk < 50% PFA.
- ☒ Choice B Non-binary statement with guard band ( $w = 1 U$ ), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
- ☐ Choice C Customer defined, Customers may define arbitrary multiple of  $r$  to have applied as guard band ( $w = r U$ ).
- ; PFA – Probability of False Accept



(Mr. Udon Srichana)

Authorized signatory

### Without adjustment

**Desired Temperature : 20.0°C Tolerances : 1.0 °C**

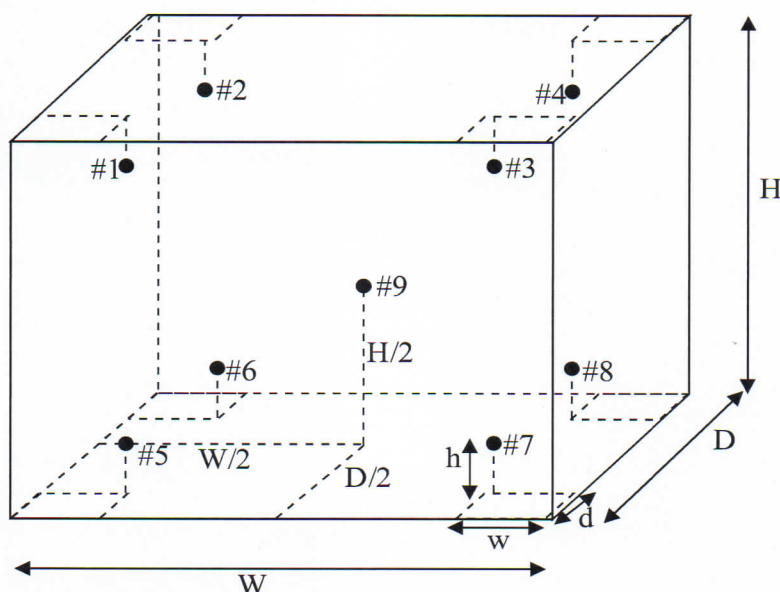
Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	20.17	0.17	0.49	1.0	Pass
#2	20.13	0.13	0.49	1.0	Pass
#3	19.99	-0.01	0.56	1.0	Pass
#4	19.98	-0.02	0.60	1.0	Pass
#5	20.21	0.21	0.51	1.0	Pass
#6	20.17	0.17	0.46	1.0	Pass
#7	19.97	-0.03	0.57	1.0	Pass
#8	20.07	0.07	0.47	1.0	Pass
#9	20.13	0.13	0.43	1.0	Pass

Correction\* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use

### The End of Statements of Conformity



### Standard Installation Locations

Volume (Calibration Zone)= 122 (Liters)

Inside chamber:	W = 65 (cm)	D = 50 (cm)	H = 76 (cm)
Standard Locations (#1, #2, #3, #4):	w = 7 (cm)	d = 5 (cm)	h = 8 (cm)
Standard Locations (#5, #6, #7, #8):	w = 7 (cm)	d = 5 (cm)	h = 8 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	101	102	103	104	105	106	107	108	109

### Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.

**Measured Temperature:** The average reading of standards at any positions or location.

**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.



## Calibration Results:

### Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	20.17	0.17	0.49
#2	20.13	0.13	0.49
#3	19.99	-0.01	0.56
#4	19.98	-0.02	0.60
#5	20.21	0.21	0.51
#6	20.17	0.17	0.46
#7	19.97	-0.03	0.57
#8	20.07	0.07	0.47
#9	20.13	0.13	0.43

### Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
20.0	20.0	20.0	20.17	20.13	19.99	19.98	20.21	20.17	19.97	20.07	20.13	0.60

### Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20.0	0.47	0.48	1.13

Note: \* Maximum uncertainty of the each position

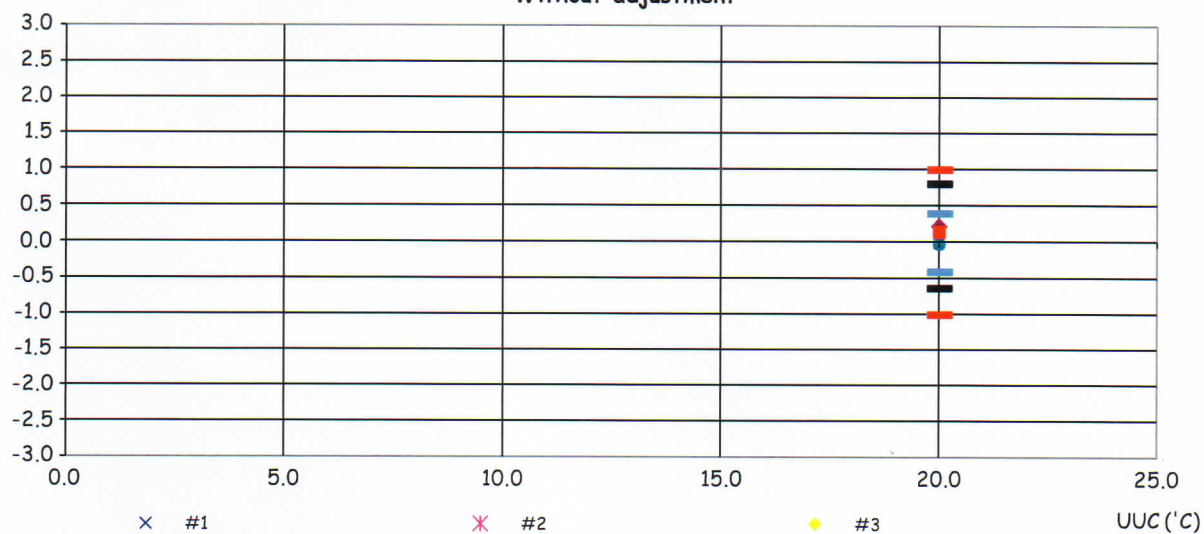
## The End of Certificate

# Corr\_Distribution & Max\_Measurement Uncertainty

Job\_No. WO-00017098

Without adjustment

Correction ('C)

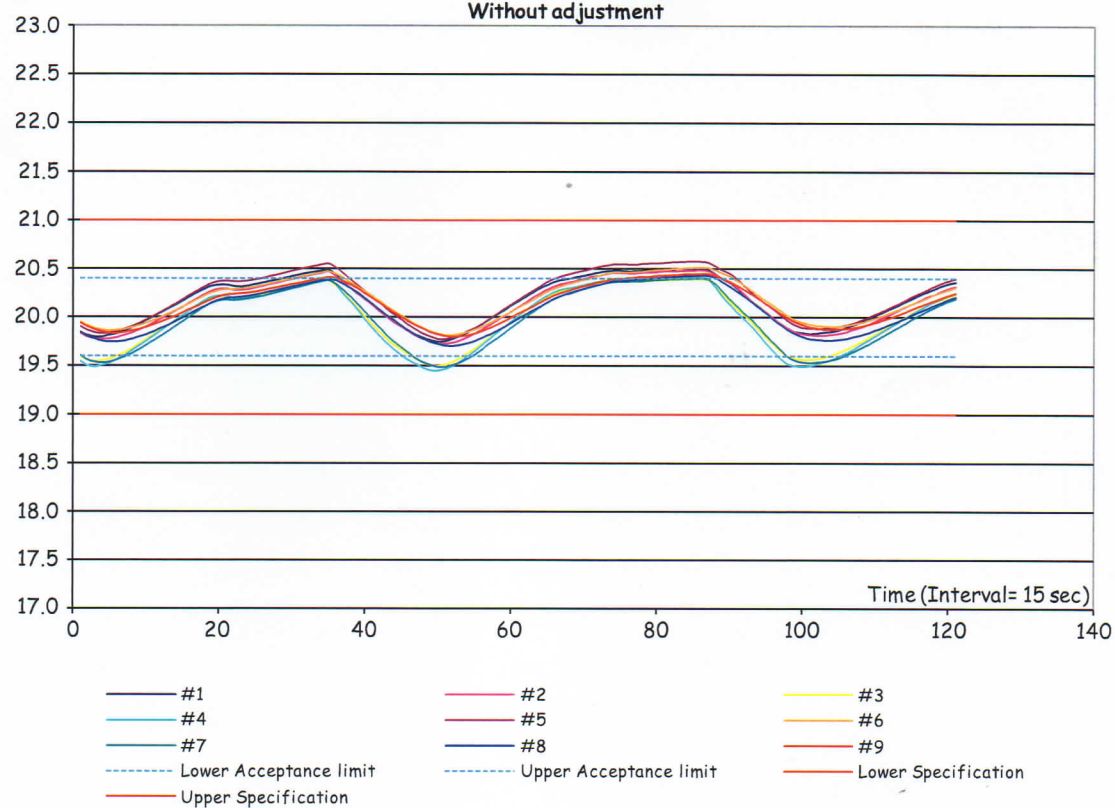


## Temperature Distribution @ 20.0°C

Job\_No. WO-00017098

Without adjustment

Std('C)



## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00017098

ชนิดเครื่องมือ: Cooled Incubator

รุ่น: KB 240

หมายเลขเครื่อง: 20180000012164(WW-16-001)

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
14 Feb 2024			14 Feb 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพอะไหล่ล้อย่น ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อเสนอแนะ :

---

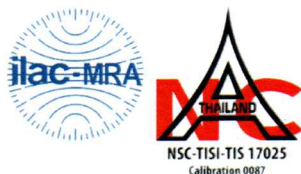


---

Mr. Ampol Srisumphan

Service Engineer





# Certificate of Calibration

<b>Equipment:</b>	Hot Air Oven	<b>Certificate No.:</b>	C31240372
<b>Model:</b>	UF 55	<b>Issued Date:</b>	15 February 2024
<b>Serial No.(or ID):</b>	B219.0142 ( WW-05-002 )	<b>Job No.:</b>	WO-00017098
<b>Manufacturer:</b>	Memmert	<b>Page:</b>	1 of 5
<b>Condition:</b>	In Condition	<b>Ventilation Valve:</b>	Closed
<b>Shelves(pc.):</b>	2		

**Customer:** C.E.M Technology (Thailand) Co., Ltd.  
31/8 Moo 13, Tambom Raikhing,  
Amphur Sampran, Nakhonpathom 73210 Thailand.

**Environment Condition:** Temperature: 29 °C ± 0.6 °C  
Humidity: 61 %RH ± 5.3 %RH  
Voltage: 230 VAC ± 1.5 VAC

**Calibration Place:** C.E.M Technology (Thailand) Co., Ltd. ( Laboratory Room )  
219/43 Moo 12 Petchkasam Road,  
Omnoi Krathum Baen, Samut Sakhon 74130 Thailand

**Calibration By:** Mr. Ampol Srisumphan

**Calibration Date:** 14 February 2024

**The Method used:** In house method, CAL-WI-16, base on TLAS-G20

**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10240001



(Mr. Ampol Srisumphan)

Person in charge



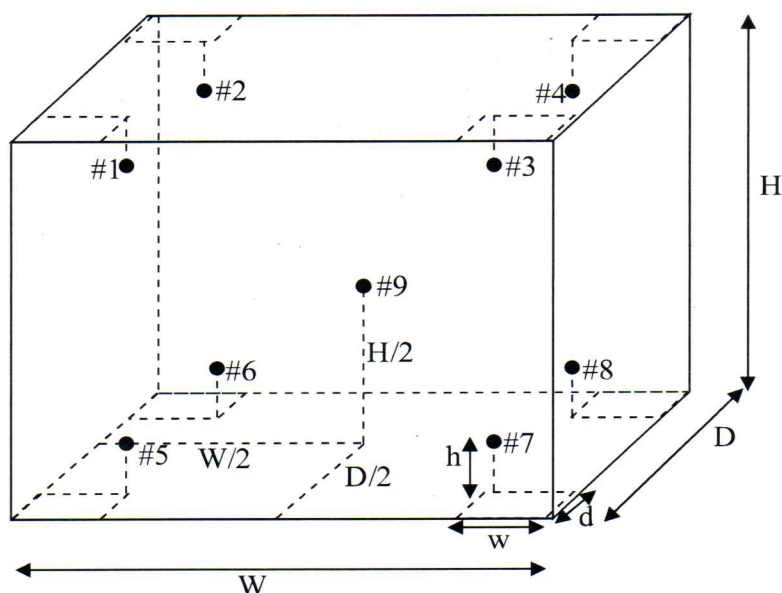
(Mr. Udon Srichana)

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.



### Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber:  $W = 40$  (cm)  $D = 33$  (cm)  $H = 40$  (cm)

Standard Locations (#1, #2, #3, #4):  $w = 5$  (cm)  $d = 5$  (cm)  $h = 5$  (cm)

Standard Locations (#5, #6, #7, #8):  $w = 5$  (cm)  $d = 5$  (cm)  $h = 5$  (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	201	202	203	204	205	206	207	208	209

### Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.

**Measured Temperature:** The average reading of standards at any positions or location.

**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

## Calibration Results:

### Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	104.38	0.38	0.39
#2	104.15	0.15	0.39
#3	104.39	0.39	0.39
#4	104.26	0.26	0.39
#5	103.88	-0.12	0.39
#6	104.13	0.13	0.39
#7	104.47	0.47	0.39
#8	104.41	0.41	0.39
#9	104.65	0.65	0.39

### Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.0	104.38	104.15	104.39	104.26	103.88	104.13	104.47	104.41	104.65	0.39

### Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.83	0.12	0.96

Note: \* Maximum uncertainty of the each position



**Without adjustment (Cont.)**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	180.34	0.34	0.56
#2	179.98	-0.02	0.56
#3	180.46	0.46	0.56
#4	180.34	0.34	0.56
#5	180.63	0.63	0.56
#6	180.33	0.33	0.56
#7	179.22	-0.78	0.56
#8	179.80	-0.20	0.56
#9	180.74	0.74	0.56

**Temperature Distribution**

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180.0	180.0	180.0	180.34	179.98	180.46	180.34	180.63	180.33	179.22	179.80	180.74	0.56

**Chamber Characterization**

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.59	0.08	1.66

Note: \* Maximum uncertainty of the each position

**The End of Certificate**

**Without adjustment (Cont.)**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 110.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	110.40	0.40	0.46
#2	110.15	0.15	0.46
#3	110.45	0.45	0.46
#4	110.37	0.37	0.46
#5	110.42	0.42	0.46
#6	110.29	0.29	0.46
#7	109.86	-0.14	0.46
#8	110.12	0.12	0.46
#9	110.51	0.51	0.46

**Temperature Distribution**

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
110.0	110.0	110.0	110.40	110.15	110.45	110.37	110.42	110.29	109.86	110.12	110.51	0.46

**Chamber Characterization**

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
110.0	0.71	0.11	0.86

Note: \* Maximum uncertainty of the each position

## Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

### Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ( $w = 0$ ), Specific Risk < 50% PFA.
- ☒ Choice B Non-binary statement with guard band ( $w = 1 U$ ), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
- ☐ Choice C Customer defined, Customers may define arbitrary multiple of  $r$  to have applied as guard band ( $w = r U$ ).
- ; PFA – Probability of False Accept



(Mr. Udon Srichana)

Authorized signatory

## Without adjustment

**Desired Temperature : 104.0°C Tolerances : 1.0 °C**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	104.38	0.38	0.39	1.0	Pass
#2	104.15	0.15	0.39	1.0	Pass
#3	104.39	0.39	0.39	1.0	Pass
#4	104.26	0.26	0.39	1.0	Pass
#5	103.88	-0.12	0.39	1.0	Pass
#6	104.13	0.13	0.39	1.0	Pass
#7	104.47	0.47	0.39	1.0	Pass
#8	104.41	0.41	0.39	1.0	Pass
#9	104.65	0.65	0.39	1.0	Condition Pass

Correction\* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use



## Statements of conformity:(Cont.)

### Without adjustment (Cont.)

**Desired Temperature : 110.0°C Tolerances : 5.0 °C**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 110.0 °C

Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	110.40	0.40	0.46	5.0	Pass
#2	110.15	0.15	0.46	5.0	Pass
#3	110.45	0.45	0.46	5.0	Pass
#4	110.37	0.37	0.46	5.0	Pass
#5	110.42	0.42	0.46	5.0	Pass
#6	110.29	0.29	0.46	5.0	Pass
#7	109.86	-0.14	0.46	5.0	Pass
#8	110.12	0.12	0.46	5.0	Pass
#9	110.51	0.51	0.46	5.0	Pass

Correction\* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use

### Without adjustment

**Desired Temperature : 180.0°C Tolerances : 2.0 °C**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

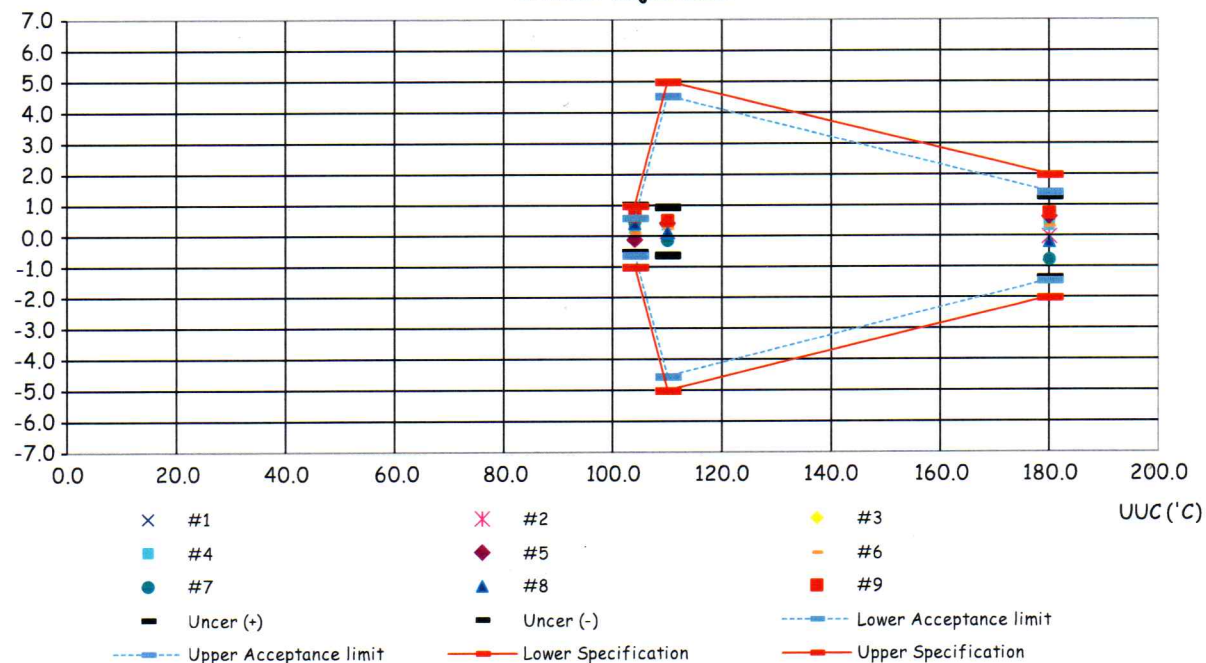
Locations	Measured (°C)	Correction* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	180.34	0.34	0.56	2.0	Pass
#2	179.98	-0.02	0.56	2.0	Pass
#3	180.46	0.46	0.56	2.0	Pass
#4	180.34	0.34	0.56	2.0	Pass
#5	180.63	0.63	0.56	2.0	Pass
#6	180.33	0.33	0.56	2.0	Pass
#7	179.22	-0.78	0.56	2.0	Pass
#8	179.80	-0.20	0.56	2.0	Pass
#9	180.74	0.74	0.56	2.0	Pass

Correction\* = Measured Temperature - Desired Temperature

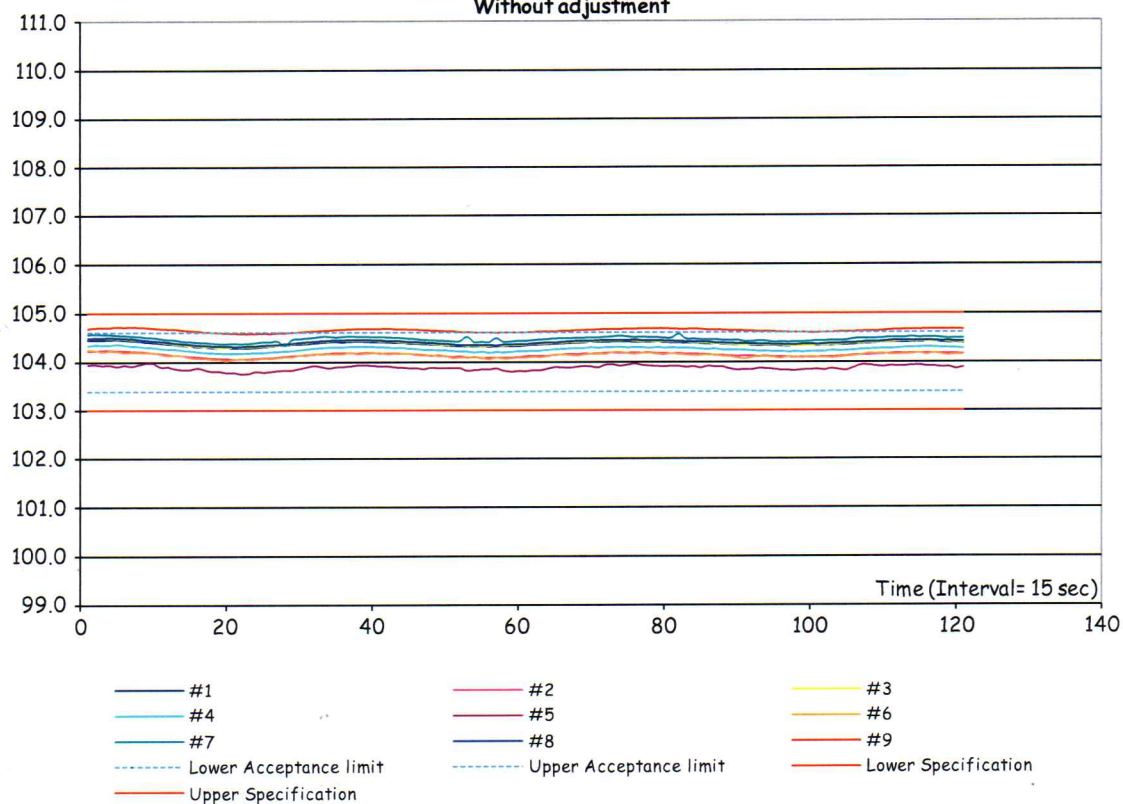
The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use

## The End of Statements of Conformity

Without adjustment

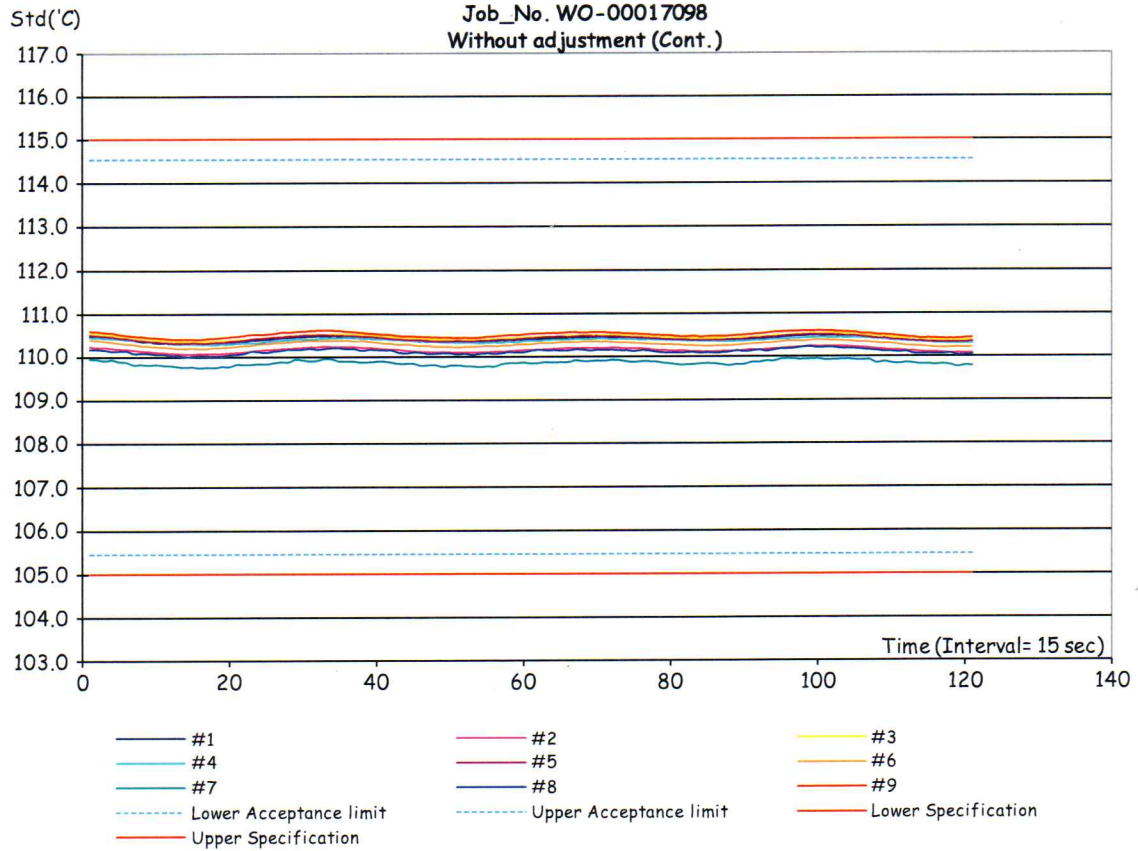


**Without adjustment**



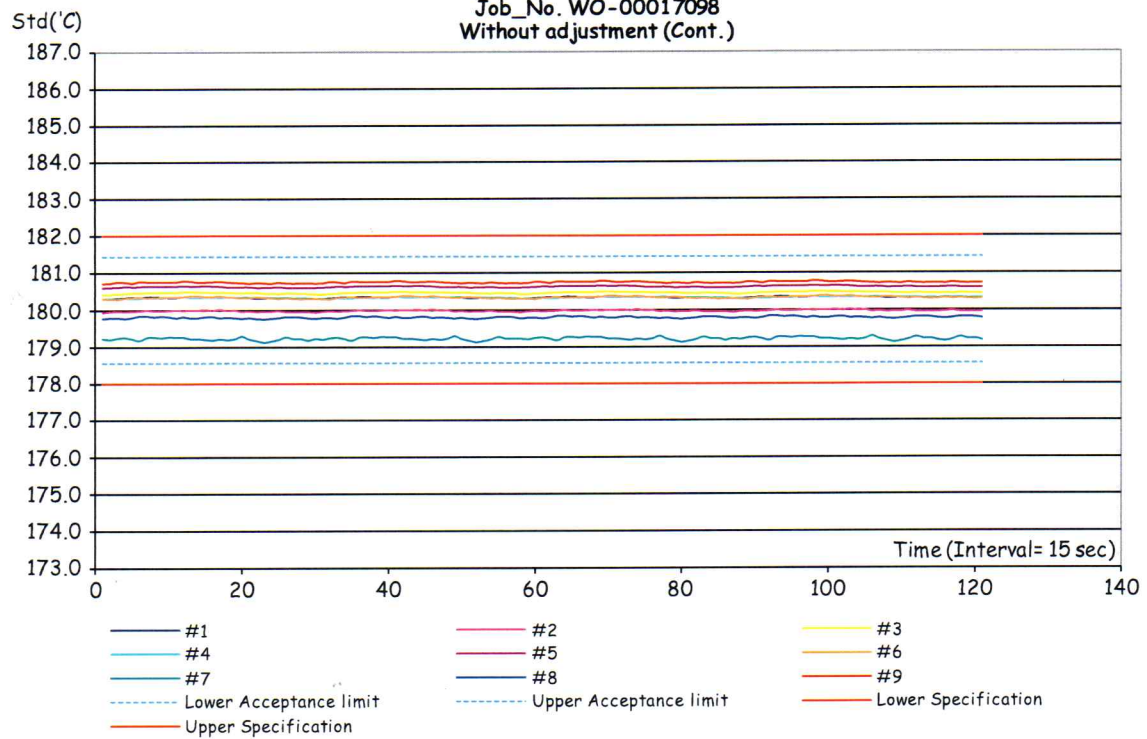
# Temperature Distribution @ 110.0°C

Job\_No. WO-00017098  
Without adjustment (Cont.)



# Temperature Distribution @ 180.0°C

Job\_No. WO-00017098  
Without adjustment (Cont.)





## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00017098

ชนิดเครื่องมือ: Hot Air Oven

รุ่น: UF 55

หมายเลขเครื่อง: B219.0142 ( WW-05-002 )

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
14 Feb 2024			14 Feb 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพอะแดปเตอร์ ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อเสนอแนะ :

---



---

Mr. Ampol Srisumphan  
Service Engineer

CERT.No.: HS-U059H

**Certificate of Calibration**

Calibration Date : 28 Aug 23	Model : YSI 5000
Submitted by : C.E.M TECHNOLOGY (THAILAND) Co., LTD.	S/N : 18L109487
219/43 Moo 12, Petchkasem Road, Ornoi, Krathumban,	Probe : YSI 5010
Samutsakorn 74130	S/N : 22G100123
	ID NO. :
Avg Room Temp : 20 °C	Air Temp ref : S/N. F8065C26
Avg Water Temp : 20 °C	Barometric ref : S/N. F8065C26
Air Pressure : 760.00 mmHg	Water Temp ref : S/N. 11430
Salinity : 0 ppt	
	Technician : Kittipong M.

**Calibration Details**

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.08	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.08	(PASS)	-
Measurement 4 (mg/l)	9.08	(PASS)	-
Measurement 5 (mg/l)	9.08	(PASS)	-
Measurement 6 (mg/l)	9.08	(PASS)	-
Measurement 7 (mg/l)	9.08	(PASS)	-
Measurement 8 (mg/l)	9.08	(PASS)	-
Measurement 9 (mg/l)	9.09	(PASS)	-
Measurement 10 (mg/l)	9.09	(PASS)	-
Mean Measurement	9.08	mg/l	-
Inaccuracy	0.01	mg/l	-
Overall Status	(PASS)		

**Manufacturer Specification**

Accuracy = +/- 0.02 mg/l

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



Technician Signature

(Kittipong Maekwong)



Laboratory Manager

(Supreecha Sumaritam)



# Avio200 Preventive Maintenance Report

Company Name:

Instrument Location:

Instrument Serial No.:

Date:



## ICP-OES/Avio200 Preventive Maintenance (PM)

Company Name:			
Address (Instrument Location):			
Serial Number:		PM Number:	
Customer Name (if applicable):		Telephone Number:	
Service Engineer Name:		Service Order Number:	
Date PM Performed: (DD-MMM-YYYY)		Next PM Due Date: (DD-MMM-YYYY)	
Standard Labor Hours to Complete PM :	4 hours		

Part Number	Release	Publication Date	
09370140 Rev.5	B	January 2018	

### Scope

The purpose of this PM is to ensure the continued functionality of the PerkinElmer/Avio200 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

### General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

### Copyright Information

This document contains proprietary information that is protected by copyright. All rights are reserved. No part of this publication may be reproduced in any form whatsoever or translated into any language without the prior, written permission of PerkinElmer, Inc. **Copyright © 2013 PerkinElmer, Inc.**

### Trademarks

Registered names, trademarks, etc. used in this document, even when not specifically marked as such, are protected by law. PerkinElmer is a registered trademark of PerkinElmer, Inc. All other trademarks and registered trademarks not owned by PerkinElmer, Inc. or its subsidiaries that are depicted herein are the property of their respective owners.

**Except as specifically set forth in its terms and conditions of sale, PerkinElmer makes no Warranty of any kind with regard to this document, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.**

PerkinElmer shall not be liable for incidental or consequential damages in connection with the furnishing or use of this document.

## Component List

Component / Specific Model	Serial #	Configuration Notes

## Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
09995098	Air Filter-Spectrometer	
N077520	Air Filter-RF Generator	
09992731	Axial Window	
B0810377	Radial Window	
N0770438	O-ring kit, injector support adapter	
N0780437	O-ring kit, torch	

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date: (MM/YY)
N0691579	Multi-Element Standard (N069-1579 diluted 10X)	1		
N9300221	Instrument Calibration-4 (N9300221 diluted 100X)	1		

# Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

## 1. General:

- ☐ Ask customer about unit's performance since last visit.
- ☐ Check incoming AC line voltage under load for proper levels and grounding.
- ☐ Is the instrument operational?

## 2. Mechanical:

- ☐ Inspect and clean all fans and filters.
- ☐ Inspect and replace torch components and necessary.

Torch Components Replaced: ☐ Yes ☐ No

If yes, list components replaced:

- ☐ Inspect all tubing for signs of cracking or leaking and replace as necessary.

Tubing Replaced: ☐ Yes ☐ No

If yes, list tubing replaced:

- ☐ Inspect the peristaltic pump for proper operation.
- ☐ Check and adjust if necessary, the external nitrogen, argon shear gas and water supply pressures.
- ☐ Check and adjust if necessary, the internal nitrogen, main argon, torch argon and shear gas pressures

Regulator	Measured Pressure	Set Pressure
Nitrogen	N/A	NA (calibrated in Factory)
Main Argon		76psig
Torch Argon		67psig
Shear Gas		65psig
Water		35psi

- ☐ Check the shear gas nozzle for blockages and proper, uniform flow.
- ☐ Inspect nitrogen Hi/Low purge and shear gas solenoids for proper function.
- ☐ Inspect the function of all spectrometer motors. Drive the motors from the Spectrometer DCM. Check all motors, couplings, set screws, gears or drive assembly located on the spectrometer (prism/grating wavelength drives, slits, shutter, DV mirror, X/Y mirror) if problems are found.
- ☐ Perform preventative maintenance on the chiller as required. Make the customer aware of the importance of maintaining the chiller fluid level and filter replacement.
- ☐ Drain air compressor surge tank.
- ☐ Clean exterior of instrument.

### 3. Electrical:

- ☐ Visually inspect all PC boards for cleanliness and signs of corrosion.
  - ☐ Check all RF generator and spectrometer power supply voltages.
  - ☐ Run instrument diagnostic checks from the appropriate Device Control Module.

#### **RF Generator:**

- ☐ Check the RF generator status screens.
- ☐ Check the function of all interlocks.

#### **Spectrometer:**

- ☐ Check the spectrometer status screens.
- ☐ Check for proper function of all motors from the Motor Control window.

### 4. Optical:

- ☐ Check the neon lamp for proper operation.
- ☐ Ensure that neon initialization passes at power up.
- ☐ Ensure that there is a single, well defined peak of sufficient intensity (approximately 15,000 to 60,000 cts.) for the 703.241nm neon line viewed in the DCM Collect Spectra window. Re-generate the neon correction table if problems are encountered. If problems are still exhibited after the table is re-generated, replace the neon lamp assembly.

Neon Lamp Replaced: ☐Yes ☐No

- ☐ Perform the Initialize Optics routine from the Spectrometer Control window.
- ☐ Insure that the routine passes with no error codes. If it fails, run a manual prism scan from the spectrometer DCM.
- ☐ Insure the Dark Current measurement (Detector Calibration) passes at initialization.
- ☐ Check the shutter home sensor position.
- ☐ Check prism/electronics temperature sensor readback values from the DCM. It is normal for these readings to be shown in red. A typical prism temperature is approximately 29.5 degree C. A typical electronics temperature is approximately 35 degree C.
- ☐ Check the detector temperature from the DCM for -7.0 to -8.5 degree C. If outside of this range the detector cooling fan may not be operational. Further inspection may be necessary.
- ☐ Inspect for proper function of the transfer optics. 1) shutter 2) DV mirror 3) X/Y mirror.
- ☐ Clean or replace the axial and radial view windows as necessary.

Axial Window Replaced: ☐Yes ☐No  
Radial Window Replaced: ☐Yes ☐No

### 5. Post PM Performance Tests:

- ☐ Perform View Align.

#### **5.1 Spectral Resolution:**

- ☐ Measure the spectrometers ability to separate two adjacent wavelengths.

Parameter	Specification	Test Result	Pass/Fail
As 193.696 - Resolution	≤0.009		
Ni 231.604 - Resolution	≤0.011		
Ni 341.476 - Resolution	≤0.015		
Ba 455.403 - Resolution	≤0.020		



**5.2 Precision:**

- ☐ Test for reproducibility of a set of measurement.

Parameter	Specification	Test Result	Pass/Fail
<b>Zn 213.856</b>	%RSD ≤ 1 %		
<b>Mg 280.856</b>	%RSD ≤ 1 %		
<b>Mg 285.207</b>	%RSD ≤ 1 %		
<b>Ba 455.403</b>	%RSD ≤ 1 %		

**5.3 Mn BEC:**

- ☐ Run Axial and Radial BEC according to the A&T spec, or the commissioning test procedure.

**Mn Background Equivalent Concentration:**

Method "MnBEC" For Samples "IB (2%HNO3)" and "IS (N069-1579/10)", record intensities.

Calculated BEC:  $BEC = (IB * Conc\ of\ Std) / (IS - IB)$ . Where Conc of Std = 1,000 PPB

Element	Mode	Conc.	IB	IS	
<b>Mn 257.610</b>	Radial	1,000 ppb			
<b>Mn 257.610</b>	Axial	1,000 ppb			
<b>Mn 257.610</b>	<b>IB*Conc.</b>	<b>IS - IB</b>	<b>BEC</b>	<b>Spec</b>	<b>Pass/Fail</b>
<b>Radial</b>				<b>&lt;30 PPB</b>	
<b>Axial</b>				<b>&lt;30 PPB</b>	

**6. Review:**

- ☐ Review with the customer PM work performed.
- ☐ Discuss recommended customer supplied materials to have on hand.
- ☐ Attach PM sticker.

## Additional Comments

### Additional Comments Regarding the PM

## Review

***The preventive maintenance checks and if applicable performance tests for ICP-OES/Avio200 have been completed.***

***This ICP-OES/Avio200 Passes ☐ Fails ☐ the preventive maintenance.***

### Review of Preventive Maintenance:

Authorized PerkinElmer Representative:

representative: 

Date:

(DD-MMM-YYYY)

Authorized Customer Representative

2. Don

Date:

(DD-MMM-YYYY)

## CERTIFICATE OF CALIBRATION

**Certificate No.:** T0-2109034/23

**Page** 1 **of total** 4 **pages**

**Customer** C.E.M TECHNOLOGY (THAILAND) CO., LTD.  
219/43 Moo 12, Petchkasem Road, Omnoi,  
Krathumban, Samutsakorn 74130

<b>Equipment</b>	Thermo Reactor		
<b>Manufacturer</b>	Spectroquant	<b>Model</b>	TR 420
<b>Serial No.</b>	23290802	<b>ID No.</b>	-
<b>Description</b>	Resolution of UUC : 1 °C		

**Environmental Conditions** Ambient Temperature: (23 ± 3) °C  
Relative Humidity: (50 ± 15) %  
Atmospheric Pressure: -

**Calibration Location** Blue Devils Laboratory (TL)

**Received Date** 21 September 2023

**Calibration Date** 22 September 2023

**Date of Issue** 23 September 2023

**Condition of Artifacts** Used conditions but can be calibrated

**Checked by**



Act as Technical Manager

**Approved by**



Representative of Managing Director

<input type="checkbox"/> ( Krisyosl K. )	<input type="checkbox"/> ( Sakda Y. )
<input type="checkbox"/> ( Patiphan K. )	<input type="checkbox"/> ( Onnapa P. )
<input checked="" type="checkbox"/> ( Pongsak H. )	<input type="checkbox"/> ( Nitiphong K. )
<input type="checkbox"/> ( Kanung C. )	<input type="checkbox"/> ( Nonthachai K. )
<input type="checkbox"/> ( Pramong P. )	<input type="checkbox"/> ( Noppol P. )

( Dr. Ekachai Puttitwong )

This calibration certificate shall not be reproduced other than in full except with the prior written approval of the Thai Heart Calibration Co., Ltd.



**Certificate No.:** T0-2109034/23

**Page 2 of total 4 pages**

**Reference Method :**

- The calibration method used was CP-142 based on an in-house method.
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

**Reference Standard Instruments:**

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Data Logger with Sensors	34972A/ 34901A	MY59002120/ MY41211040	I0-0302002/23	Feb. 3, 2024	THC

**Remark:** This certificate is traceable to the International System of Unit (SI Unit) through:

- THC, Thai Heart Calibration Co., Ltd.

**Measurement Results:**

# L

Hole No.	UUC Setting (°C)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Stability of UUC (± °C)	Uncertainty (± °C)
# 1	150	149.9	150	-0.1	0.22	0.68
# 2	150	149.8	150	-0.2	0.14	
# 3	150	149.5	150	-0.5	0.21	
# 4	150	149.8	150	-0.2	0.20	
# 5	150	149.1	150	-0.9	0.16	
# 6	150	149.6	150	-0.4	0.32	
# 7	150	149.2	150	-0.8	0.14	
# 8	150	149.7	150	-0.3	1.80	
# 9	150	149.5	150	-0.5	0.18	
# 10	150	149.1	150	-0.9	0.16	
# 11	150	149.1	150	-0.9	0.16	
# 12	150	149.2	150	-0.8	0.17	

UUC : Unit Under Calibration

Calibrated by Pongsak



**Certificate No.:** T0-2109034/23

**Page 3 of total 4 pages**

**Measurement Results (Cont.):**

# R

Hole No.	UUC Setting (°C)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Stability of UUC (± °C)	Uncertainty (± °C)
# 1	150	150.2	150	0.2	0.25	0.68
# 2	150	150.2	150	0.2	0.29	
# 3	150	150.0	150	0.0	0.29	
# 4	150	149.6	150	-0.4	0.18	
# 5	150	149.1	150	-0.9	0.13	
# 6	150	149.5	150	-0.5	0.25	
# 7	150	149.1	150	-0.9	0.16	
# 8	150	149.1	150	-0.9	0.13	
# 9	150	149.7	150	-0.3	0.20	
# 10	150	149.5	150	-0.5	0.20	
# 11	150	149.2	150	-0.8	0.13	
# 12	150	149.6	150	-0.4	0.23	

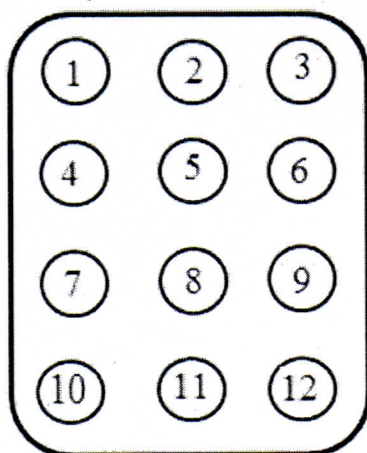
UUC : Unit Under Calibration

Calibrated by. Pongsak

Certificate No.: T0-2109034/23

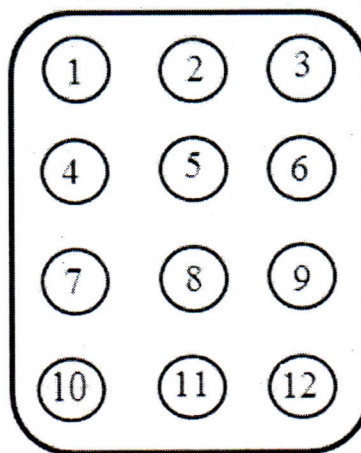
Page 4 of total 4 pages

Measurement Results (Cont.):



Front View

L



Front View

R

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2.00$ , providing a level of confidence approximately 95%.

- End of Certificate -



# Performance Verification Certificate

Job No. LSPR2306369

**Equipment :** AA SPECTROMETER      **Serial No. :** A7310  
**Manufacturer :** GBC Scientific      **Verification Date :** 23-Jun-2023  
**Model Type :** SavantAA  
**Customer :** บริษัท ซี.อี.เอ็ม เทคโนโลยี (ไทยแลนด์) จำกัด  
 219/43 หมู่12 ถนนเพชรเกษม ตำบลอ้อมน้อย อำเภอกระทุ่มแบน จังหวัดสมุทรสาคร 74130

## Result of Verification

Test Description	Criteria	Reading	Result
1. EHT	< 350 V	332 V	PASS
Photometric Noise (if >350 V)	Std. Dev <0.0002	-	
2. Wavelength Accuracy , Cu 324.75 nm	± 0.20 nm	324.65 nm	PASS
3. Wavelength Accuracy , Cs 852.10 nm	± 0.20 nm	852.30 nm	PASS
4. Slit Width 0.2 nm	± 0.02 nm	0.22 nm	PASS
5. Slit Width 0.5 nm	± 0.05 nm	0.51 nm	PASS
6. Slit Width 1.0 nm	± 0.10 nm	0.99 nm	PASS
7. Standard Gauze Screen <u>0.49</u> Abs*	± 0.02 Abs.	0.4888 Abs.	PASS
BC mode with gauze		-0.0001 Abs.	
BC mode without gauze		-0.0004 Abs.	
Difference between With gauze and without gauze	< 0.004 Abs.	0.0003 Abs.	PASS
8. ABS Reading 5ppm,Cu	> 0.7 Abs.	0.740 Abs.	PASS
9. %RSD	< 0.5 %	0.48 %	PASS

\* Write in the criteria column the Abs reading on the gauze screen calibration label

**We hereby certify that instrument complies with GBC factory specifications**

**Your satisfaction is our promise @ DKSH Technology Limited**

**Verification By :** Mr. NIWAT SUPATANIT  
**Issued Date :** 3-Jul-2023

**Signatory :** \_\_\_\_\_





This is to certify that

**Niwat Supatanit**

From

**DKSH Technology Limited  
Thailand**

has successfully completed GBC Service  
Training including hardware and software training,  
installation and repair on the following instruments:

AAS Instruments and Accessories

UV-Vis Instruments and Accessories

ICP-OES Quantima and Accessories

Introduction to:

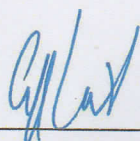
ICP-TOFMS OptiMass

High Performance Liquid Chromatography

X-ray Equipment Emma

Training conducted in Penang, Malaysia

From 22 July to 2 August 2019



---

Geoff Condick  
CEO





**Certified Reference Material**  
**Reference material certificate****Copper Standard for AAS****TraceCERT®**  
Traceable Certified Reference Materials

**Product no.:** 38996  
**Lot no.:** BCCH9264  
**Description of CRM:** Copper metal (pure material) in 2% HNO<sub>3</sub> (prepared with HNO<sub>3</sub> suitable for trace analysis and high-purity water, 18.2 MΩ·cm, 0.22 μm filtered).  
**Expiry date:** JUN 2025  
**Storage:** Store at 5°C-25°C  
**Density (certified) at 20°C:** 1011.3 kg m<sup>-3</sup> ± 0.5 kg m<sup>-3</sup>

**Constituent**      **Certified values at 20°C and expanded uncertainties,  $U = k \cdot u$  ( $k = 2$ ) [1][2]**

<b>Copper</b>	<b>989 mg kg<sup>-1</sup> ± 4 mg kg<sup>-1</sup></b>	<b>1000 mg L<sup>-1</sup> ± 4 mg L<sup>-1</sup></b>
---------------	--	---

**Metrological traceability:** Certified values are traceable to the International System of units (SI) through a metrologically valid weighing process. Details see "Details on metrological traceability".<sup>[3]</sup>

**Measurement method:** The certified value is determined by high-precision weighing of thoroughly characterized starting materials and verified by measurement against NIST SRMs or similar CRMs in accordance with ISO/IEC 17025.<sup>[4]</sup>

**Intended use:** Calibration of AAS, ICP, spectrophotometry or any other analytical technique.

**Instructions for handling and correct use:** The bottle's temperature must be 20°C. Shake well before every use. If storage of a partially used bottle is necessary (at the user's risk), the cap should be tightly sealed and the bottle should be stored at reduced temperature (e.g. refrigerator) to minimize transpiration rate.

**Health and safety information:** Please refer to the Safety Data Sheet for detailed information about the nature of any hazard and appropriate precautions to be taken.

**Packaging:** 250 mL HDPE bottle

**Accreditation:** Sigma-Aldrich Production GmbH is accredited by the Swiss Accreditation Service SAS as reference material producer under no. SRMS 0001 in accordance with international standard ISO 17034<sup>[5]</sup>

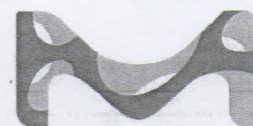
**Certificate issue date:** 29 JUL 2022

**ISO 17034**  
**SRMS 0001***S. Matt*

S. Matt – CRM Operations

*Dr. P. Zell*

Dr. P. Zell – Approving Officer





## CERTIFICATE OF CONFORMANCE

**Equipment name** : Gauze membrane  
**Serial Number** : F104  
**Procedure Used** : NIST neutral density filter: 8661/SRM 930D (1210)  
**Reference Standard** : Spectrophotometer, LIBRA S70  
**Serial Number** : 136821

**Result :**

Wavelength (nm)	Measured Value (A.U.)
440	0.489

Valid for 12 months from date of issue.

**Issue Date** : 5 March 2023  
**Operator by** : Mr. Niwat Supatanit



## PREVENTIVE MAINTENANCE AND PERFORMANCE VERIFICATION REPORT

### ATOMIC ABSORPTION SPECTROPHOTOMETER (AAS)

Issued Date: 23/06/23

**Customer :** บริษัท ซี.อี.เอ็ม เทคโนโลยี (ไทยแลนด์) จำกัด

**Manufacturer :** GBC Scientific Equipment Pty Ltd.

**Address :** 219/43 หมู่ 12 ถนนเพชรเกษม ตำบลอ้อมน้อย

**Model :** SavantAA

อำเภอกระทุ่มแบน จังหวัดสมุทรสาคร 74130

**Serial No :** A7310

**Contract :**

**Location :**

#### Power on switch and initial status

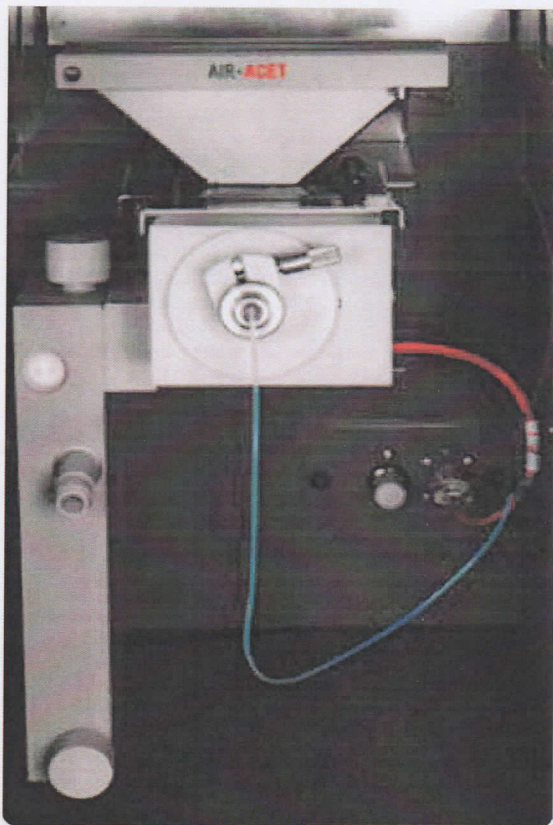
*Instrument Ready ที่เครื่องพร้อมใช้งานใน 2 นาที*

Preventive Maintenance	Pass	Fail	Remarks
<i>Electrical Voltage</i>			
- <b>Main voltage</b> ( power supply check 220V $\pm$ 10V ).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	220.1 V
- <b>Power indicator light</b> (Replace if faulty).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
- <b>Power core</b> (Clean or replace as appropriate).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
- <b>Fan</b> (Clean or replace filter element as appropriate).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
<i>Environment</i>			
- <b>Temperature</b> (10 to 35 deg.C)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	25.1 C
- <b>Humidity</b> (8 to 80%).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	47 %
- <b>Air Quality (No Dust)</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
- No corrosive vapours present from laboratory sample preparation or external sources.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
<i>Optics</i>			
- <b>Windows lens</b> (Clean or replace as appropriate).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Light Source</b> (Check operation. Replace if required).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>D2 Lamp</b> (Check operation. Replace if required).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
<i>Gas system</i>			
- <b>General</b> (Tube and Fitting /Check for leaks).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Air Zero</b> (Inlet pressure range 300-400 kPa).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	400kPa
- <b>Acetylene</b> (Inlet pressure range 55-96 kPa).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.9kPa
- <b>Nitrous oxide</b> (Inlet pressure range 300-400 kPa).	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Computer</i>			
- <b>Operating system</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Windows 7
- <b>Software Version</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Savant 3.0
- <b>Verify that all computer links and installed software operate correctly</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready

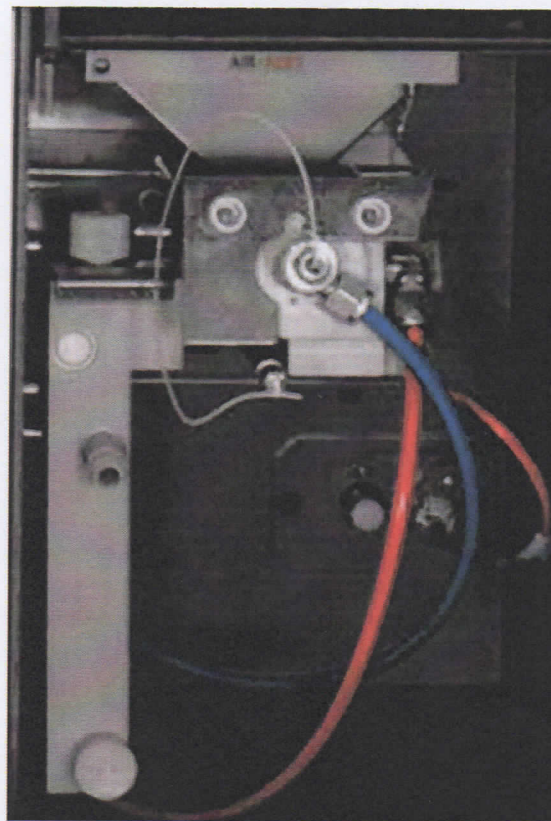


## Spray Chamber Type

☐ ABR Spray Chamber



☒ Standard Spray Chamber



Preventive Maintenance	Pass	Fail	Remark
<i>Flame system</i>			
- <b>Burner head</b> (Clean the jaws using GBC Burner Cleaning Card).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Burner mount</b> (Check for wear. Replace the burner retaining plate if required).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Spray chamber</b> (Visually inspect the bead for cracks, pitting or solid deposits. Check or replace O-ring kit).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Safety interlocks</b>			
➢ Burner (Check for Interlocks connector)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
➢ Spray chamber (Check for Interlocks connector)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Pressure relief bung.</b> (Check or replace O-ring)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Nebulizer</b> (Clean and check operation / Replace the O-ring)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Gas connections</b> (Check for leaks).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Capillary tube</b> (Check bends and clog).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Liquid trap</b> (Drain / clean and replace O-ring ).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready



Gas Flow Optimisation	Pass	Fail	Remark
- <b>Bleed gas lines</b> (Relieve pressure in the spray chamber).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Ignitor</b> (Ignite the flame several times to check ignition reliability. Replace the glow plug if required).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Extinguish</b> (Check operation).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Horizontal movement</b> (Check operation for STD. Spray Chamber).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Vertical movement</b> (Check operation for STD. Spray Chamber).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- <b>Burner Adjuster</b> (Check operation for ABR Spray Chamber)			
➤ Burner Angle (° C)	<input type="checkbox"/>	<input type="checkbox"/>	
➤ Angle Zero (mm)	<input type="checkbox"/>	<input type="checkbox"/>	
➤ Work head Height (mm)	<input type="checkbox"/>	<input type="checkbox"/>	
➤ Work head Centre (mm)	<input type="checkbox"/>	<input type="checkbox"/>	

Note:

N/A

Signature	
<b>Customer :</b>         	<b>Date :</b>         
<b>Service Engineer :</b>         	<b>Maintenance Date :</b>         



Performance Verification	Specification	Actual Value	Pas s	Failed	Remarks
<b>1. Wavelength accuracy</b> (optic calibration check).	Cu 324.75 nm $\pm$ 0.2 nm	324.65 nm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Cs 852.10 nm $\pm$ 0.2 nm	852.30 nm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>2. Slit width accuracy</b> (0.2 nm ,0.5 nm,1.0 nm)	0.2 nm $\pm$ 0.02 nm	0.216 nm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	0.5 nm $\pm$ 0.05 nm	0.51 nm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.0 nm $\pm$ 0.10 nm	0.99 nm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>3. EHT</b>	<350V	332 V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>4. Absorbance accuracy</b> (absorbance calibration check). ➤ Gauze 0.49 A.U.	Reading $\pm$ 10% of calibrated value.	0.4888 Abs.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>5. Background correction</b> (optics alignment check). difference between measurement with and without 0.49 A.U. gauze for 10 samples.	SavantAA <1%	BC on with gauze:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	SensAA/XplorAA <2%	-0.0001 Abs BC on without gauze: -0.0004 Abs			
<b>6. Sensitivity /noise flame test</b> (aqueous Cu solution test under air-acetylene flame).	Cu 5 ppm >0.7 A.U.	0.7396 Abs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	<0.5% RSD	0.48 %	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Note:

N/A

Signature	
Customer : ..... ( ..... )	Date :
Service Engineer : ..... ( Mr. NIWAT SUPATANIT )	Maintenance Date : 23 / Jun / 2023





## Certificate of Calibration

### Aquion RFIC: Anion (ID#1084)

This certificate is to verify that instrument below are calibrated

by Archemica International Co., Ltd.

Aquion S/N: 221280114

AS-DV S/N: 2205880126

For

C.E.M Technology (Thailand) Co., Ltd.



Operator Signature: Itsaraphap Bumrungjeam

Date: Jan 25 ,2024

(Mr.Itsaraphap Bumrungjeam)

Applications Chemist

การดูแลบำรุงรักษาเชิงป้องกัน

**Preventive Maintenance**



**บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด**

**ฝ่ายบริการหลังการขาย**

โทร 0 2 639 7000 E-mail: [service.tec.th@dksh.com](mailto:service.tec.th@dksh.com)

**ฝ่ายขายและการตลาด**

โทร 0 2 639 7000 E-Mail : [marketing.tec.th@dksh.com](mailto:marketing.tec.th@dksh.com)

Website : [www.dksh.co.th/technology/scientific-thailand](http://www.dksh.co.th/technology/scientific-thailand)



## เงื่อนไขการให้บริการ Preventive Maintenance

บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้บริการตามขอบข่ายของการบริการ เฉพาะ ในวันและเวลา ราชการ หากมีความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักชดถุกษ์) บริษัท ฯ จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

### ขอบข่ายการบริการ

- ตรวจสอบสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายการผลการตรวจสอบเครื่องมือ

### หมายเหตุ

- ราคานี้ไม่รวมถึงค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้รับบริการอยู่นอกเขตพื้นที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง เป็นต้น
- บริษัท ฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงราคา โดยไม่แจ้งให้ทราบล่วงหน้า

## ช่องทางการติดต่อ



DKSH Technology Limited (บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด)

เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260

เลขประจำตัวผู้เสียภาษี 010-555-001-4547 (สำนักงานใหญ่)



Call center 0 2 639 7000



DKSH Scientific



[www.dksh.com/scientific-thailand](http://www.dksh.com/scientific-thailand)



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



@dkshscientific

## Preventive Maintenance Contract

จำนวนในการทำสัญญาบริการ ...1...ครั้งต่อปี

ครั้งที่ ..1.. วันที่ 15/05/2024.....

### รายละเอียดผู้รับบริการ

หน่วยงาน	บริษัท ซี.อี.เอ็ม เทคโนโลยี (ไทยแลนด์) จำกัด		
ที่อยู่	219/43 หมู่ 12 ถนนเพชรเกษม ตำบลอ้อมน้อย อำเภอกระทุ่มแบน จังหวัดสมุทรสาคร 74130		
โทรศัพท์	0869054664	แฟกซ์	-

### ผู้ติดต่อ

ชื่อ - นามสกุล	คุณศิริภาพร พิมพา				
ตำแหน่ง	เจ้าหน้าที่ห้องปฏิบัติการ				
โทรศัพท์	0869054664	เบอร์ต่อ	-	แฟกซ์	-
E-mail	lab.cemtech1@gmail.com				

### รายละเอียดผู้ให้บริการ

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่) เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260 โทรศัพท์ 0 2 693 7000 Email: <a href="mailto:sudarat.sk@dksh.com">sudarat.sk@dksh.com</a> เจ้าหน้าที่ประสานงาน : คุณสุภารัตน์ ศิริรัตน์ โทรศัพท์ 090 678 6925	
เจ้าหน้าที่ผู้ให้บริการ	นายจิรายุช สเลอาด
ตำแหน่ง	Specialist, Technical Service.
โทรศัพท์	0938138736 แฟกซ์ -
E-mail	Jirayut.js@dksh.com

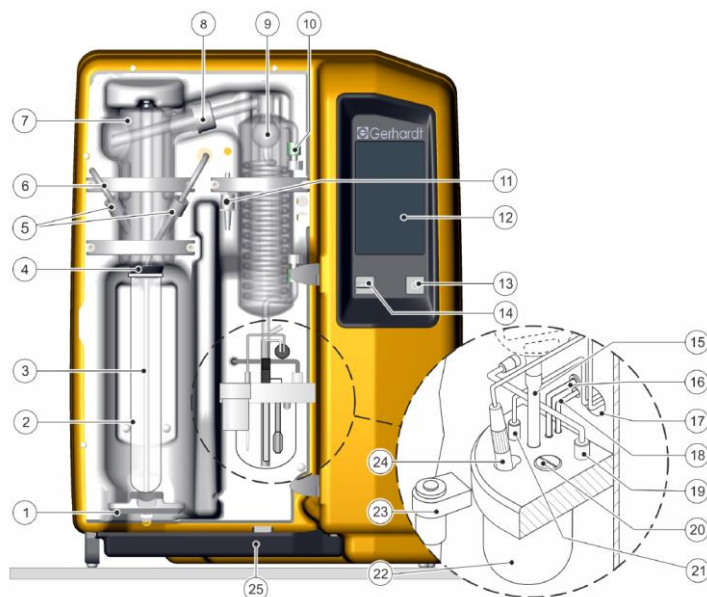
ลงนามผู้รับบริการ		ลงนามผู้ให้บริการ	
ตัวจริง	(.....)	ตัวจริง	(นาย จิรายุช สเลอาด)
ตำแหน่ง		ตำแหน่ง	Specialist, Technical Service.
วันที่ / ประทับตราบริษัท		วันที่ / ประทับตราบริษัท	15/05/2024

JOB:LSPR2403415.....MODEL:VAP 200.....S/N: GER5200180181

## Operational Qualification (OQ)

ตรวจสอบสภาพเครื่อง

### FRONT

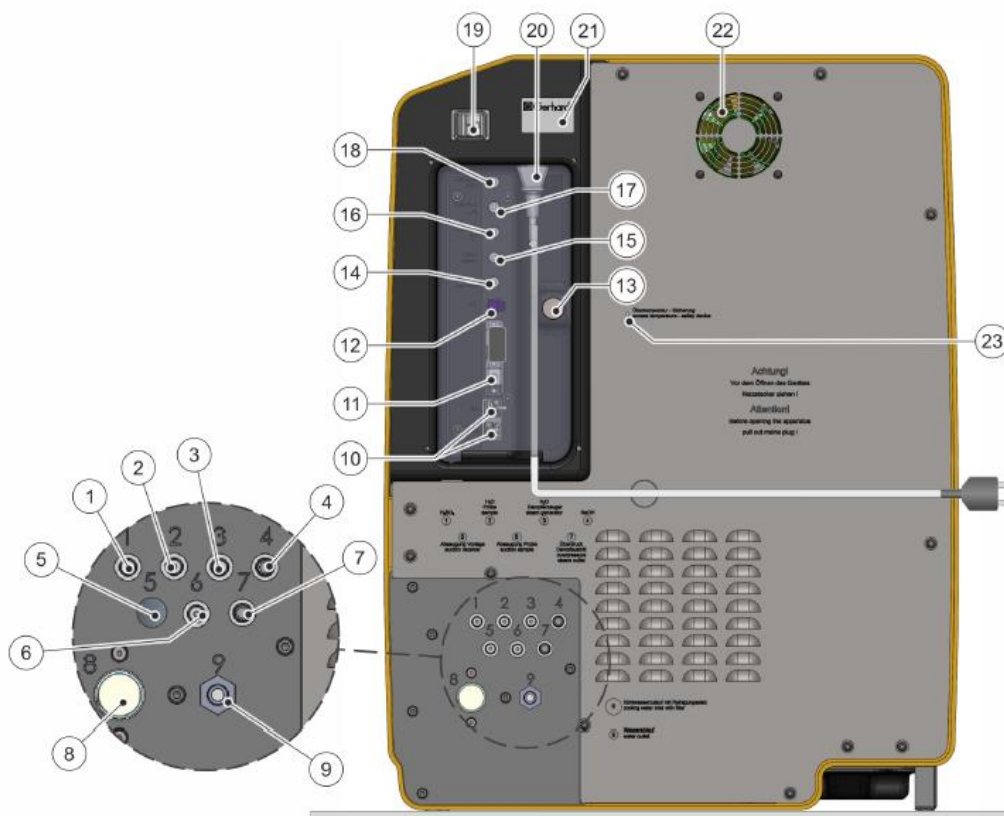


No		PASS	FAIL	N/A
1	Quick clamping device with clamping block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Digestion tube 250/300 ml	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	PTFE steam inlet tubing	<input checked=""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

\*\* only VAP 450

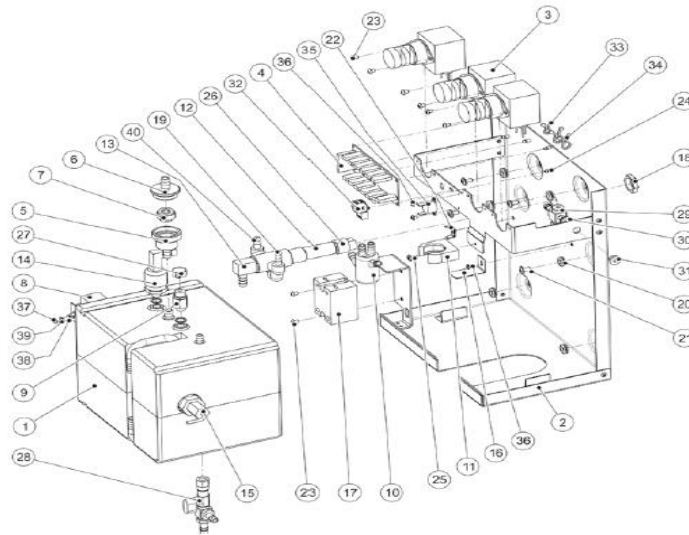


## REAR



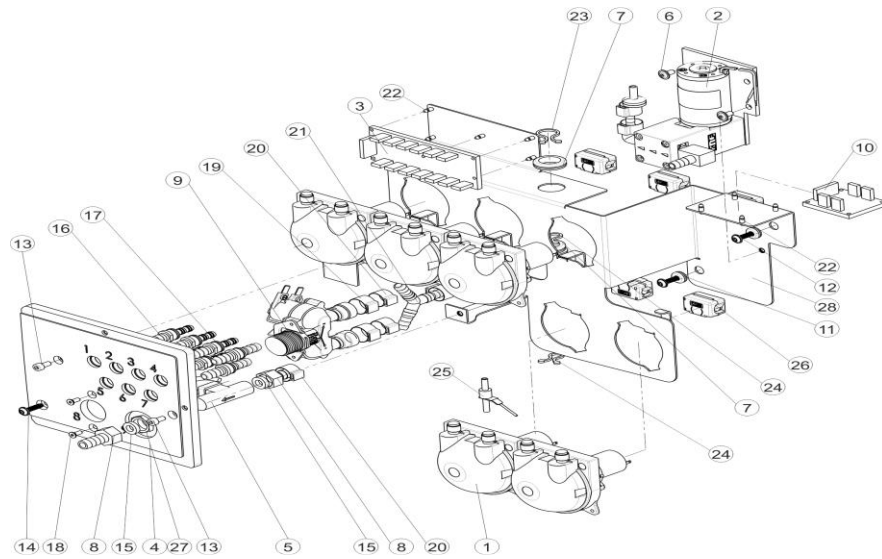
No		PASS	FAIL	N/A
1	Tube connection for sample H3BO3 supply	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Tube connection for sample H2O supply	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Tube connection for steam generator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

## Inside Steam generator



No		PASS	FAIL	N/A
1	Steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Steam generator traverse	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Pinch valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Circuit board distributor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Valve tubing connection	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Housing safety valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Safety valve SKT	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Excess temperature protection , steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Safety valve G 1/8 0,5 bar	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Ventilation glass pinch valve VAPODEST	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Hose clamp for ventilation clamp	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Distributor PP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Angle connection PP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Pressure transmitter	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Level switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Fixing bracket steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Relay HT+	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	VA Hexagon nut 1/2"	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Angle connection 1/8"	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Bushing nipple 6-10-14	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	VA Lens head screw M5 X 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Grounding connection , 2-pole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	VA Lens head screw M4 X 6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	Spacer bolt 5 mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	VA Lens head screw M4 X 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26	Tubing connection	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	Hose clamp 14.5 mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28	Module ball valve with nozzles	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29	Cross manifold with spout	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30	Seal copper G 1/8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31	Locking screw 1/8"	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32	Pin strip	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33	Bundle clamp 12 H 4500	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34	Bundle clamp 12 H 4502	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35	Temperature switch 80°C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36	VA Lens head screw M3 X 6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37	VA Hexagon nut M4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38	Lins head screw M4 X 8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39	VA Spring washer	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40	Angle connection , reduced , 1/8" PP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Module Pump holder VAP200 - 450 V3



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

Control panel



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



## รายละเอียดการตรวจสอบ

### ขั้นตอนการบริการ

#### ตรวจสอบระบบไฟฟ้า (Electrical Test)

- ความต้านทานทางไฟฟ้าของเครื่องกับกราวด์
- กระแสไฟฟ้าที่ใช้งาน

#### ตรวจสอบสภาพเครื่อง (Optical Test)

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

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

- ระบบสร้างและควบคุมความดันของ Steam
- ระบบการเติมน้ำเข้า Sample Tube
- ระบบการเติม Na OH
- ระบบการเติม H<sub>3</sub>BO<sub>3</sub>

## รายงานผลการให้บริการ

### 1. TECHNICAL DATA

	Pass	Fail	N/A	Remark
Main Supply 220 volt + 10% 50 Hz with ground	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Norminal current	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....8a.....

#### 1.1 COOLING WATER BATH

	Pass	Fail	N/A	Remark
Temperature 15-20 °C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Cooling Water Outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Control Temperature	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

#### 1.2 OPTICAL TEST VAP<sub>200</sub>

	Pass	Fail	N/A	Remark
Screw cap GL14	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Screw cap GL18	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Screw cap GL32	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Distillation Head	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Condensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Viton Cone	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	เสื่อมสภาพ
Ventilation Valve BV	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Micro Switch Sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Agitator motor for propeller	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....

### 2. SYSTEM COOLING WATER INLET

	Pass	Fail	N/A	Remark
Cooling Water Inlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Cooling Water Outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Flow control valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

### 3.SYSTEM CONTROL

	Pass	Fail	N/A	Remark
Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Program	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Adding NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Adding H <sub>2</sub> O	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Adding H <sub>3</sub> BO <sub>3</sub>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Suction Sample	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Suction Reciver	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....

### 4.SYSTEM DISTILLATION

	Pass	Fail	N/A	Remark
Boiler	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Level Sensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Novopren	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Solenoid Valve Shut-Off	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Solenoid Valve Steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Solenoild Valve soft steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Ventilation Valve Premount	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Excess Pressure Detector	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Heating Element	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

**5. PUMP**

	Pass	Fail	N/A	Remark
Pump H <sub>2</sub> O Steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
- Non-Return Valve	-	-	-	.....
Pump H <sub>2</sub> O Sample	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
- Non-Return Valve	-	-	-	.....
Pump NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
- Non-Ruturn Valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Pump H3BO3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
- Non-Ruturn Valve	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Pump suction	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Pump suction receiver	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....

**6. The Following Program Run :**

	Pass	Fail	N/A	Remark
Addition H2O 0-999 ml.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Addition NaOH 0-999 ml.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Addition H3BO3 0-999 ml.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Reaction Time 0-108 min	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Distillation Time 0-108 min	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Steam Capacity 10%-100%	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Suction Sampe	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Suction Receiver	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....

**7. Measured pumps**

	Remark
Pump NaOH Volume : <u>13,33</u> .ml	.....

Remark : .....

.....



## ข้อมูลสนับสนุนด้านเทคนิค (General Technical Support)

### การบำรุงรักษาทั่วไป (Basic maintenance)

#### Cleaning program

Glass parts and tubes must be rinsed daily before starting analysis in order to prevent clogging by crystallising chemicals.

The following settings are recommended for this:

parameters	Value
H <sub>2</sub> O addition	150 ml
NaOH addition	0 ml
Distillation time	7 min
Steam power	100 %
Reaction time	0 s
Suction sample	30 s

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

➔ All liquid carrying parts are cleaned. In the case of strong soiling, approx. 10 ml of sulphuric acid can also be added to the digestion tube.

#### General error message

Fault description	Cause	Remedy
'Cooling water flow volume too low'	Cooling water pressure under 1 bar	<ul style="list-style-type: none"><li>■ Open water tap.</li><li>■ Check coolant pressure.</li><li>■ Check coolant tube.</li></ul> Program continues automatically once error has been fixed.
'Sample tube missing'	Sample tube missing.	<ul style="list-style-type: none"><li>■ Insert sample tube.</li></ul> Continue program or restart.
'Distillation room protective door open'	Protection door not closed	<ul style="list-style-type: none"><li>■ Close protection door.</li></ul> Program continues automatically once error has been fixed.
'Reagent storage/waste'	One or more storage tanks are empty	<ul style="list-style-type: none"><li>■ Fill storage tank.</li><li>■ Check correct seating of the universal sensors.</li></ul> The running program can be continued after rectification of the error.
	The sample waste tank is full.	<ul style="list-style-type: none"><li>■ Empty sample waste tank.</li><li>■ Check correct seating of the universal sensors.</li></ul> The running program can be continued after rectification of the error.

## Analytical errors

Fault description	Cause	Remedy
Analysis results too high	The chemicals used are contaminated with nitrogen compounds.	<ul style="list-style-type: none"> <li>■ Detailed checking of the chemicals.</li> <li>■ Determination of a blank value.</li> <li>■ Replace the chemicals if necessary.</li> </ul>
	Violent reaction in the digestion tube, sodium hydroxide drops get into the receiver.	<ul style="list-style-type: none"> <li>■ Increase of the water addition amount.</li> </ul>
	Glass bridge of the condenser is broken or worn out, sodium hydroxide drops get into the receiver.	<ul style="list-style-type: none"> <li>■ Replacement of the glass condenser.</li> </ul>
	Glass cleaning agents in the digestion tube.	<ul style="list-style-type: none"> <li>■ Clean digestion tube in advance with distilled water.</li> </ul>
	Entrainment of ammonia from the previous sample.	<ul style="list-style-type: none"> <li>■ Increase distillation time.</li> <li>■ Check whether the sample was previously sufficiently alkalisied.</li> </ul>
Analysis result too low or no result	Incomplete distillation; distillation time too short.	<ul style="list-style-type: none"> <li>■ No quantitative expulsion of the ammonia content.</li> <li>■ The distillation amount should be 100 ml.</li> </ul>
	Ammonia escapes at leaking places.	<ul style="list-style-type: none"> <li>■ Soldered or defective Viton plugs; clean or replace.</li> <li>■ Check seals (GL screw connections) on the distribution head; replace if necessary.</li> <li>■ Check valve at the condenser is gummed up; clean or replace.</li> <li>■ Digestion tube is damaged at the neck extension.</li> <li>■ Distribution head glass leaks; replace.</li> </ul>
	Addition amount of the sodium hydroxide too little; no ammonia development.	<ul style="list-style-type: none"> <li>■ Check the constant flow rate of the NaOH pump (see Technical Data).</li> </ul>
	Too low boric acid amount in the receiver; escaping ammonia is not completely bonded.	<ul style="list-style-type: none"> <li>■ Increase of the boric acid amount.</li> </ul>
	Tube not completely immersed in the acid receiver.	<ul style="list-style-type: none"> <li>■ Increase of the acid amount.</li> </ul>
	Formation of stable ammonia compounds which are not destroyed with sodium hydroxide.	<ul style="list-style-type: none"> <li>■ This problem only occurs with catalysts containing mercury. Sodium sulphate solution destroys these compounds.</li> </ul>

การดูแลบำรุงรักษาเชิงป้องกัน

**Preventive Maintenance**



**บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด**

**ฝ่ายบริการหลังการขาย**

โทร 0 2 639 7000 E-mail: [service.tec.th@dksh.com](mailto:service.tec.th@dksh.com)

**ฝ่ายขายและการตลาด**

โทร 0 2 639 7000 E-Mail : [marketing.tec.th@dksh.com](mailto:marketing.tec.th@dksh.com)

Website : [www.dksh.co.th/technology/scientific-thailand](http://www.dksh.co.th/technology/scientific-thailand)



## เงื่อนไขการให้บริการ Preventive Maintenance

บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้บริการตามขอบข่ายของการบริการ เฉพาะ ในวันและเวลา ราชการ หากมีความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักชัตตฤกษ์) บริษัทฯ จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

### ขอบข่ายการบริการ

- ตรวจสอบสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายการผลการตรวจสอบเครื่องมือ

### หมายเหตุ

- ราคานี้ไม่รวมถึงค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้รับบริการอยู่นอกเขตพื้นที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง เป็นต้น
- บริษัท ฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงราคา โดยไม่แจ้งให้ทราบล่วงหน้า

## ช่องทางการติดต่อ



DKSH Technology Limited (บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด)

เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260

เลขประจำตัวผู้เสียภาษี 010-555-001-4547 (สำนักงานใหญ่)



Call center 0 2 639 7000



DKSH Scientific



[www.dksh.com/scientific-thailand](http://www.dksh.com/scientific-thailand)



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



@dkshscientific

## Preventive Maintenance Contract

จำนวนในการทำสัญญาบริการ ...1...ครั้งต่อปี

ครั้งที่ 1.. วันที่ 15/05/2024.....

### รายละเอียดผู้รับบริการ

หน่วยงาน	บริษัท ซี.อี.เอ็ม เทคโนโลยี (ไทยแลนด์) จำกัด		
ที่อยู่	219/43 หมู่ 12 ถนนเพชรเกษม ตำบลอ้อมน้อย อำเภอกระทุ่มแบน จังหวัดสมุทรสาคร 74130		
โทรศัพท์	0869054664	แฟกซ์	-

### ผู้ติดต่อ

ชื่อ - นามสกุล	คุณศิริภาพร พิมพา				
ตำแหน่ง	เจ้าหน้าที่ห้องปฏิบัติการ				
โทรศัพท์	0869054664	เบอร์ต่อ	-	แฟกซ์	-
E-mail	lab.cemtech1@gmail.com				

### รายละเอียดผู้ให้บริการ

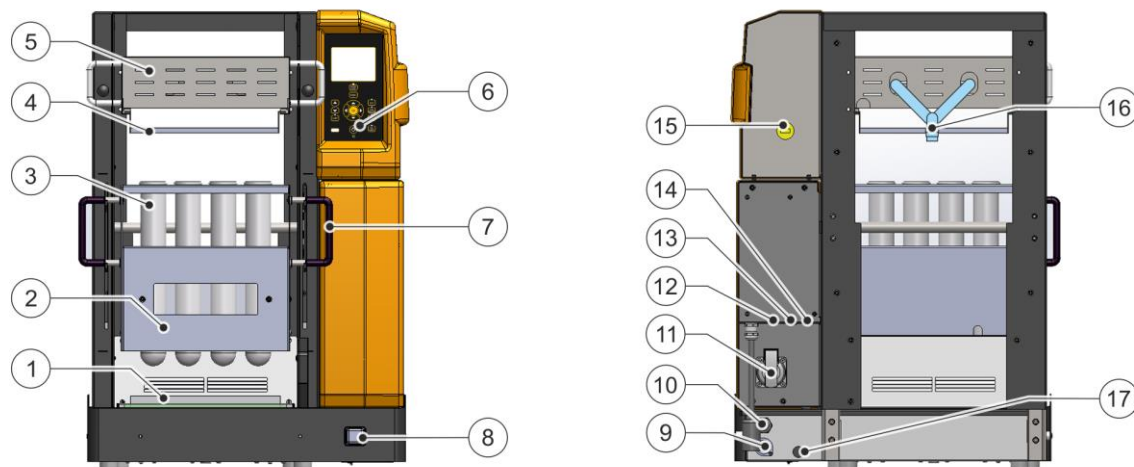
บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่)	
เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260	
โทรศัพท์ 0 2 693 7000 Email: <a href="mailto:sudarat.sk@dksh.com">sudarat.sk@dksh.com</a>	
เจ้าหน้าที่ประสานงาน : คุณสุภารัตน์ ศิริรัตน์ โทรศัพท์ 090 678 6925	
เจ้าหน้าที่ผู้ให้บริการ	นายจิรายุส สเลอาด
ตำแหน่ง	Specialist, Technical Service.
โทรศัพท์	0938138736
E-mail	Jirayut.js@dksh.com

ลงนามผู้รับบริการ		ลงนามผู้ให้บริการ	
ตัวบรรจง	(.....)	ตัวบรรจง	(นาย จิรายุส สเลอาด)
ตำแหน่ง		ตำแหน่ง	Specialist, Technical Service.
วันที่ / ประทับตราบริษัท		วันที่ / ประทับตราบริษัท	15/05/2024

JOB No: LSPR2403414.....MODEL: KT 20s S/N: GER5720180118

### Part 3: ตรวจสอบเช็คสภาพเครื่อง

#### Front and rear view of KT-L version



No.		PASS	Fail	N/A	Remark
1	KJELDATHERM digestion block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	เสื่อมสภาพ
2	Insert rack	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3	Digestion tube	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4	Stainless steel drip tray	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5	Exhaust manifold	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6	Controls module, removable	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7	Handle for insert rack	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8	Mains switch with overcurrent protection function	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9	Connection for lift unit	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10	Mains cable with plug	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11	Power supply for TURBOSOG	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12	Connects controller module to block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13	Connection for fan for cooling samples (optional)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
14	Connection for external cooling water valve (optional)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
15	Connects controller module to block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16	Connection for Iso-Versinic hose (extraction)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17	Excess temperature fuse	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18	Lift	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



## Part 4: สะเอียดและรายงานผลการให้บริการ Preventive Maintenance

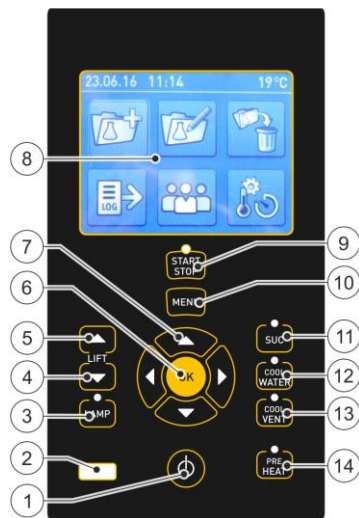
### 4.1 ตรวจเช็คระบบไฟฟ้า

	Pass	Fai	N/A	Remark
ใช้ไฟ 220 V 50 Hz	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
กระแสไฟฟ้าตามพิกัดเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

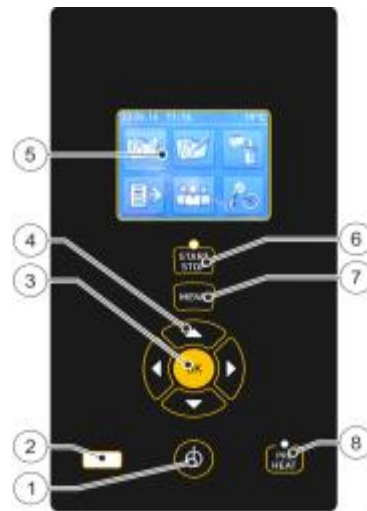
### 4.2 ตรวจสอบสภาพอุปกรณ์ภายนอก

	Pass	Fail	N/A	Remark
สายไฟของเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
ท่อแก๊วรวมไอรกด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
สายยางต่อกับท่อแก๊วรวมไอรกด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
สภาพของ Aluminum block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	เสื่อมสภาพ
การขึ้นลงของ Lift	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Light	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
Current Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Thermostat	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

#### 4.3 ตรวจสอบระบบการทำงาน



☐ KT-L



☒ KT

	Pass	Fail	N/A	Remark
Switch controller on or off.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
USB port	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
LAMP button	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
LIFT down button	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
LIFT up button	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
OK button	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Navigation buttons	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
START/STOP button	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
MENU button	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
SUC button	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
COOLWATER button (optional)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
COOL VENT button (optional)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	.....
PRE HEAT button	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
การขึ้นของอุณหภูมิมากกว่า10องศาต่อหน้าที่ที่250องศา	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
การทำงานของตัวป้องกันอุณหภูมิสูงเกิน	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
การทำงานของระบบควบคุมอุณหภูมิ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

## การบำรุงรักษาทั่วไป (Basic maintenance)

1. การย่อยตัวอย่างเกิดการเดือดที่รุนแรงอันเนื่องมาจากตัวอย่างนั้นสามารถป้องกันได้โดยแนะนำให้ย่อยด้วยการตั้งการเพิ่มอุณหภูมิเป็นระดับเช่น ย่อยที่ระดับอุณหภูมิ 250 C ครบเวลา 15 นาทีจึงเปลี่ยนเป็นอุณหภูมิ 380 C เพื่อป้องกันการล้นออกมา
2. เมื่อใช้เสร็จไม่ควรปล่อยให้ Tube เย็นกับตัวเครื่อง
3. ต้องนำถาดรองไอกรดใส่ทุกครั้งหลังจากใช้งานเสร็จ เพื่อป้องกันการหยดของไอกรดที่จะหยดลงมาที่ตัวเครื่อง
4. ทำความสะอาดตัวหลุมย่อยด้วยน้ำหรือผ้าชุบน้ำในกรณีที่มีคราบกรดหยดลงมาติดอยู่ในหลุม  
เพื่อป้องกันไม่ให้คราบดังกล่าวไปกั้นการแผ่อุณหภูมิ