

การดูแลบำรุงรักษาเชิงป้องกัน

**Preventive Maintenance**



**บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด**

**ฝ่ายบริการหลังการขาย**

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**ฝ่ายขายและการตลาด**

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## เงื่อนไขการให้บริการ Preventive Maintenance

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



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**DKSH Scientific**



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[@dkshscientific](https://line.me/tv/@dkshscientific)

## Preventive Maintenance Contract

จำนวนในการทำสัญญาบริการ .....1..... ครั้ง ต่อ ปี  
ครั้งที่ ...1...วันที่..... 17/08/2023.....

### รายละเอียดผู้รับบริการ

หน่วยงาน	บริษัท บูโร เวอร์ทีส เอคิว แล็บ (ประเทศไทย) จำกัด		
ที่อยู่	อุทยานวิทยาศาสตร์ประเทศไทย 111 หมู่9 ถนนพหลโยธิน ตำบลคลองหนึ่ง คลองหลวง จังหวัดปทุมธานี 12120		
โทรศัพท์		แฟกซ์	

ผู้ติดต่อ



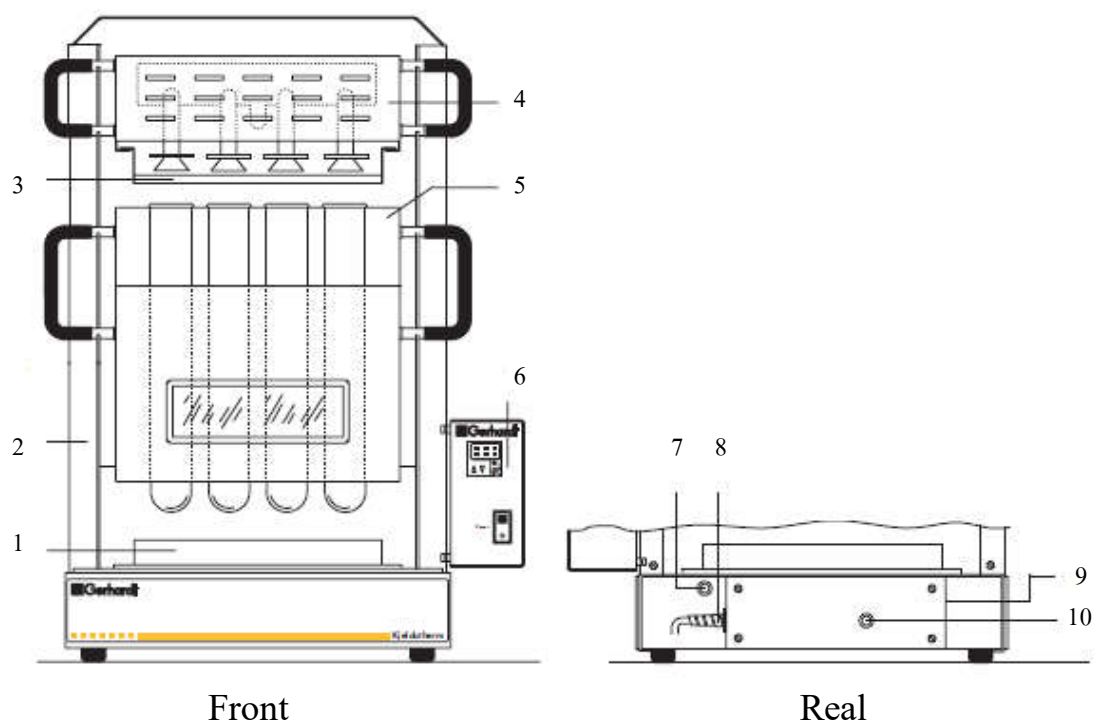
### รายละเอียดผู้ให้บริการ

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่) เลขที่ 2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260		
[Redacted]		
เจ้าหน้าที่ผู้ให้บริการ	[Redacted]	
ตำแหน่ง	[Redacted]	
โทรศัพท์	-	
E-mail	[Redacted]	

ลงนามผู้รับบริการ		ลงนามผู้ให้บริการ	[Redacted]
ตัวบรรจง	(.....)	ตัวบรรจง	
ตำแหน่ง		ตำแหน่ง	
วันที่ / ประทับตราบริษัท		วันที่ / ประทับตราบริษัท	

Part 1: ตรวจสอบเช็คสภาพเครื่อง

Digestion Unit



No.		PASS	Fail	Remark
1	KJALDATHEAM –Digestion Block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2	Two tier console	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3	Drip tray	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4	Exhaust system	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5	Insert rack	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6	Control unit	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
7	Inner for PT-100	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
8	Connection cable	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
9	Excess current switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
10	Excess temperature	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

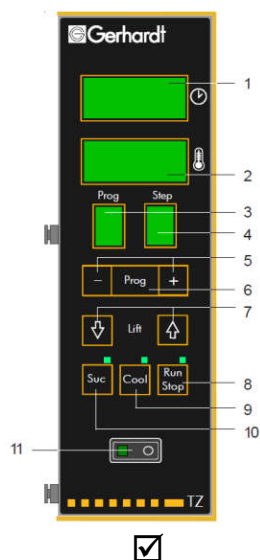
## Part 2: รายละเอียดและรายงานผลการให้บริการ Preventive Maintenance

### 2.1 ตรวจเช็คระบบไฟฟ้า

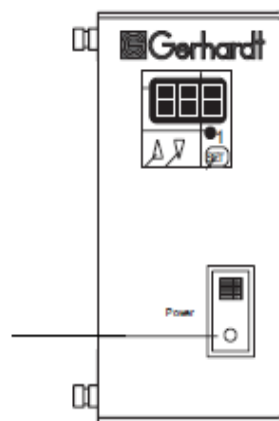
	Pass	Fail	N/A	Remark
ใช้ไฟ 220 V 50 Hz	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
กระแสไฟฟ้าตามพิกัดเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

### 2.2 ตรวจอุปกรณ์ภายนอก

	Pass	Fail	N/A	Remark
สายไฟของเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
ท่อแก๊วรวมไอกรด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
สายยางต่อกับท่อแก๊วรวมไอกรด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
สภาพของ Aluminum block	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	เริ่มเสื่อมสภาพเล็กน้อย



**TZ control**



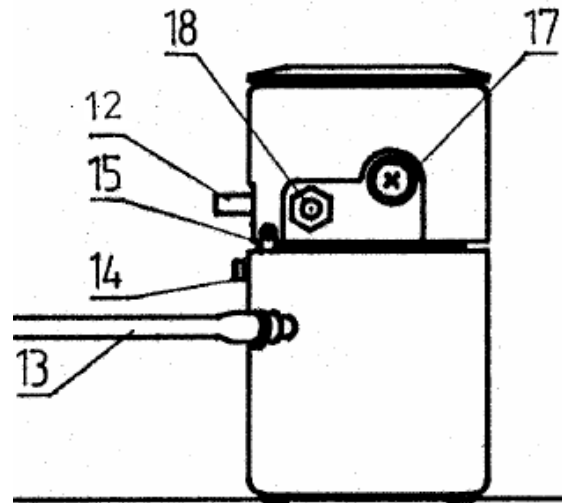
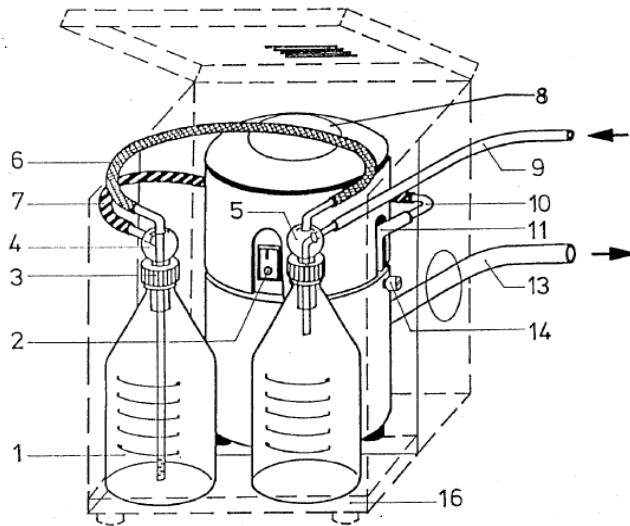
**TR control**

### 2.3 ตรวจเช็คระบบการทำงาน

	Pass	Fail	N/A	Remark
สวิตช์เปิด-ปิดหลัก (1) TR control (11) TZ control	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
จอแสดงผลของ Control	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
ปุ่มกด ตั้งค่า โปรแกรม TZ control (5,6)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
ปุ่มกด ขึ้น ลง ลิฟท์ TZ control (7)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
ปุ่มกด ตั้งค่า Suction TZ Control (10)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
ปุ่มกดตั้งค่า Cool Trap TZ Control (9)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
ปุ่มกด เริ่ม / หยุดการทำงาน TZ Control (8)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
การขึ้นของอุณหภูมิมากกว่า 10 องศาต่อหน้าที่ 250 องศา	<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"/>	.....

JOB No: .....LSPR2305476..... MODEL: .....TUR/K..... S/N:.....6300 15 0026.....

☒ TUR/K



No.		PASS	Fail	N/A	Remark
1	Glass-Bottle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2	Power switch green	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3	Screw cap With Silicone seal GL45	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	เริ่มเสื่อมสภาพ ควรเปลี่ยนพร้อม Seal
4	Down pipe long	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5	Down pipe Short	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6	Isoversinic tubing 12/17	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7	Isoversinic tubing 12/17	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8	Turbosog	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9	Isoversinic tubing 12/17 manifold	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10	Glass elbow	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11	Isoversinic tubing 12/17	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12	Inlet from manifold	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13	Cooling water outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14	Screw for suction capacity	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15	Gas outlet pipe	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16	Drip tray	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17	Water inlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18	Connection cable	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

### การบำรุงรักษาทั่วไป (Basic maintenance)

1. การย่อยตัวอย่างเกิดการเดือดที่รุนแรงอันเนื่องจากตัวอย่างนั้นสามารถป้องกันได้โดยแนะนำให้ย่อยด้วยการตั้งการเพิ่มอุณหภูมิเป็นระดับเช่น ย่อยที่ระดับอุณหภูมิ 250 C ระยะเวลา 15 นาทีจึงเปลี่ยนเป็นอุณหภูมิ 380 C เพื่อป้องกันการล้นออกมา
2. เมื่อใช้เสร็จไม่ควรปล่อยให้ Tube เย็นกับตัวเครื่อง
3. ต้องนำถาดรองไอกรดใส่ทุกครั้งหลังจากใช้งานเสร็จ เพื่อป้องกันการหยดของไอกรดที่จะหยดลงมาที่ตัวเครื่อง
4. ทำความสะอาดตัวหลุมย่อยด้วยน้ำหรือผ้าชุบน้ำในกรณีที่มีการบกรดหยดลงมาติดอยู่ในหลุม เพื่อป้องกันไม่ให้คราบดังกล่าวไปกั้นการแผ่อุณหภูมิ

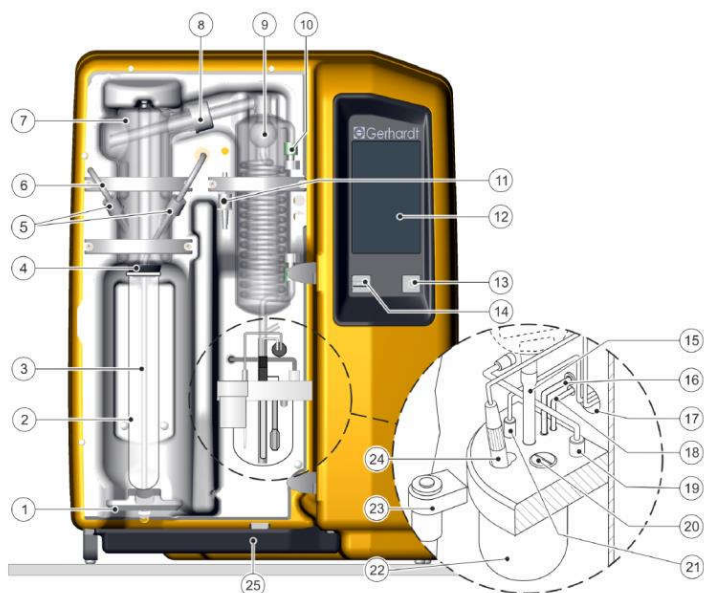


JOB No: LSPR2309931 MODEL: VAP 400 S/N: 5400 15 0006

## Part 1: Operational Qualification (OQ)

### 1.1 ตรวจสอบสภาพเครื่อง

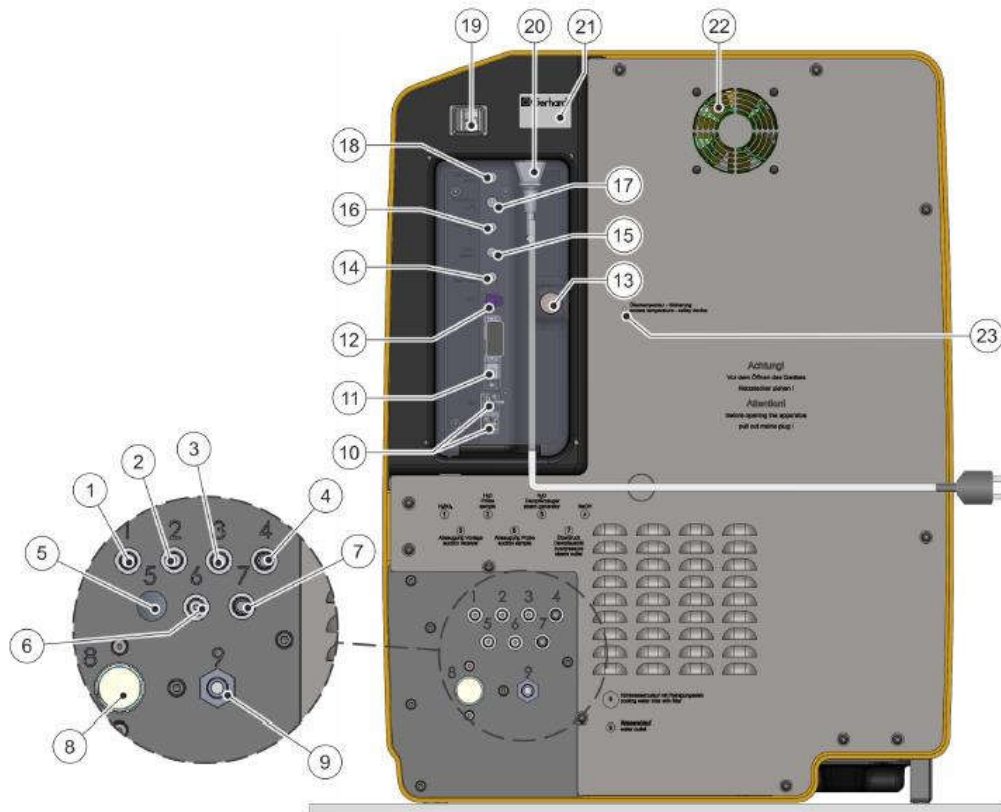
#### FRONT



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"/>

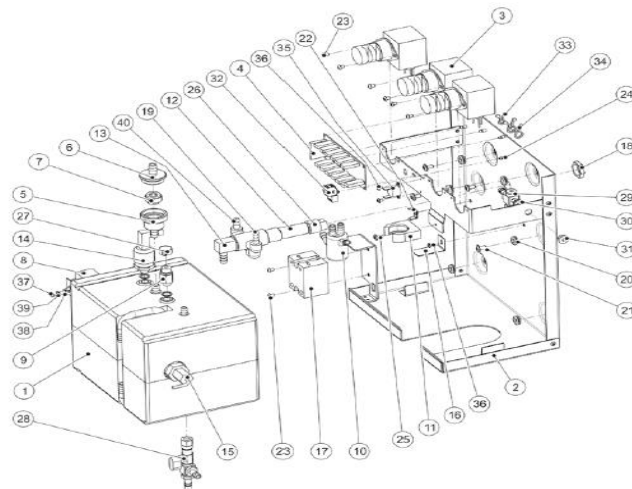
\*\* only VAP 450

## REAR



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

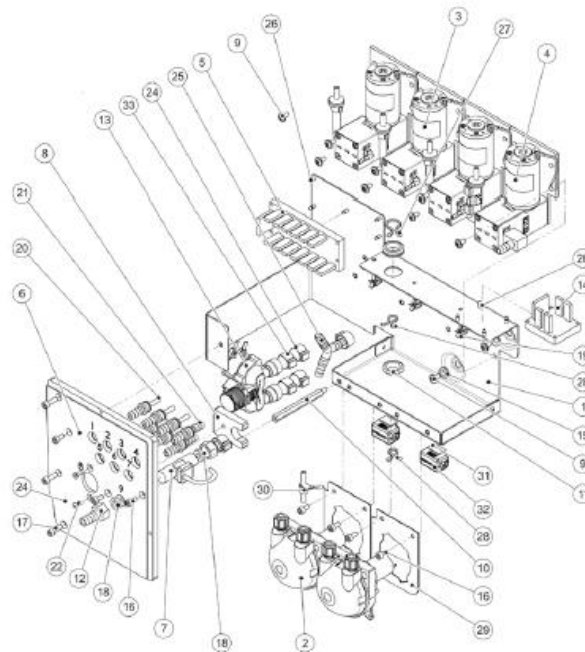
## Inside Steam generator



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

☒ Inside Pump holder VAP200 - 450 V1-V2



No		PASS	FAIL	N/A
1	Pump holding plate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Peristaltic pump for sample suction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Diaphragm pump for H2O (Com[plete incl angle connection piece)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Diaphragm pump for NaOH (Com[plete incl angle connection piece)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	PC board distributor PT	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Tubing connection module VAP	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Water pressure control FT110	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Bracket for tubing connection module	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	VA Lens head screw with flange M5X10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Spacer bolt M5X80	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Bushing nozzle 18-22-27-1,5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Screw-in socket G3-8 LW10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Magnetic valve R2v 2/2 way	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	PC board distributor REVAP 450	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Bushing nozzle 6-10-14-1,5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	VA Cylinder screw M5X10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	VA Cylinder screw M5X16	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	Seal EPDM 15 X 4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Cable clip	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Tubing connection piece 51X10X5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Tubing connection piece 51 X 10 X 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	VA-Countersunk screw M4X10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	Hose clamp S8-7	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	Clamp	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25	Y-tube connector	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26	Spacer bolt 5 mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	Bundle clamp 12 H 6506	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28	Bundle clamp 12 H 4502	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29	Holder for peristaltic pump	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30	Kit grounding pump	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31	Adhesive tape	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32	Snap ferrite VAP300-450	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33	Clamp	<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"/>

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## 2 รายละเอียดการตรวจสอบ

### 2.1 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>

## 2.2 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"/>	.....
Normal current	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

#### 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....400...

	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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	.....
Distillation Head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	.....
Condensor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	.....
Viton Cone	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	.....
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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input 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 H2O	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Adding H3BO3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Suction Sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Suction Reciver	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input 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 type="checkbox"/>	<input checked="" 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"/>	.....
Solenoid Valve soft steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Ventilation Valve Premount	<input type="checkbox"/>	<input checked="" 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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Pump H <sub>2</sub> O Sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
- Non-Return Valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
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 H <sub>3</sub> BO <sub>3</sub>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
- Non-Ruturn Valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Pump suction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Pump suction receiver	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

**6. The Following Program Run :**

	Pass	Fail	N/A	Remark
Addition H <sub>2</sub> O 0-999 ml.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Addition NaOH 0-999 ml.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Addition H <sub>3</sub> BO <sub>3</sub> 0-999 ml.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input 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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....
Suction Receiver	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	.....

**7. Measured pumps**

		Remark
Pump NaOH	Volume : 15.00.....ml	.....
Pump H <sub>2</sub> O	Volume : 15.90.....ml	.....
Pump H <sub>3</sub> BO <sub>3</sub>	Volume : 18.00.....ml	.....

Remark : .....จากการ PM พบว่ามีอะไหล่เสื่อมสภาพหลายรายการ ได้แก่ หัวกลั่น ,ปลาย condensor บาง ทำให้มีคราบสารออกมาที่  
 .....Screw cap gl32 ,screw cap gl32 เสื่อม,สายNovoprene ควรเปลี่ยน, ventilation valve รั่วเล็กน้อย,viton cone ควรเปลี่ยน.....



## Part 3: ข้อมูลสนับสนุนด้านเทคนิค (General Technical Support)

### 3.1 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.

### 3.2 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> <p>Program continues automatically once error has been fixed.</p>
'Sample tube missing'	Sample tube missing.	<ul style="list-style-type: none"> <li>■ Insert sample tube.</li> </ul> <p>Continue program or restart.</p>
'Distillation room protective door open'	Protection door not closed	<ul style="list-style-type: none"> <li>■ Close protection door.</li> </ul> <p>Program continues automatically once error has been fixed.</p>
'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> <p>The running program can be continued after rectification of the error.</p>
	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> <p>The running program can be continued after rectification of the error.</p>

## 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>■ Soiled 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>

## Performance Verification Certificate

Job No. LSPR2208846

**Equipment :** AA SPECTROMETER      **Customer :** Environment & Laboratory Co.,Ltd.  
**Manufacturer :** GBC Scientific      **Location :** Laboratory  
**Model Type :** SavantAA      **Verification Date :** 10 October 2022  
**Serial No. :** A8631

### Result of Verification

Test Description	Tolerance	Reading	Result
1. EHT Photometric Noise	< 350 V -	253 V -	PASS
2. Wavelength Accuracy , Cu 324.7 nm	± 0.20 nm	324.80 nm	PASS
3. Wavelength Accuracy , Cs 852.10 nm	± 0.20 nm	852.17 nm	PASS
4. Slit Width 0.2 nm	± 0.02 nm	0.22 nm	PASS
5. Slit Width 0.5 nm	± 0.05 nm	0.52 nm	PASS
6. Slit Width 1.0 nm	± 0.10 nm	1.05 nm	PASS
7. Standard Gauze Screen 0.49 Abs BC mode with gauze BC mode without gauze * Difference between With gauze and without gauze	± 0.02 Abs   < 0.02 Abs	0.489 Abs 0.0007 Abs 0.0009 Abs -0.0002 Abs	PASS   PASS
8. ABS Reading 5ppm,Cu	> 0.7 Abs	0.884 Abs	PASS
9. %RSD	< 0.5 %	0.19 %	PASS

We hereby certify that instrument complies with GBC factory specifications

Your satisfaction is our promise @ SPCRT

DKSH Technology Limited  
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260  
Phone +662 639 7000, Fax +662 333 1026  
Email: [marketing.tec.th@dksh.com](mailto:marketing.tec.th@dksh.com) Website: [www.dksh.com](http://www.dksh.com)

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด  
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพฯ 10260  
โทรศัพท์ +662 639 7000 โทรสาร +662 333 1026  
อีเมล [marketing.tec.th@dksh.com](mailto:marketing.tec.th@dksh.com) [www.dksh.com](http://www.dksh.com)



## PREVENTIVE MAINTENANCE AND PERFORMANCE VERIFICATION REPORT

### ATOMIC ABSORPTION SPECTROPHOTOMETER (AAS)

Issued Date: 10/10/22

Customer : บริษัท เอ็นไวรอนเม้นท์ แอนด์ แลบลอราตอรี จำกัด

Manufacturer : GBC Scientific Equipment Pty Ltd.



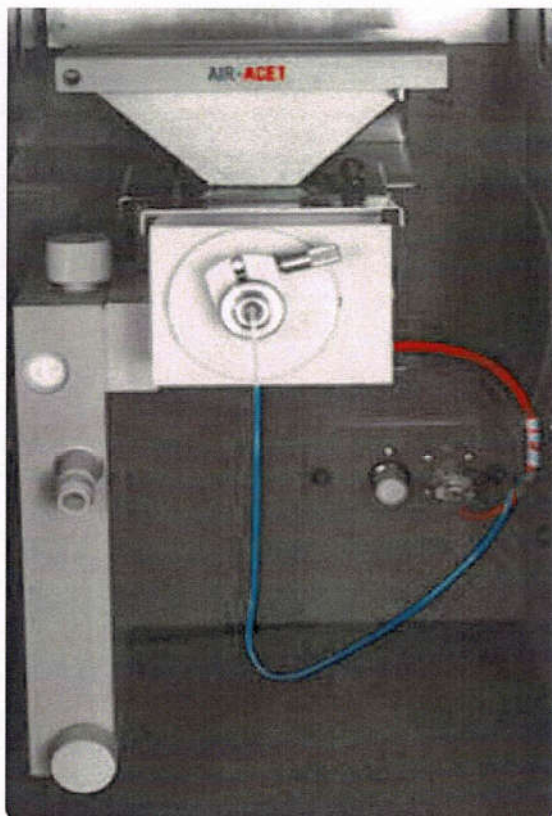
#### Power on switch and initial status

Instrument Ready สถานะเครื่องพร้อมใช้งาน

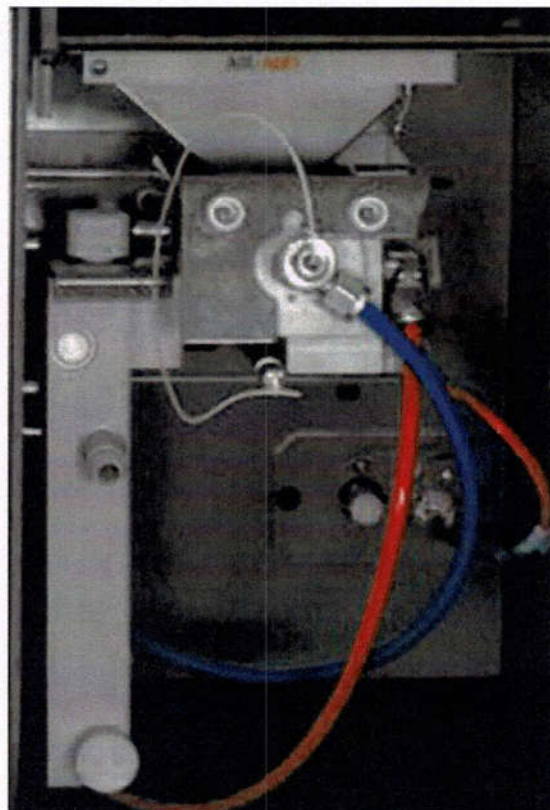
Preventive Maintenance	Pass	Fail	Remarks
<i>Electrical Voltage</i>			
- Main voltage ( power supply check 220V $\pm$ 10V ).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	236.5 VAC
- Power indicator light (Replace if faulty).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
- Power core (Clean or replace as appropriate).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
- Fan (Clean or replace filter element as appropriate).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
<i>Environment</i>			
- Temperature (10 to 35 deg.C)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	25.2 C
- Humidity (8 to 80%).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	55%
- Air Quality (No Dust)	<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>			
- Windows lens (Clean or replace as appropriate).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Clean
- Light Source (Check operation. Replace if required).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- D2 Lamp (Check operation. Replace if required).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
<i>Gas system</i>			
- General (Tube and Fitting /Check for leaks).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- Air Zero (Inlet pressure range 300-400 kPa).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4 Bar
- Acetylene (Inlet pressure range 55-96 kPa).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.9 Bar
- Nitrous oxide (Inlet pressure range 300-400 kPa).	<input type="checkbox"/>	<input type="checkbox"/>	
<i>Computer</i>			
- Operating system	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Windows 10
- Software Version	<input checked="" type="checkbox"/>	<input type="checkbox"/>	SavantAA3.11
- Verify that all computer links and installed software operate correctly	<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>			
- Burner head (Clean the jaws using GBC Burner Cleaning Card).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- Burner mount (Check for wear. Replace the burner retaining plate if required).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- Spray chamber (Visually inspect the bead for cracks, pitting or solid deposits. Check or replace O-ring kit).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- Safety interlocks			
➤ 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
- Pressure relief bung. (Check or replace O-ring)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- Nebulizer (Clean and check operation).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- Gas connections (Check for leaks).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- Capillary tube (Check bends and clog).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready
- Liquid trap (Drain / clean and replace O-ring kit).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Ready



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

Note:

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Signature	
Customer	Date :
<div style="background-color: black; width: 400px; height: 100px; margin-top: 20px;"></div>	<div style="background-color: black; width: 400px; height: 100px; margin-top: 20px;"></div>
	Maintenance Date : 10/Oct/2022

Performance Verification	Specification	Actual Value	Pass	Failed	Remarks
1. Wavelength accuracy (optic calibration check).	Cu 324.75 nm $\pm 0.2$ nm	324.80 nm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
	Cs 852.10 nm $\pm 0.2$ nm	852.17 nm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
2. Slit width accuracy (0.2 nm ,0.5 nm,1.0 nm)	0.2 nm $\pm 0.02$ nm	0.22 nm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
	0.5 nm $\pm 0.05$ nm	0.52 nm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
	1.0 nm $\pm 0.10$ nm	1.05 nm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
3. EHT	<350V	253 V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
4. Absorbance accuracy (absorbance calibration check). ➤ Gauze 0.49 A.U.	Reading $\pm 10\%$ of calibrated value.	0.4891 Abs.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
5. Background correction (optics alignment check). difference between measurement with and without 0.49 A.U. gauze for 10 samples.	SavantAA <1% SensAA/XplorAA <2%	BC on with gauze: 0.0007 Abs. BC on without gauze: 0.0009 Abs.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
6. Sensitivity /noise flame test (aqueous Cu solution test under air-acetylene flame).	Cu 5 ppm >0.7 A.U.	0.8839 Abs.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A
	<0.5% RSD	0.19 %	<input checked="" type="checkbox"/>	<input type="checkbox"/>	N/A

Note:

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Signature	
Customer .....	Date :
	Maintenance Date : 10/Oct/2022



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM1185

Page.: 1 of 3

## Certificate of Calibration

Equipment :	Autoclave
Manufacturer :	Rexall
Model :	LS-2D
Serial No. :	04131
ID No. :	AUT-01
Submitted by :	Environment & Laboratory Co.,Ltd. 40 Soi Liangmueangnonthaburi 13, Talad Kwan, Mueang, Nonthaburi 11000
Location :	Room No. 205
Received Order :	14 July 2022
Calibration Date :	15 July 2022
Ambient Temperature :	( 26 ± 10 ) °C
Relative Humidity :	( 50 ± 30 ) %



Issue Date : 27 July 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0043527





Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2207-0250OC-7

Cert. No.: 22TM1185

Page.: 2 of 3

**Procedure Used :-**

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1 ) Data Acquisition	34970A	MY44073381	22LM78/1	12 May 2023

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

3. This certification is traceable to the International System of Unit.

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3\*\*

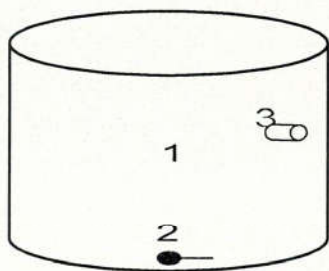
(\*\* = Categorization of pathogens according to hazard and categories of containment, second edition, 1990 )

It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source



	<u>Environmental</u>		
	( °C )	( %R.H. )	( Volt )
<b>Beginning of Calibration</b>	27	68	224
<b>Finished of Calibration</b>	28	63	223

<u>Position</u>	<u>Description</u>	<u>Ref. Std. ID No.:</u>
1 =	Center of chamber	20-01TC-01
2 =	Temperature sensor	20-01TC-02
3 =	Exhaust port	20-01TC-03



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2207-0250OC-7

Cert. No.: 22TM1185

Page.: 3 of 3

**Result of Calibration :-** ( \* ) Without Adjustment

Operating parameter Set : Temperature = 120 °C

Sterilization period = 15 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( kg/cm <sup>2</sup> )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
120	-	1	121.644	0.82	1.2	1.2	2
		2	121.524				
		3	121.570				

**Average\*** : The average of 30 values in each position.

**Stability** : One-half of the greatest maximum difference of measured temperature at any one probe.

**UUC\*** : Unit Under Calibration

**Note** : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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# MAINTENANCE AND IPV TEST CERTIFICATE MODEL

## Avio 200

Customer	<div style="background-color: black; width: 100%; height: 100%;"></div>	Date Tested:	September 9, 2022
Address :		Recommendation Recertification	
		Period	12 Months
		Recertification Due:	September 9, 2023
		Date Last Certified:	January 14, 2021
User Name		Visit Number:	1 of 1
Phone:	PerkinElmer Phone:	<div style="background-color: black; width: 100%; height: 100%;"></div>	
E - Mail :	PerkinElmer Fax:	<div style="background-color: black; width: 100%; height: 100%;"></div>	

CONFIGURATION TESTED		
MODEL	SERIAL NUMBER	SOFTWARE
Avio 200	079S16062402	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
IPV Method		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Multielement Standard	N069-1579	Jun 30,2023
Instrument Cal. STD4	N930-0221	Nov 30, 2023
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
2 % HNO3		
10 % HNO3		

## MAINTENANCE AND IPV TEST CERTIFICATE MODEL

### Avio 200

SERIAL NUMBER: 079S16062402

DATE TESTED:

September 9, 2022

#### 1. MECHANICAL CHECKS

A. Inspect and clean all fans and filters.

☐ OK

B. Inspect and replace as necessary, all torch components including the RF coil.

☐ OK

C. Inspect all tubing for sign of clacking or leaking.

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK

#### 2. OPTICAL CHECKS

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgebfilters.

☐ OK

C. Recheck optical alignment.

☐ OK

#### 3. COOLING SYSTEM CHECKS

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ OK

#### 4. PERFORMANCE CHECKS

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK

# MAINTENANCE AND IPV TEST CERTIFICATE MODEL

## Avio 200

SERIAL NUMBER: 079S16062402

DATE TESTED:

September 9, 2022

### PARAMETER

### SPECIFICATION

### FINAL VALUE

#### Spectral Resolution : UV

As	193.696 nm	≤ 0.009 nm	<u>0.00765</u> nm
Ni	231.604 nm	≤ 0.011 nm	<u>0.00885</u> nm
Ni	341.476 nm	≤ 0.015 nm	<u>0.01268</u> nm

#### Spectral Resolution : VIS

Ba	455.403 nm	≤ 0.020 nm	<u>0.01519</u> nm
----	------------	------------	-------------------

#### Precision

Zn	206.200 nm	% RSD ≤ 1.0 %	<u>0.58</u> %
Mg	280.271 nm	% RSD ≤ 1.0 %	<u>0.17</u> %
Mg	285.213 nm	% RSD ≤ 1.0 %	<u>0.18</u> %
Ba	455.403 nm	% RSD ≤ 1.0 %	<u>0.22</u> %

#### Detection Limits : Axial

Tl	190.801 nm	3(sd)	<u>0.25</u> ppb
As	193.696 nm	3(sd)	<u>1.92</u> ppb
Se	196.026 nm	3(sd)	<u>0.99</u>
Pb	220.353 nm	3(sd)	<u>1.24</u> ppb

#### Detection Limits : Radial

As	193.696 nm	3(sd)	<u>1.12</u> ppb
Zn	213.857 nm	3(sd)	<u>0.06</u> ppb
Mn	257.610 nm	3(sd)	<u>0.00</u> ppb
La	379.478 nm	3(sd)	<u>0.09</u> ppb
Ba	455.403 nm	3(sd)	<u>0.01</u> ppb
Ba	493.408 nm	3(sd)	<u>0.01</u> ppb

#### BEC : Axial (IB X 1000)/(IS-IB)

Mn	257.610 nm	≤ 30 ppb	<u>4.50</u> ppb
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#### BEC : Radial (IB X 1000)/(IS-IB)

Mn	257.610 nm	≤ 30 ppb	<u>5.91</u> ppb
----	------------	----------	-----------------

**MAINTENANCE AND IPV TEST CERTIFICATE MODEL****Avio 200****SERIAL NUMBER:** 079S16062402**DATE TESTED:** September 9, 2022**Remarks :**

Commissioning follow as commissioning performance sheets.

This is to certify that the above tests have been performed and the configuration tested



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,  
including warranty terms.

**Service Department PerkinElmer Ltd.**



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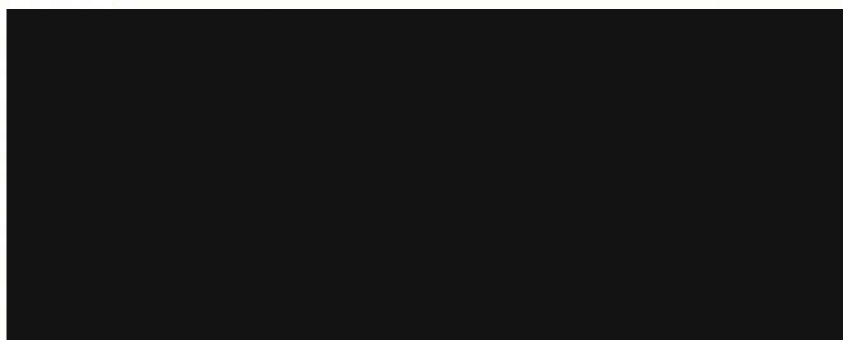


Cert. No.: 22TM1184

Page.: 1 of 3

## Certificate of Calibration

Equipment :	Incubator
Manufacturer :	Memmert
Model :	BM 500
Serial No. :	D593.0342
ID No. :	CHI-002
Submitted by :	Environment & Laboratory Co.,Ltd. 40 Soi Liangmueangnonthaburi 13, Talad Kwan, Mueang, Nonthaburi 11000
Location :	Room No. 204
Received Order :	14 July 2022
Calibration Date :	15 July 2022
Ambient Temperature :	( 26 ± 10 ) °C
Relative Humidity :	( 50 ± 30 ) %



Issue Date : 27 July 2022

The Uncertainties are for a confidence probability of approximately 95%

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A 0043524





Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2207-0250OC-4

Cert. No.: 22TM1184

Page.: 2 of 3

**Procedure Used :-**

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34970A	MY44073381	22LM78/1	12 May 2023

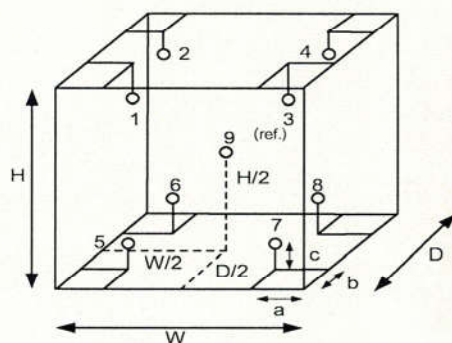
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Close



Environment during calibration		
	Beginning	Finished
Temp. ( °C )	23	22
REL.Humid. ( % )	67	66
AC Supply ( Volt )	223	224

**Probe Installation Details :**

a = 5.0 cm  
b = 5.0 cm  
c = 5.0 cm

**Dimension of Chamber :**

D = 0.40 m  
W = 0.56 m  
H = 0.48 m  
Capacity = 0.11 m<sup>3</sup>

Position :	Ref. Std. ID No.:
1	1RTD-2/1
2	1RTD-2/2
3	22-01RTD-03
4	1RTD-2/4
5	1RTD-2/5
6	1RTD-2/6
7	1RTD-2/7
8	1RTD-2/8
9 (ref.)	1RTD-2/9





Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2207-0250OC-4  
**Result of Calibration :-** ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 22TM1184

Page.: 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
35.0	35.0	35.0	0.035	0.55	0.63	0.30	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
35.0	35.100	34.653	35.131	34.871	35.067	34.888	35.092	35.235	35.170

**Average\*** : The average of 30 values in each position.

**Temperature stability** : One-half of the greatest maximum difference of measured temperature at any one sensor

**Temperature uniformity** : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

**Overall Variation** : The Difference of the maximum and minimum measured temperatures throughout observation

**UUC\*** : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

-oOo-



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Cert.No.: 22CHO415

Page.: 1 of 3

## Certificate of Calibration

Equipment :	Spectrophotometer
Manufacturer :	Hach
Model :	DR 3900
Serial No. :	1988383
ID No. :	-
Condition As-Received:	Used Item
Received Date :	14 July 2022
Calibration Date :	14 July 2022
Reference :	2207-0250OC-11
Submitted by :	Environment & Laboratory Co.,Ltd. 40 Soi Liangmueangnonthaburi 13 Talad Kwan, Mueang, Nonthaburi 11000
Calibration Place :	Room No. 304
Ambient Temperature :	( 27.5 - 27.2 ) °C (On-Site)
Relative Humidity :	( 53.2 - 53.8 ) % (On-Site)
Calibration Procedure :	In - house method : CP-OCH4 based on ASTM E 275-01



Issue Date :

27 July 2022

The Uncertainties are for a confidence probability of approximately 95%

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A 0043531





Cert. No. : 22CHO415

Page : 2 of 3

**Condition of calibration result**

1. Reference Standard Material :

<u>Material</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1. Absorbance Standard set	8331	86623	08 Sep 2022
2. Wavelength Standard set	14536	89302	19 Jan 2023
3. Wavelength Standard set	14537	89303	19 Jan 2023

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

3. This certificate is traceable to the International System of Unit maintained at :

- National Physical Laboratory (NPL), The United Kingdom of Great Britain and Northern Ireland
- National Institute of Standards and Technology (NIST), The United States of America

4. Spectral BandWidth : 5 nm

Scan Speed : - nm/min

**Calibration Results : without adjustment**

**Wavelength Accuracy**

<b>Certified Values of Reference Material ( nm )</b>	<b>UUC Reading ( nm )</b>	<b>Uncertainty of Measurement ( <math>\pm</math> nm )</b>	<b>Coverage Factor <i>k</i></b>
418.40	418	0.59	2.00
537.00	536	0.59	2.00
638.00	638	0.66	2.00
747.61	748	0.59	2.00
807.04	807	0.59	2.00



Cert. No. : 22CHO415

Page : 3 of 3

**Calibration Results : without adjustment**

**Photometric Accuracy**

Wavelength (nm)	Certified Values of Reference Material ( Abs )	UUC Reading ( Abs )	Uncertainty of Measurement ( $\pm$ Abs )	Coverage Factor <i>k</i>
420.0	Zero	0.000	0.0028	2.00
	0.5723	0.571	0.0034	2.00
	0.7522	0.750	0.0031	2.00
	1.0907	1.089	0.0033	2.00
440.0	Zero	0.000	0.0028	2.00
	0.5616	0.560	0.0034	2.00
	0.7345	0.732	0.0032	2.00
	1.0646	1.063	0.0034	2.00
465.0	Zero	0.000	0.0028	2.00
	0.5118	0.513	0.0034	2.00
	0.6773	0.678	0.0031	2.00
	0.9809	0.983	0.0034	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5228	0.522	0.0030	2.00
	0.6861	0.684	0.0030	2.00
	0.9941	0.992	0.0031	2.00
590.0	Zero	0.000	0.0028	2.00
	0.5546	0.552	0.0029	2.00
	0.7159	0.714	0.0032	2.00
	1.0369	1.032	0.0030	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5401	0.538	0.0029	2.00
	0.6835	0.681	0.0030	2.00
	0.9889	0.987	0.0031	2.00

**Remark**

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer

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

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TEL. 0-2717-3000-27 FAX. 0-2719-9484

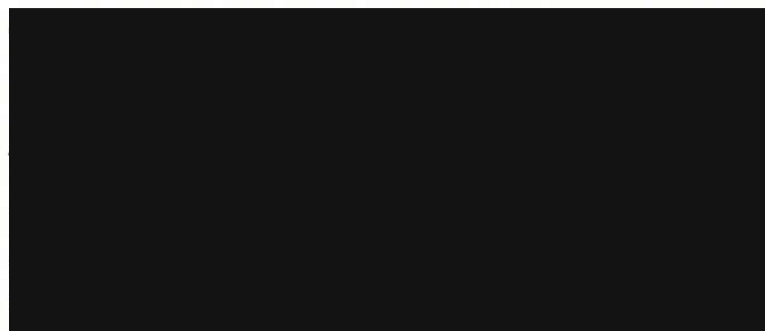


Cert. No.: 22TM1183

Page.: 1 of 3

## Certificate of Calibration

Equipment :	Water Bath
Manufacturer :	Memmert
Model :	WB22
Serial No. :	I505.0053
ID No. :	WAB-01
Submitted by :	Environment & Laboratory Co.,Ltd. 40 Soi Liangmueangnonthaburi 13, Talad Kwan, Mueang, Nonthaburi 11000
Location :	Room No. 303
Received Order :	14 July 2022
Calibration Date :	14 - 15 July 2022
Ambient Temperature :	( 26 ± 10 ) °C
Relative Humidity :	( 50 ± 30 ) %



Issue Date : 27 July 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0043523



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2207-0250OC-3

Cert. No.: 22TM1183

Page.: 2 of 3

**Procedure Used :-**

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer ( IPRT ).

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1 ) Data Acquisition	34970A	MY44073381	22LM78/1	12 May 2023

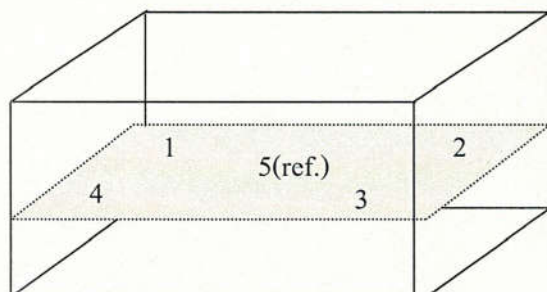
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	31	45	219
Finished of Calibration	30	52	218



Front

Position :	Ref. Std. S/N.:
1	4803988-006
2	4803988-007
3	4804539-014
4	4804539-015
5(ref.)	4804539-016





Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2207-0250OC-3  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 22TM1183

Page.: 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.514	44.511	44.517	44.498	44.519
60.0	60.0	60.0	60.015	60.009	60.009	59.982	59.991

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
44.5	0.047	0.028	0.15	2
60.0	0.073	0.035	0.15	2

**Average\*** : The average of 30 values in each position.

**Uniformity** : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

**Stability** : One-half of the greatest maximum difference of measured temperature at any one probe.

**UUC\*** : Unit Under Calibration

**Note** : The reported uncertainty of measurement was included stability and excluded uniformity.

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

-o0o-