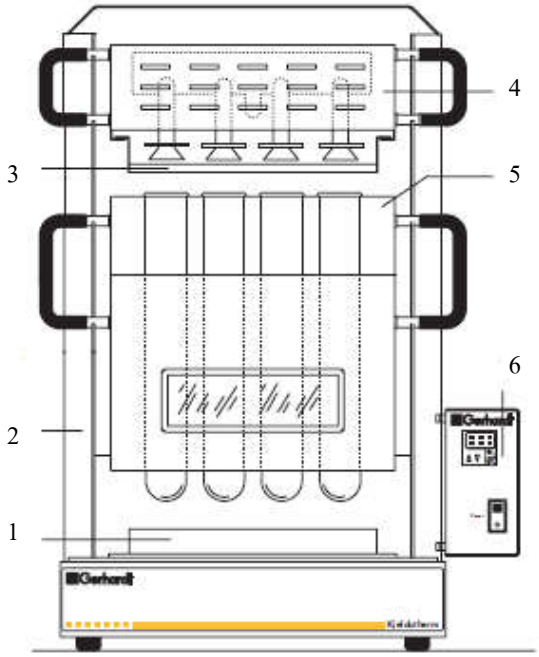
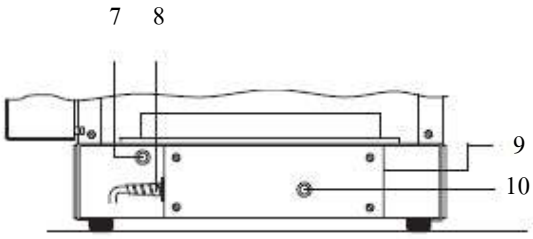
JOB No: ..... LSPR2309932..... MODEL: .....KB 20s..... S/N: 7020 16 0087 / 7210 16 0009

Part 1: ตรวจเช็คสภาพเครื่อง

Digestion Unit



Front



Real

No.		PASS	Fail	Remark
1	KJALDATHEAM –Digestion Block	☑	☐	
2	Two tier console	☑	☐	
3	Drip tray	☑	☐	
4	Exhaust system	☑	☐	
5	Insert rack	☑	☐	
6	Control unit	☑	☐	
7	Inner for PT-100	☑	☐	
8	Connection cable	☑	☐	
9	Excess current switch	☑	☐	
10	Excess temperature	☑	☐	

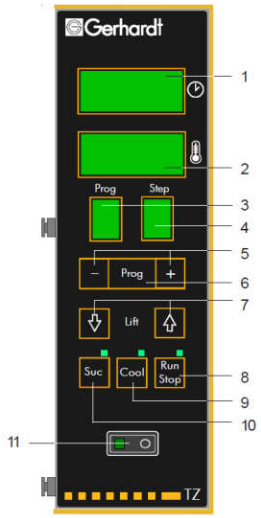
Part 2: รายละเอียดและรายงานผลการให้บริการ Preventive Maintenance

2.1 ตรวจเช็คระบบไฟฟ้า

	Pass	Fail	N/A	Remark
ใช้ไฟ 220 V50 Hz	☑	☐	☐	……..
กระแสไฟฟ้าตามพิกัดเครื่อง	☑	☐	☐	……..

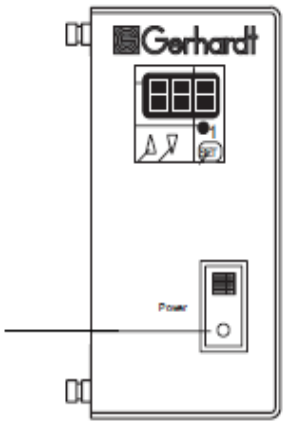
2.2 ตรวจอุปกรณ์ภายนอก

	Pass	Fail	N/A	Remark
สายไฟของเครื่อง	☑	☐	☐	……..
ท่อแก้วรวมไอกรด	☑	☐	☐	……..
สายยางต่อกับท่อแก้วรวมไอกรด	☑	☐	☐	……..
สภาพของ Aluminum block	☑	☐	☐	เริ่มเสื่อมสภาพเล็กน้อย



☑

TZ control



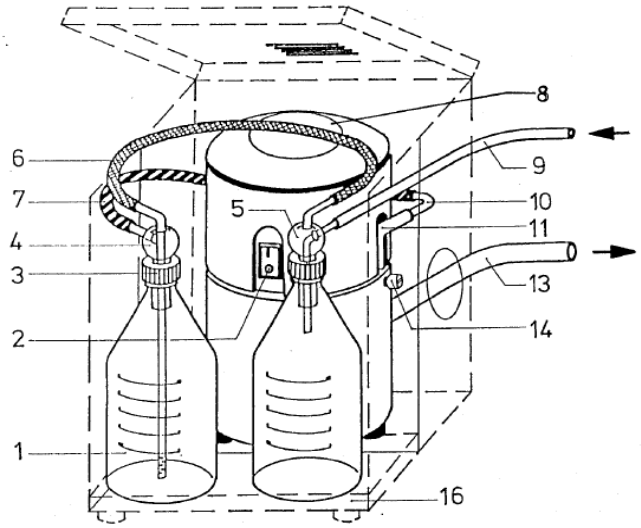
☐

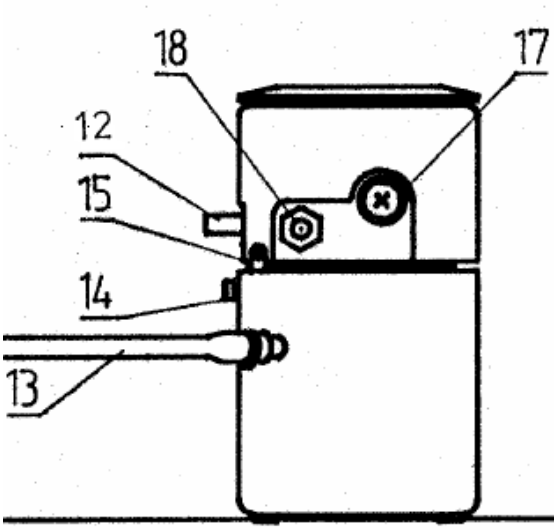
TR control

2.3ตรวจเช็คระบบการทำงาน	Pass	Fail	N/A	Remark
สวิทช์เปิด-ปิดหลัก (1)TR control (11)TZ control	☑	☐	☐	……..
จอแสดงผลของ Control	☑	☐	☐	……..
ปุ่มกด ตั้งค่า โปรแกรม TZ control (5,6)	☑	☐	☐	……..
ปุ่มกด ขึ้น ลง ลิฟท์ TZ control (7)	☑	☐	☐	……..
ปุ่มกด ตั้งค่า Suction TZ Control (10)	☑	☐	☐	……..
ปุ่มกดตั้งค่า Cool Trap TZ Control (9)	☑	☐	☐	……..
ปุ่มกด เริ่ม / หยุดการทำงาน TZ Control (8)	☑	☐	☐	……..
การขึ้นของอุณหภูมิมากกว่า10องศาต่อนาทีที่250องศา	☑	☐	☐	……..
การทำงานของตัวป้องกันอุณหภูมิสูงเกิน	☑	☐	☐	……..
การทำงานของระบบควบคุมอุณหภูมิ	☑	☐	☐	……..

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

☑ **TUR/K**





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

การบำรุงรักษาทั่วไป (Basic maintenance)

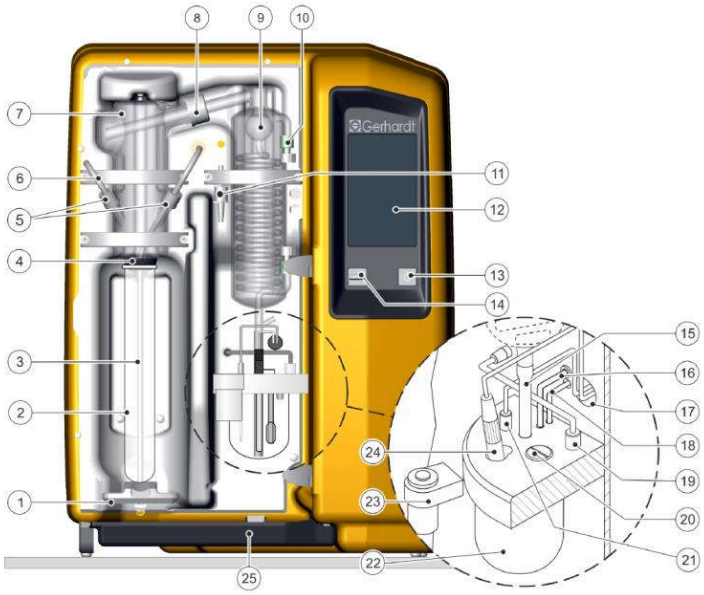
1. การย่อยตัวอย่างเกิดการเดือดที่รุนแรงอันเนื่องจากตัวอย่างนั้นสามารถป้องกันได้โดยแนะนำให้ย่อยด้วยการตั้งการเพิ่มอุณหภูมิเป็นระดับเช่น ย่อยที่ระดับอุณหภูมิ 250 C ครบเวลา 15 นาทีจึงเปลี่ยนเป็นอุณหภูมิ 380 C เพื่อป้องกันการล้นออกมา
2. เมื่อใช้เสร็จไม่ควรปล่อยให้ Tube เย็นกับตัวเครื่อง
3. ต้องนำถาดลองไอกรดใส่ทุกครั้งหลังจากใช้งานเสร็จ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

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

Part 1: Operational Qualification (OQ)

1.1 ตรวจสอบสภาพเครื่อง

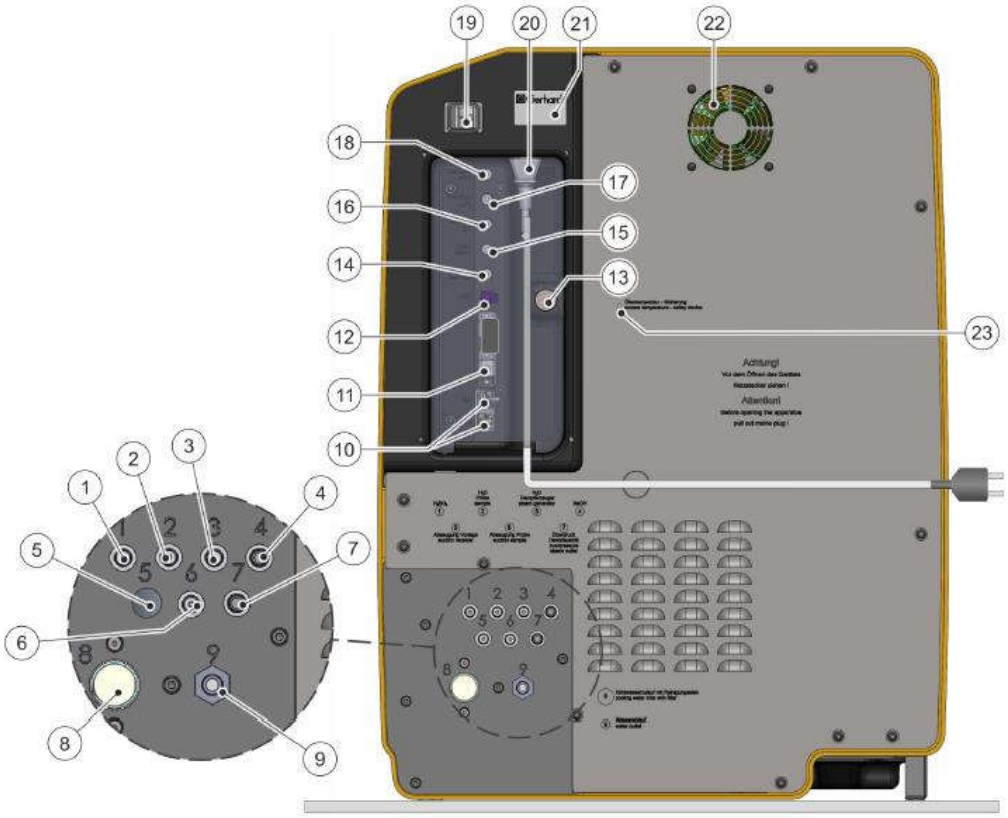
FRONT



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

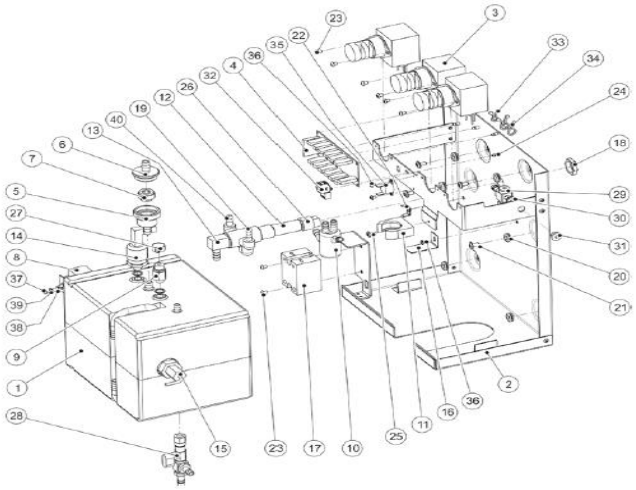
** only VAP 450

REAR



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

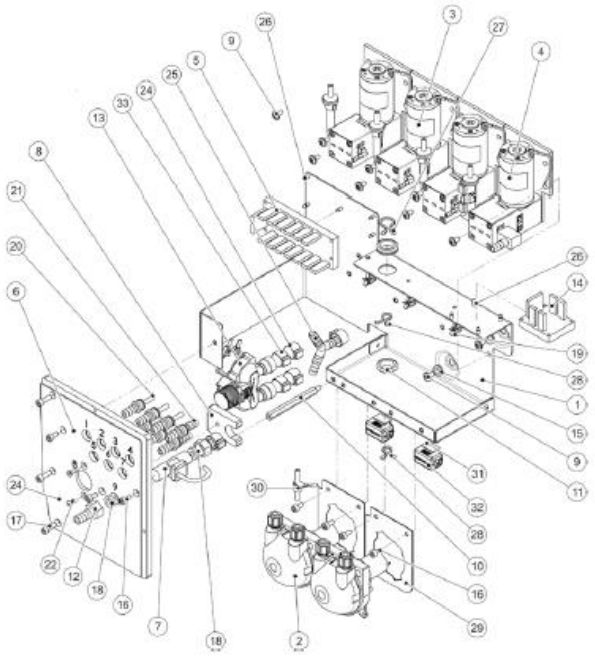
Inside Steam generator



No		PASS	FAIL	N/A
1	Steam generator	☑	☐	☐
2	Steam generator traverse	☑	☐	☐
3	Pinch valve	☑	☐	☐
4	Circuit board distributor	☑	☐	☐
5	Valve tubing connection	☑	☐	☐
6	Housing safety valve	☑	☐	☐
7	Safety valve SKT	☑	☐	☐
8	Excess temperature protection , steam generator	☑	☐	☐
9	Safety valve G 1/8 0,5 bar	☑	☐	☐
10	Ventilation glass pinch valve VAPODEST	☑	☐	☐
11	Hose clamp for ventilation clamp	☑	☐	☐
12	Distributor PP	☑	☐	☐
13	Angle connection PP	☑	☐	☐
14	Pressure transmitter	☑	☐	☐
15	Level switch	☑	☐	☐
16	Fixing bracket steam generator	☑	☐	☐
17	Relay HT+	☑	☐	☐
18	VA Hexagon nut ½“	☑	☐	☐
19	Angle connection 1/8“	☑	☐	☐
20	Bushing nipple 6-10-14	☑	☐	☐
21	VA Lens head screw M5 X 10	☑	☐	☐
22	Grounding connection , 2-pole	☑	☐	☐
23	VA Lens head screw M4 X 6	☑	☐	☐
24	Spacer bolt 5 mm	☑	☐	☐
25	VA Lens head screw M4 X 10	☑	☐	☐
26	Tubing connection	☑	☐	☐
27	Hose clamp 14.5 mm	☑	☐	☐
28	Module ball valve with nozzles	☑	☐	☐
29	Cross manifold with spout	☑	☐	☐
30	Seal copper G 1/8	☑	☐	☐
31	Locking screw 1/8”	☑	☐	☐
32	Pin strip	☑	☐	☐
33	Bundle clamp 12 H 4500	☑	☐	☐
34	Bundle clamp 12 H 4502	☑	☐	☐
35	Temperature switch 80°C	☑	☐	☐
36	VA Lens head screw M3 X 6	☑	☐	☐
37	VA Hexagon nut M4	☑	☐	☐
38	Lins head screw M4 X 8	☑	☐	☐

39	VA Spring washer	☑	☐	☐
40	Angle connection, reduced , 1/8" PP	☑	☐	☐

☑ Inside Pump holder VAP200 - 450 V1-V2



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

25	Y-tube connector	☑	☐	☐
26	Spacer bolt 5 mm	☑	☐	☐
27	Bundle clamp 12 H 6506	☑	☐	☐
28	Bundle clamp 12 H 4502	☑	☐	☐
29	Holder for peristaltic pump	☑	☐	☐
30	Kit grounding pump	☑	☐	☐
31	Adhesive tape	☑	☐	☐
32	Snap ferrite VAP300-450	☑	☐	☐
33	Clamp	☑	☐	☐

Control panel



No		PASS	FAIL
1	Title bar	☑	☐
2	Status bar	☑	☐
3	Navigation button	☑	☐
4	Smart switch with multiple functions	☑	☐
5	USB interface	☑	☐

---

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 FunctionTest)

- ระบบสร้างและควบคุมความดันของ Steam
- ระบบการเติมน้ำเข้า Sample Tube
- ระบบการเติม Na OH
- ระบบการเติม H3BO3

2.2 รายงานผลการให้บริการ

1. TECHNICAL DATA	Pass	Fail	N/A	Remark
Main Supply 220 volt + 10% 50 Hz with ground	☑	☐	☐	……..
Norminal current	☑	☐	☐	……..

1.1 COOLING WATER BATH	Pass	Fail	N/A	Remark
Temperature 15-20 °C	☑	☐	☐	……..
Cooling Water Outlet	☑	☐	☐	……..
Control Temperature	☑	☐	☐	……..

1.2 OPTICAL TEST VAP....400...	Pass	Fail	N/A	Remark
Screw cap GL14	☑	☐	☐	……..
Screw cap GL18	☑	☐	☐	……..
Screw cap GL32	☐	☑	☐	……..
Distillation Head	☐	☑	☐	……..
Condensor	☐	☑	☐	……..
Viton Cone	☐	☑	☐	……..
Ventilation Valve BV	☑	☐	☐	……..
Micro Switch Sample	☑	☐	☐	……..
Agitator motor for propeller	☑	☐	☐	……..

2. SYSTEM COOLING WATER INLET	Pass	Fail	N/A	Remark
Cooling Water Inlet	☑	☐	☐	……..
Cooling Water Outlet	☑	☐	☐	……..
Flow control valve	☑	☐	☐	……..

3.SYSTEM CONTROL	Pass	Fail	N/A	Remark
Display	☑	☐	☐	……..
Program	☑	☐	☐	……..
Adding NaOH	☑	☐	☐	……..
Adding H2O	☑	☐	☐	…….
Adding H3BO3	☑	☐	☐	…….
Suction Sample	☑	☐	☐	…….
Suction Reciver	☑	☐	☐	.....

4.SYSTEM DISTILLATION	Pass	Fail	N/A	Remark
Boiler	☑	☐	☐	…….
Level Sensor	☑	☐	☐	…….
Novopren	☐	☑	☐	…….
Solenoid Valve Shut-Off	☑	☐	☐	…….
Solenoid Valve Steam	☑	☐	☐	…….
Solenoild Valve soft steam	☑	☐	☐	…….
Ventilation Valve Premount	☐	☑	☐	…….
Excess Pressure Detector	☑	☐	☐	…….
Heating Element	☑	☐	☐	…….

5. PUMP	Pass	Fail	N/A	Remark
Pump H_2O Steam	☑	☐	☐	……..
- Non-Return Valve	☑	☐	☐	……..
Pump H_2O Sample	☑	☐	☐	……..
- Non-Return Valve	☑	☐	☐	……..
Pump NaOH	☑	☐	☐	……..
- Non-Ruturn Valve	☑	☐	☐	……..
Pump H3BO3	☑	☐	☐	…….
- Non-Ruturn Valve	☑	☐	☐	…….
Pump suction	☑	☐	☐	…….
Pump suction receiver	☑	☐	☐	…….

6. The Following Program Run :		Pass	Fail	N/A	Remark
Addition H2O	0-999 ml.	☑	☐	☐	……
Addition NaOH	0-999 ml.	☑	☐	☐	……
Addition H3BO3	0-999 ml.	☑	☐	☐	……
Reaction Time	0-108 min	☑	☐	☐	…….
Distillation Time	0-108 min	☑	☐	☐	…….
Steam Capacity	10%-100%	☑	☐	☐	……
Suction Sampe		☑	☐	☐	……
Suction Receiver		☑	☐	☐	……

7. Measured pumps		**Remark**
Pump NaOH	Volume : .....15.00.....ml	……..
Pump H2O	Volume : .....15.90.....ml	……..
Pump H3BO3	Volume : .....18.00.....ml	……..

Remark : ……จากการ PM พบว่ามีอะไหล่เสื่อมสภาพหลายรายการ ได้แก่ หัวกลัน ,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_2O 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	■ Open water tap. ■ Check coolant pressure. ■ Check coolant tube. Program continues automatically once error has been fixed.
'Sample tube missing'	Sample tube missing.	■ Insert sample tube. Continue program or restart.
'Distillation room protective door open'	Protection door not closed	■ Close protection door. Program continues automatically once error has been fixed.
'Reagent storage/ waste'	One or more storage tanks are empty	■ Fill storage tank. ■ Check correct seating of the universal sensors. The running program can be continued after rectification of the error.
	The sample waste tank is full.	■ Empty sample waste tank. ■ Check correct seating of the universal sensors. 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.	■ Detailed checking of the chemicals. ■ Determination of a blank value. ■ Replace the chemicals if necessary.
	Violent reaction in the digestion tube, sodium hydroxide drops get into the receiver.	■ Increase of the water addition amount.
	Glass bridge of the condenser is broken or worn out, sodium hydroxide drops get into the receiver.	■ Replacement of the glass condenser.
	Glass cleaning agents in the digestion tube.	■ Clean digestion tube in advance with distilled water.
	Entrainment of ammonia from the previous sample.	■ Increase distillation time. ■ Check whether the sample was previously sufficiently alkalised.
Analysis result too low or no result	Incomplete distillation; distillation time too short.	■ No quantitative expulsion of the ammonia content. ■ The distillation amount should be 100 ml.
	Ammonia escapes at leaking places.	■ Soiled or defective Viton plugs; clean or replace. ■ Check seals (GL screw connections) on the distribution head; replace if necessary. ■ Check valve at the condenser is gummed up; clean or replace. ■ Digestion tube is damaged at the neck extension. ■ Distribution head glass leaks; replace.
	Addition amount of the sodium hydroxide too little; no ammonia development.	■ Check the constant flow rate of the NaOH pump (see Technical Data).
	Too low boric acid amount in the receiver; escaping ammonia is not completely bonded.	■ Increase of the boric acid amount.
	Tube not completely immersed in the acid receiver.	■ Increase of the acid amount.
	Formation of stable ammonia compounds which are not destroyed with sodium hydroxide.	■ This problem only occurs with catalysts containing mercury. Sodium sulphate solution destroys these compounds.

Technology

DKSH

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	< 350	V	253	V	PASS
Photometric Noise	-		-		
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	± 0.02	Abs	0.489	Abs	PASS
BC mode with gauze			0.0007	Abs	
BC mode without gauze			0.0009	Abs	
* Difference between With gauze and without gauze	< 0.02	Abs	-0.0002	Abs	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 speccifications

***Your satisfaction is our promise* @ SPCRT**

[redacted]

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

Job No. LSPR2208846
☐ Service contract Basic Plan
☐ Service contract Performance Plan

DKSH
บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด

PREVENTIVE MAINTENANCE AND PERFORMANCE VERIFICATION REPORT

ATOMIC ABSORPTION SPECTROPHOTOMETER (AAS)

Issued Date: 10/10/22

Customer :	บริษัท เอ็นไวรอนเม้นท์ แอนด์ แลบอราตอรี่ จำกัด	Manufactuer :	GBC Scientific Equipment Pty Ltd.
Address :	53/3 หมู่ 3 ถนนเรวดี ตำบลตลาดขวัญ อำเภอเมืองนนทบุรี จังหวัดนนทบุรี 11000	Model :	SavantAA
		Serial No :	A8631
Contract :	[redacted]	Location :	Laboratory

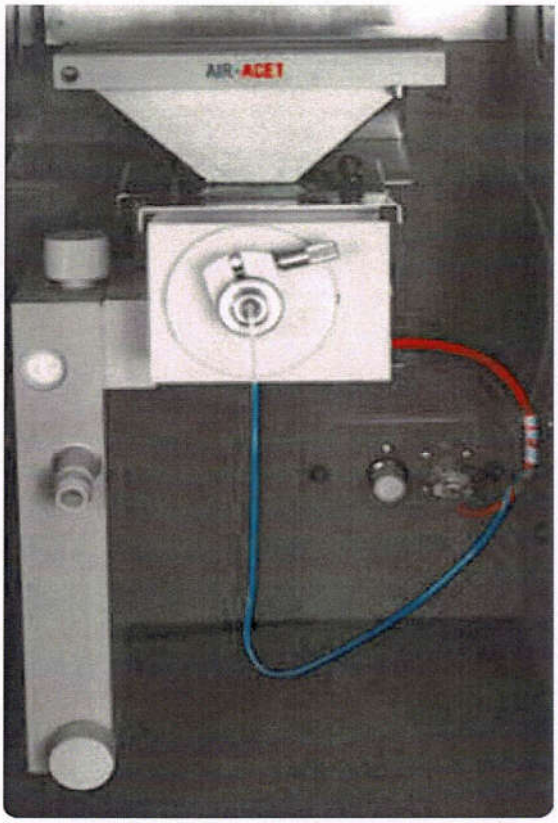
Power on switch and initial status

Instrument Ready สถานะเครื่องพร้อมใช้งาน

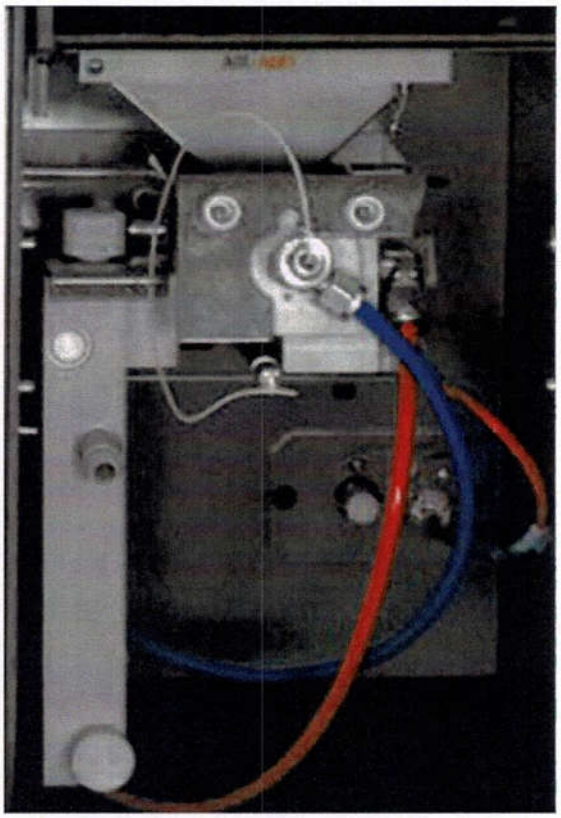
Preventive Maintenance	Pass	Fail	Remarks
Electrical Voltage			
- **Main voltage** (power supply check 220V ±10V).	☑	☐	236.5 VAC
- **Power indicator light** (Replace if faulty).	☑	☐	N/A
- **Power core** (Clean or replace as appropriate).	☑	☐	N/A
- **Fan** (Clean or replace filter element as appropriate).	☑	☐	N/A
Environment			
- **Temperature** (10 to 35 deg.C)	☑	☐	25.2 C
- **Humidity** (8 to 80%).	☑	☐	55%
- **Air Quality (No Dust)**	☑	☐	N/A
- No corrosive vapours present from laboratory sample preparation or external sources.	☑	☐	N/A
Optics			
- **Windows lens** (Clean or replace as appropriate).	☑	☐	Clean
- **Light Source** (Check operation. Replace if required).	☑	☐	Ready
- **D2 Lamp** (Check operation. Replace if required).	☑	☐	Ready
Gas system			
- **General** (Tube and Fitting /Check for leaks).	☑	☐	Ready
- **Air Zero** (Inlet pressure range 300-400 kPa).	☑	☐	4 Bar
- **Acetylene** (Inlet pressure range 55-96 kPa).	☑	☐	0.9 Bar
- **Nitrous oxide** (Inlet pressure range 300-400 kPa).	☐	☐	
Computer			
- **Operating system**	☑	☐	Windows 10
- **Software Version**	☑	☐	SavantAA3.11
- **Verify that all computer links and installed software operate correctly**	☑	☐	Ready

Spray Chamber Type

☐ ABR Spray Chamber



☑ Standard Spray Chamber



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

Gas Flow Optimisation	Pass	Fail	Remark
- **Bleed gas lines** (Relieve pressure in the spray chamber).	☑	☐	Ready
- **Ignitor** (Ignite the flame several times to check ignition reliability. Replace the glow plug if required).	☑	☐	Ready
- **Extinguish** (Check operation).	☑	☐	Ready
- **Horizontal movement** (Check operation for STD. Spray Chamber).	☑	☐	Ready
- **Vertical movement** (Check operation for STD. Spray Chamber).	☑	☐	Ready
- **Burner Adjuster** (Check operation for ABR Spray Chamber)			
➢ Burner Angle (°C)	☐	☐	
➢ Angle Zero (mm)	☐	☐	
➢ Workhead Height (mm)	☐	☐	
➢ Workhead Centre (mm)	☐	☐	

Note:

Signature	
Customer ..... (.....)	Date :
[redacted]	Maintenance Date : 10/Oct/2022

Performance Verification	Specification	Actual Value	Pass	Failed	Remarks
1. **Wavelength accuracy** (optic calibration check).	Cu 324.75 nm ±0.2 nm	324.80 nm	☑	☐	N/A
	Cs 852.10 nm ±0.2 nm	852.17 nm	☑	☐	N/A
2. **Slit width accuracy** (0.2 nm ,0.5 nm,1.0 nm)	0.2 nm ±0.02 nm	0.22 nm	☑	☐	N/A
	0.5 nm ±0.05 nm	0.52 nm	☑	☐	N/A
	1.0 nm ±0.10 nm	1.05 nm	☑	☐	N/A
3. **EHT**	<350V	253 V	☑	☐	N/A
4. **Absorbance accuracy** (absorbance calibration check). ➢ Gauze 0.49 A.U.	Reading ±10% of calibrated value.	0.4891 Abs.	☑	☐	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.	☑	☐	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.	☑	☐	N/A
	<0.5% RSD	0.19 %	☑	☐	N/A

Note:

Signature	
Customer ..... (.....)	Date :
[redacted]	Maintenance Date : 10/Oct/2022

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

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 :	12 July 2023
Calibration Date :	12 July 2023
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %

[redacted]

Issue Date : 24 July 2023

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2307-0094OC-7

Cert. No.: 23TM1099

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:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY41021843	22LM172	TPA	27 Dec 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.
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)

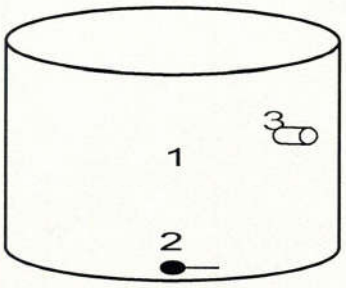
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

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

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	30	55	220
Finished of Calibration	30	57	220

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	21-04TC-01
2 =	Temperature sensor	21-04TC-02
3 =	Exhaust port	21-04TC-03

[redacted]

Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2307-0094OC-7
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 23TM1099

Operating parameter Set : Temperature = 121 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (kg/cm²)	Uncertainty (± °C)	Coverage Factor *k*
121	-	1	121.837	0.89	1.2	1.3	2
		2	121.869				
		3	121.875				

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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[redacted]

PerkinElmer

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Avio 200

Customer :	Environment & Laboratory	**Date Tested:**	September 9, 2022
		Recommendation Recertification	
Address :	[redacted]	**Period**	12 Months
		Recertification Due:	September 9, 2023
		Date Last Certified:	January 14, 2021
User Name:	[redacted]	**Visit Number:**	1 of 1
Phone:		**PerkinElmer Phone:**	[redacted]
E - Mail :		**PerkinElmer Fax:**	

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		

PerkinElmer

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 reqiured, 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

PerkinElmer Ltd. 290 Soi 17 Rama 9 Road, Khwang Bangkapi, Khet Huay Kwang, Bangkok 10310, Thailand

PerkinElmer

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	0.00765	nm
	Ni 231.604 nm	≤ 0.011	nm	0.00885	nm
	Ni 341.476 nm	≤ 0.015	nm	0.01268	nm
Spectral Resolution : VIS					
	Ba 455.403 nm	≤ 0.020	nm	0.01519	nm
Precision					
	Zn 206.200 nm	% RSD	≤ 1.0 %	0.58	%
	Mg 280.271 nm	% RSD	≤ 1.0 %	0.17	%
	Mg 285.213 nm	% RSD	≤ 1.0 %	0.18	%
	Ba 455.403 nm	% RSD	≤ 1.0 %	0.22	%
Detection Limits : Axial					
	Tl 190.801 nm	3(sd)		0.25	ppb
	As 193.696 nm	3(sd)		1.92	ppb
	Se 196.026 nm	3(sd)		0.99	
	Pb 220.353 nm	3(sd)		1.24	ppb
Detection Limits : Radial					
	As 193.696 nm	3(sd)		1.12	ppb
	Zn 213.857 nm	3(sd)		0.06	ppb
	Mn 257.610 nm	3(sd)		0.00	ppb
	La 379.478 nm	3(sd)		0.09	ppb
	Ba 455.403 nm	3(sd)		0.01	ppb
	Ba 493.408 nm	3(sd)		0.01	ppb
BEC : Axial (IB X 1000)/(IS-IB)					
	Mn 257.610 nm	≤ 30 ppb		4.50	ppb
BEC : Radial (IB X 1000)/(IS-IB)					
	Mn 257.610 nm	≤ 30 ppb		5.91	ppb

PerkinElmer Ltd. 290 Soi 17 Rama 9 Road, Khwang Bangkapi, Khet Huay Kwang, Bangkok 10310, Thailand

PerkinElmer

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 perfomed 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.

[redacted]

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Cert. No.: 23TM1100

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 :	12 July 2023
Calibration Date :	12 July 2023
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %

[redacted]

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 0056478

Equipment : Incubator
Condition As-Received : Used Item
Reference : 2307-0094OC-4

Cert. No.: 23TM1100

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:-

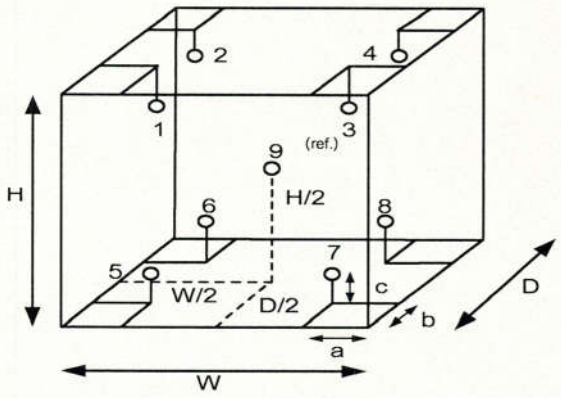
Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY41021843	22LM172	TPA	27 Dec 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	22	22
REL.Humid. (%)	64	66
AC Supply (Volt)	222	221



Position :	Ref. Std. ID No.:
1	18-04RTD-01
2	18-04RTD-02
3	18-04RTD-03
4	18-04RTD-04
5	18-04RTD-05
6	18-04RTD-06
7	18-04RTD-07
8	18-04RTD-08
9 (ref.)	18-04RTD-09

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^3

[redacted]

Equipment : Incubator
Condition As-Received : Used Item
Reference : 2307-0094OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 23TM1100

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor *k*
35.0	35.0	35.0	0.040	0.27	0.48	2

Calibration Point (°C)	Measured Temperature (°C) Position									Uncertainty (±°C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.021	34.900	35.010	35.284	34.853	34.919	34.945	34.964	35.089	0.30

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 %.

-o0o-

[redacted]

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Cert. No.: 23TM1273

Certificate of Calibration

Equipment :	Incubator
Manufacturer :	Envilab-Intiligent
Model :	-
Serial No. :	-
ID No. :	CHI-005
Submitted by :	Environment & Laboratory Co.,Ltd. 40 Soi Liangmueangnonthaburi 13, Talad Kwan, Mueang, Nonthaburi 11000
Location :	Room No. 204
Received Order :	24 August 2023
Calibration Date :	24 August 2023
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %

[redacted]

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.

Equipment : Incubator
Condition As-Received : Used Item
Reference : 2308-0600OC-1

Cert. No.: 23TM1273

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:-

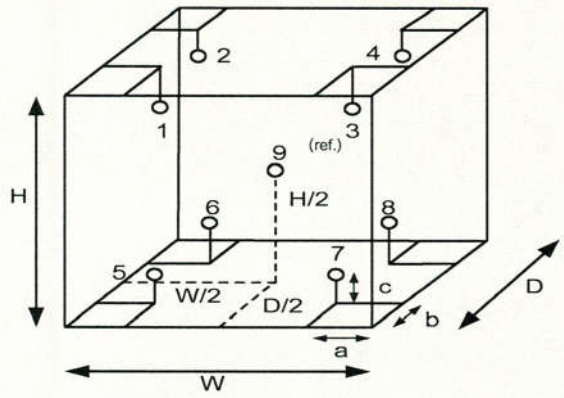
Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44035217	22LM170	TPA	16 Dec 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	23	23
REL.Humid. (%)	50	54
AC Supply (Volt)	220	220



Position :	Ref. Std. ID No.:
1	18-10RTD-01
2	18-10RTD-02
3	18-10RTD-03
4	18-10RTD-04
5	18-10RTD-05
6	18-10RTD-06
7	18-10RTD-07
8	18-10RTD-08
9 (ref.)	18-10RTD-09

Probe Installation Details :

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

Dimension of Chamber :

D =	0.40	m
W =	0.70	m
H =	1.0	m
Capacity =	0.28	m^3

[redacted]

Equipment : Incubator
Condition As-Received : Used Item
Reference : 2308-0600OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 23TM1273

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor *k*
35.0	35.0	35.0	0.47	1.2	1.8	2

Calibration Point (°C)	Measured Temperature (°C) Position									Uncertainty (±°C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	34.805	34.737	34.701	34.435	34.724	34.783	35.228	35.604	34.816	0.71

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 %.

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[redacted]

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Cert.No.: 23CHO420
Page.: 1 of 3

Certificate of Calibration

Equipment :	Spectrophotometer
Manufacturer :	Hach
Model :	DR 3900
Serial No. :	1988383
ID No. :	SPE-002
Condition As-Received:	Used Item
Received Date :	12 July 2023
Calibration Date :	12 July 2023
Reference :	2307-0094OC-11
Submitted by :	Environment & Laboratory Co.,Ltd. 40 Soi Liangmueangnonthaburi 13 Talad Kwan, Mueang, Nonthaburi 11000
Calibration Place :	Room No. 304
Ambient Temperature :	(26.7 - 26.9) °C (On-Site)
Relative Humidity :	(57.2 - 51.2) % (On-Site)
Calibration Procedure :	In - house method : CP-OCH4 based on ASTM E 275-01

[redacted]

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

Condition of calibration result

1. Reference Standard Material :

Material	Serial No.	Certificate No.	Due date
1. Absorbance Standard set	32587	100509	28 Mar 2024
2. Absorbance Standard set	32590	100508	28 Mar 2024
3. Absorbance Standard set	8331	105939	28 Sep 2024
4. Wavelength Standard set	29829	94776	02 Sep 2023
5. Wavelength Standard set	29829	94777	02 Sep 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

Certified Values of Reference Material (nm)	UUC Reading (nm)	Uncertainty of Measurement (± nm)	Coverage Factor *k*
361.40	361	0.59	2.00
447.20	446	0.59	2.00
537.00	536	0.59	2.00
638.00	637	0.59	2.00
740.51	741	0.59	2.00
807.04	807	0.59	2.00

[redacted]

Calibration Results : without adjustment

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (±Abs)	Coverage Factor *k*
350.0	Zero	0.000	0.0046	2.00
	0.4246	0.423	0.0061	2.00
	Zero	0.000	0.0050	2.00
	0.6385	0.633	0.0055	2.00
440.0	Zero	0.000	0.0028	2.00
	0.5607	0.560	0.0030	2.00
	0.7336	0.733	0.0030	2.00
	1.0636	1.063	0.0030	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5224	0.522	0.0028	2.00
	0.6856	0.684	0.0029	2.00
	0.9937	0.992	0.0028	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5397	0.538	0.0028	2.00
	0.6832	0.680	0.0028	2.00
	0.9886	0.985	0.0028	2.00

Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- The Potassium Dichromate filled cells are measured against a Perchloric acid blank.

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Cert. No.: 23TM1173

Certificate of Calibration

Equipment :	Water Bath
Manufacturer :	Memmert
Model :	WB 22
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 :	12 July 2023
Calibration Date :	12 - 13 July 2023
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %

[redacted]

Issue Date : 24 July 2023

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2307-0094OC-3

Cert. No.: 23TM1173

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:-

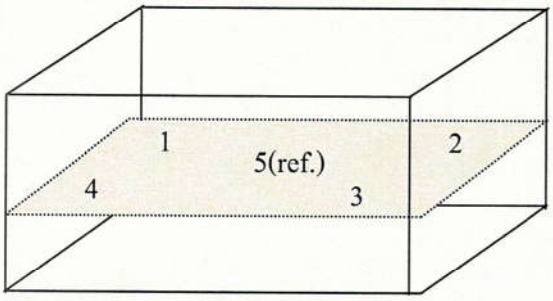
Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44073381	23LM95	TPA	19 May 2024

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.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	30	47	220
Finished of Calibration	31	50	221



Front

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

[redacted]

a 1172193

Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2307-0094OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 23TM1173

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C) Position					Uncertainty (± °C)
			1	2	3	4	5 (ref.)	
44.5	44.5	44.5	44.507	44.503	44.498	44.509	44.502	0.15
60.0	60.0	60.0	59.914	59.928	59.912	59.899	59.894	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor *k*
44.5	0.039	0.023	2
60.0	0.098	0.042	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 %.

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[redacted]

ที่ อก ๐๓๑๐(๑)/ [redacted]

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๓ กุมภาพันธ์ ๒๕๖๗

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท ทีเอ็นพี เอ็นไวรอนเม้นท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๑๙ ธันวาคม ๒๕๖๖

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน บริษัท ทีเอ็นพี เอ็นไวรอนเม้นท์ จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่อ้างถึง บริษัท ทีเอ็นพี เอ็นไวรอนเม้นท์ จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๓๑๘ สถานที่ตั้งเลขที่ ๓๓๒/๑๗๓ หมู่ที่ ๓ ตำบลบางรักพัฒนา อำเภอบางบัวทอง จังหวัดนนทบุรี ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท ทีเอ็นพี เอ็นไวรอนเม้นท์ จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

[redacted]

[redacted]

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย และสิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้จะหมดอายุในวันที่ ๑๔ มกราคม ๒๕๗๐ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

[redacted]

กองวิจัยและเตือนภัยมลพิษโรงงาน
กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ
โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕
โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙
ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th

เอกสารแนบท้ายหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ทีเอ็นพี เอ็นไวรอนเม้นท์ จำกัด เลขทะเบียน ว-๓๑๘

ที่ อก ๐๓๑๐(๑)/ [redacted] ลงวันที่ ๒๓ กุมภาพันธ์ ๒๕๖๗

ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๑ รายการ

น้ำเสีย จำนวน 7 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method[2]
		2) 5-Day BOD Test, Membrane Electrode Method[2]
2	Oil & Grease	Liquid-Liquid, Partition-Gravimetric Method[2]
3	pH	Electrometric Method[2]
4	Sulfide	Iodometric Method[2]
5	Temperature	Laboratory and Field Methods[2]
6	Total Dissolved Solids	Dried at 180 °C[2]
7	Total Suspended Solids	Dried from 103 to 105 °C[2]

น้ำใต้ดิน จำนวน 1 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	pH	Electrometric Method[2]

อากาศเสีย (ปล่องระบาย) จำนวน 2 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Opacity	Ringelmann's Method[1]
2	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method[3]

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 1 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	pH	Electrometric Method[4,5] [redacted]

เอกสารอ้างอิง...

เอกสารอ้างอิง

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2. APHA, AWWA, WEF. **Standard Methods for the Examination of Water and Wastewater.** 24th ed. Washington, DC: APHA, 2023.

3. United States Environmental Protection Agency. **Standards of Performance for New Stationary Sources.** 40 CFR 60. Appendix A, 2023.

4. United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. **pH Electrometric Measurement. SW-846 Method 9040C,** 2004.

5. United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. **Soil and Waste pH. SW-846 Method 9045D,** 200[redacted]