

ภาคผนวก จ

เอกสารรับรองเครื่องมือการตรวจวัด

## การดูแลบำรุงรักษาเชิงป้องกัน Preventive Maintenance



บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด  
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เนื้อหาการให้บริการ Preventive Maintenance

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บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้บริการตามขอบข่ายของบริการ เฉพาะ ในวันและเวลา ราชการ หากมีความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักชดถุญ) บริษัทฯ จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

### ขอบข่ายการบริการ

- ตรวจสอบสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายงานผลการตรวจสอบเครื่องมือ

### หมายเหตุ

- ราคาไม่รวมค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้รับบริการอยู่นอกเขตพื้นที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง เป็นต้น
- บริษัทฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงราคา โดย ไม่แจ้งให้ทราบล่วงหน้า



ช่องทางการติดต่อ

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



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@dkshscientific

Preventive Maintenance Contract

จำนวนในการทำสัญญาบริการ ....ครั้ง ต่อปี  
ครั้งที่ 1, วันที่ 19/04/2024.....

รายละเอียดผู้รับบริการ

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

ผู้ติดต่อ

ชื่อ - นามสกุล	คุณกนกกร ชุมพิทักษ์
ตำแหน่ง	หัวหน้าส่วน
โทรศัพท์	087 398 9274 เบอร์โทร - แฟกซ์ -
E-mail	lab_center@testtech.co.th

รายละเอียดผู้ให้บริการ

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด (ฝ่ายบริการหลังการขาย) (สำนักงานใหญ่)  
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โทรศัพท์ 0 2 693 7000 Email: [stdsales@dksh.com](mailto:stdsales@dksh.com)  
เจ้าหน้าที่ประจำสาขานาน : คุณสุภาวรัตน์ ศิริรัตน์ โทรศัพท์ 090 678 6925

เจ้าหน้าที่ผู้ให้บริการ	นายธีรายุช พลยอด
ตำแหน่ง	Specialist, Technical Service.
โทรศัพท์	0938138736 แฟกซ์ -
E-mail	<a href="mailto:jirayutjs@dksh.com">jirayutjs@dksh.com</a>

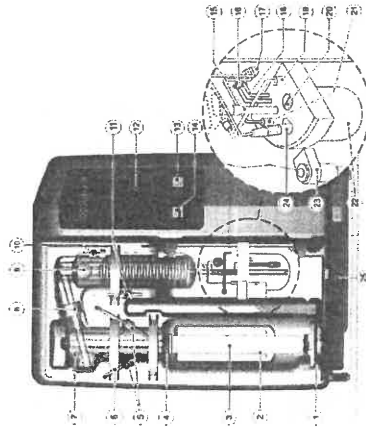
ลงนามผู้รับบริการ	ลงนามผู้ให้บริการ
ตัวจริง	ตัวจริง
ตำแหน่ง	ตำแหน่ง
วันที่ / ประทับตราบริษัท	วันที่ / ประทับตราบริษัท

JOB No: 46PR2402440.....MODEL:YAP300.....S/N: GER5300210095

Operational Qualification (OQ)

ตรวจสอบสภาพเครื่อง

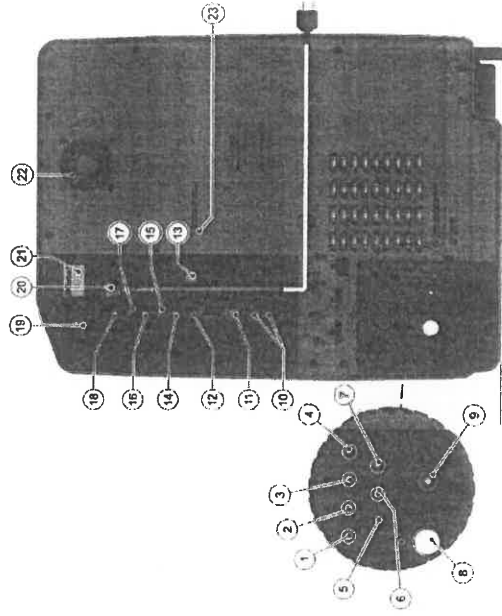
FRONT



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

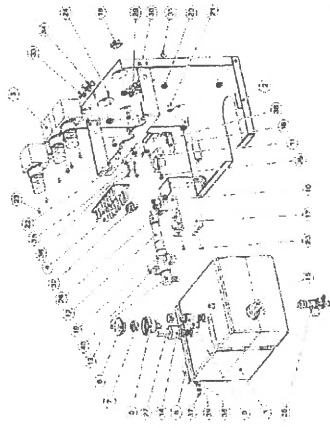
\*\* only VAP 450

REAR



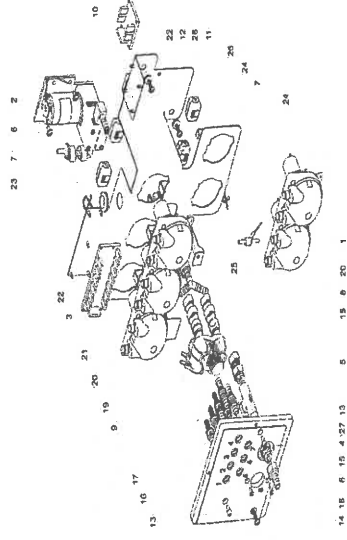
No		PASS	FAIL	N/A
1	Tube connection for sample H3BO3 supply	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Tube connection for sample H2O supply	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Tube connection for steam generator 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 type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
16	Connection socket for H2O tank level monitoring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Connection socket for H3BO3 tank level monitoring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	Connection socket for NaOH tank level monitoring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Overcurrent circuit breaker	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Apparatus socket (mains cable connection)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Rating plate with serial number	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Exhaust air fan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	Excess temperature switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# Inside Steam generator



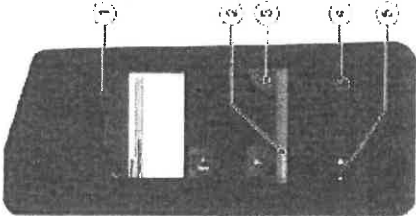
No		PASS	FAIL	N/A
1	Steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Steam generator traverse	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Pinch valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>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

# Module Pump holder VAP200 - 450 V3



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

Control panel



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

- รายละเอียดการตรวจสอบ  
ขั้นตอนการบริการ
- ตรวจสอบระบบไฟฟ้า (Electrical Test)
- ความต้านทานทางไฟฟ้าของเครื่องกับกราวด์
  - กระแสไฟฟ้าที่ใช้งาน
- ตรวจสอบสภาพเครื่อง (Optical Test)
- Main cable
  - Electric wiring
  - Pumps
  - Distribution Head
  - Condensor
  - Steam generator
  - Tubing
  - Viton cone
- ตรวจสอบ Function การทำงาน (The Function Test)
- ระบบสร้างและควบคุมความดันของ Steam
  - ระบบการคืนน้ำเข้า Sample Tube
  - ระบบการคืน Na OH
  - ระบบการคืน H3BO3

ระบบควบคุมอัตโนมัติ

1. TECHNICAL DATA

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

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

1.1 COOLING WATER BATH

Temperature 15-20 °C  
Cooling Water Outlet  
Control Temperature

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

1.2 OPTICAL TEST/AP230?

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

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

Cooling Water Inlet  
Cooling Water Outlet  
Flow control valve

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

3.SYSTEM CONTROL

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

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

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

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

Pump H<sub>2</sub>O Steam  
- Non-Return Valve  
Pump H<sub>2</sub>O Sample  
- Non-Return Valve  
Pump NaOH  
- Non-Return Valve  
Pump H3BO3  
- Non-Return Valve  
Pump suction  
Pump suction receiver

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

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

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

7. Measured pumps

Pump NaOH  
Pump H2O  
Pump H3BO3

Volume : .....20.40.....ml  
Volume : .....10.00.....ml  
Volume : .....ml  
Remark .....  
.....

## ข้อมูลสนับสนุนด้านเทคนิค (General Technical Support)

### การบำรุงรักษาทั่วไป (Basic Maintenance)

#### Cleaning program

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

The following settings are recommended for this:

Parameter	Value
H <sub>2</sub> O addition	150 ml
HNO <sub>3</sub> addition	0 ml
Dilution time	7 min
Shut-off power	100 %
Reaction time	0 s
Reaction sample	30 s

Insert a digestion tube (without sample) and start the program.  
 → All liquid carrying parts are cleaned. In the case of strong contamination, the addition of sulphuric acid can also be added to the digestion tube.

#### General error message

Message	Priority
Cooling water flow volume too low	<ul style="list-style-type: none"> <li>Open water tap.</li> <li>Check coolant pressure.</li> <li>Check coolant flow.</li> </ul> <p>Program continues automatically once error has been cleared.</p>
Sample size missing	<ul style="list-style-type: none"> <li>Insert sample size.</li> </ul> <p>Critical program is halted.</p> <p>Program continues automatically once error has been cleared.</p>
Exhaustion pump pressure too high	<ul style="list-style-type: none"> <li>Close protection door.</li> </ul> <p>Program continues automatically once error has been cleared.</p>
Reagent storage error	<ul style="list-style-type: none"> <li>Fill storage tank.</li> <li>Check correct loading of the selected reagent.</li> </ul> <p>The reagent program can be continued after refilling of the error.</p>
Gas or waste change error	<ul style="list-style-type: none"> <li>Empty sample waste tank.</li> <li>Check correct setting of the selected reagent.</li> </ul> <p>The reagent program can be continued after refilling of the error.</p>

#### Analytical errors

Message	Priority
Analytical results too high	<ul style="list-style-type: none"> <li>Initial quantity of the element.</li> <li>Calibration of a blank value.</li> <li>Prepare the standards if necessary.</li> <li>Increase of the water addition amount.</li> </ul>
	<ul style="list-style-type: none"> <li>Replacement of the glass condenser.</li> </ul>
	<ul style="list-style-type: none"> <li>Check digestion tube in advance with clean water.</li> <li>Increase dilution time.</li> <li>Check whether the sample was previously analysed or not.</li> <li>No quantitative digestion of the element in the sample.</li> <li>The digestion amount should be 100 ml.</li> <li>Isolated or obstructive Vials plugs, closed or replace.</li> <li>Check waste (H<sub>2</sub>SO<sub>4</sub> concentration) on the digestion tube. If the concentration is too high, dilute with distilled water.</li> <li>Check waste of the condenser in general or clean or replace.</li> <li>Digestion tube is changed if the HNO<sub>3</sub> concentration is too high.</li> <li>Check the digestion glass bottle, replace.</li> <li>Check the sampled flow rate of the HNO<sub>3</sub> pump from Transient Cooling.</li> <li>Increase of the flow rate amount.</li> <li>Increase of the acid amount.</li> <li>The problem may occur with calibration containing mercury. Solution depends on how many times measurement.</li> </ul>
Analytical results too low or no result	<ul style="list-style-type: none"> <li>The element used are contained in the reagent component.</li> <li>Visual reaction in the digestion tube, sodium hydroxide drops get into the reaction.</li> <li>Sample weight of the standard is wrong or the standard is contaminated with sodium hydroxide drops get into the reaction.</li> <li>Check cleaning agent in the digestion tube.</li> <li>Dilution of standards from the previous sample.</li> <li>Isotopic dilution, calibration from the start.</li> <li>Amounts exception of loading phase.</li> </ul>
	<ul style="list-style-type: none"> <li>Addition amount of the reagents (hydrogen peroxide, etc.) no measurement.</li> <li>The low waste acid amount in the reaction, causing inaccurate to the sample measurement.</li> <li>The acid amount is not accurately measured in the acid reagent.</li> <li>Problems of liquid reagents components with no acid changed with sodium hydroxide.</li> </ul>





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




CERTIFICATE No : 23T8796  
REFERENCE No : 70515-4

PAGE : 1 OF 2

### Certificate of Calibration

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

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

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
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CERTIFICATE No : 23T8796

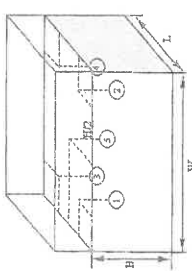
PAGE : 2 OF 2

### Calibration Report

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

#### CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.
- REFERENCE STANDARD INSTRUMENTS :-
  - 1) DATA LOGGER WITH RTD : MODEL 2625A SERIAL No 6603614 CERTIFICATE No 23T6642 DUE DATE 19-Jul-24
  3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
  4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
  5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.
- RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



#### GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 0.6  
Overall Variation of Line Voltage (V) : 3  
Instrument Condition : Normal  
Bath Inner Size (W\*H) : 59\*35\*20 cm

#### BATH PERFORMANCE

Calibrate Point (°C)	Average All Position Temp. (±°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
83.0	83.09	0.05	0.07	0.05	0.16
92.0	92.13	0.11	0.06	0.06	0.28

#### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations				Uncertainty (± °C)
		#1	#2	#3	#4	
83.0	83.0	83.08	83.09	83.06	83.11	0.15
92.0	92.0	92.11	92.13	92.10	92.16	0.19

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

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA. THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



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CERTIFICATE No : 24T1185  
REFERENCE No : 72116-3

PAGE : 1 OF 2

## Certificate of Calibration

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

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

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

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



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CERTIFICATE No : 24T1185

PAGE : 2 OF 2

## Calibration Report

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

### CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : DATA LOGGER WITH RTD  
MODEL : HYDRA 2635A  
SERIAL No : 7301307  
CERTIFICATE No : 2376636  
DUE DATE : 10-Jul-24

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

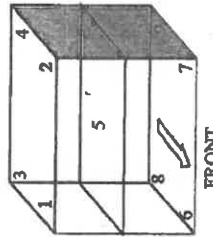
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

#### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 1  
Overall Line Voltage (V) variation : 3  
Instrument Condition : Normal  
Chamber Size (W\*L\*H): 36\*40\*72 cm



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

#### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	#5	#6	#7	#8	#9	
35.0	35.0	34.98	35.01	35.00	35.00	35.08	35.07	35.04	35.10	35.10	0.25
36.0	36.0	36.00	36.03	36.03	36.02	36.04	36.09	36.10	36.04	36.12	0.25
41.5	41.5	41.45	41.45	41.45	41.46	41.46	41.47	41.43	41.44	41.49	0.36

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

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.  
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%  
END OF CALIBRATION REPORT

F-G010 REV : 03



CERTIFICATE No : 24T1189  
REFERENCE No : 72116-7

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : AUTOCLAVE  
MANUFACTURER : HIRAYAMA  
MODEL : HVE-50  
SERIAL No : 30612085166  
ID No : EQL-155  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD.,  
SAMAEDAM, BANGKHUNTHIAN, BANGKOK  
10150

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

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

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CERTIFICATE No : 24T1189

PAGE : 2 OF 2

## Calibration Report

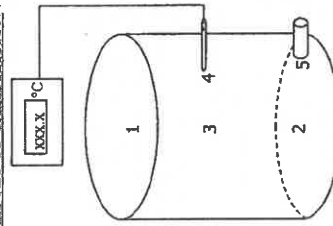
EQUIPMENT : AUTOCLAVE  
MANUFACTURER : HIRAYAMA  
MODEL : HVE-50  
ID NUMBER : EQL-155  
SERIAL NUMBER : 30612085166  
RECEIVED DATE : 09-Feb-24  
CALIBRATION DATE : 09-Feb-24  
AMBIENT TEMPERATURE : 30° C ± 1° C  
RELATIVE HUMIDITY : 33 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON BS 2646-1:2021 BY COMPARISON WITH CALIBRATED RTD DATA LOGGERS  
ON LOCATION 1 AND 2 WERE PLACED IN THE UPPER HALF AND LOWER HALF OF CHAMBER FREE SPACE RESPECTIVELY. THE  
THIRD SENSOR WAS PLACED WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE INSTRUMENT CHAMBER. SENSOR NUMBER  
4 WAS ATTACHED TO THE LOAD TEMPERATURE PROBE, IF FITTED, WITHIN 15 mm OF ITS TIP. SENSOR NUMBER 5 WAS  
PLACED IN THE CHAMBER DRAIN OR VENT WITHIN 100 mm OF ITS CONNECTION TO THE CHAMBER.  
2. REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER : MODEL : VALPROBE : SERIAL No : S350.S367.DV35.DN94 : CERTIFICATE No : 24T0890 : DUE DATE : 26-Jan-25  
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



#### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber variation : 0.5 °C  
Autoclave Condition : Normal  
Chamber Size (Diameter\*H): 30 \* 71 cm

#### CHAMBER PERFORMANCE

Calibrate Point (°C)	Average all Position (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)	Pressure (MPa)	Holding time (min)	Operating Cycle time (min)
115	115.74	0.09	0.11	0.25	0.090	20	60
121	121.59	0.06	0.21	0.28	0.125	20	60

#### FRONT

#### TEMPERATURE MEASUREMENT ACCURACY TEST(°C)

Cont. Temp	Ind Temp	#1	#2	#3	#4	#5	Uncertainty (± °C)
115	115.	115.72	115.74	115.79	115.71	115.71	0.59
121	121	121.59	121.62	121.56	121.58	121.59	0.59

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

NOTE 2 : THE STABILITY TERM IN THE UNCERTAINTY BUDGET WAS REPLACED BY THE STANDARD REPEATABILITY.

NOTE 3 : LOCATION 3 WAS REFERENCE LOCATION.

NOTE 4 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

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

END OF CALIBRATION REPORT



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## Certificate of Calibration

Number of Page(s) 1 of 3

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

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

Equipment condition Good Operation

Calibration Location Water Room

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

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

Calibrated by Mr. Wanchana Janloey

Approved by

Mr. Somthi Temboonsakdi  
Service Manager

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

Number of Page(s) 2 of 3

Certificate No. BSCC-UV-166/24

Calibration Results:

### 1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
279.44	279.18	-0.26	0.18
418.53	418.46	-0.07	0.18
536.52	536.54	0.02	0.18
684.50	684.63	0.13	0.18
879.41	879.43	0.02	0.18

### 2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	CNR	CNR	CNR	CNR
257	0.0000	0.0000	0.0000	0.0075
	0.8354	0.8333	-0.0021	0.0075
313	CNR	CNR	CNR	CNR
350	0.0000	-0.0001	-0.0001	0.0075
	0.6199	0.6190	-0.0009	0.0075

\*CNR = Customer not request

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## Certificate of Calibration

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Certificate No.

BSCC-UV-166/24

Number of Page(s)

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5761	0.5791	0.0030	0.0042
	0.7119	0.7132	0.0013	0.0042
	1.0189	1.0221	0.0032	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5610	0.5636	0.0026	0.0042
	0.7001	0.7012	0.0011	0.0042
	1.0026	1.0052	0.0026	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5249	0.5260	0.0011	0.0042
	0.6975	0.6971	-0.0004	0.0042
	1.0009	1.0012	0.0003	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5666	0.5673	0.0007	0.0042
	0.7620	0.7611	-0.0009	0.0042
	1.0982	1.0976	-0.0006	0.0042

\*CNR = Customer not request

4. Stray Light\*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
200.85-0.11nm	200.76	0.9795

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A  
\*Stray Light not NSC-ONSC Accredited.

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

\*\*\*End of Certificate\*\*\*

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

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

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

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

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

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

The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04  
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Siama Scientific Limited.

The standard for Wavelength Certificate No. 118106 and 118118  
The standard for Photometric Certificate No. 118123 and 118113  
The standard for Stray light Certificate No. 118110 and 118112  
The standard for Spectral resolution Certificate No. 118104

(Miss Kaewkan Suradech)  
Person in charge

(Mr. Nitnun Sihawan)  
Authorized signatory

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

DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok 10260  
Phone: +66 2839 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.



Calibration Results:  
Without Adjustment

Wavelength Accuracy (nm). The spectral bandwidth of Std at 2 nm and UUC at 2 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
418.61	418.5	0.11	0.13	
536.66	536.7	-0.04	0.13	
637.98	637.9	0.08	0.13	
748.48	748.6	-0.12	0.13	
807.03	807.4	-0.37	0.13	
Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5772	0.576	0.0012	0.0045
	0.7198	0.719	0.0008	0.0045
	1.0394	1.039	0.0004	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5608	0.560	0.0008	0.0045
	0.7062	0.705	0.0012	0.0045
	1.0189	1.018	0.0009	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5214	0.521	0.0004	0.0045
	0.6652	0.664	0.0012	0.0045
	0.9577	0.957	0.0007	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5192	0.518	0.0012	0.0045
	0.6907	0.689	0.0017	0.0045
	0.9949	0.993	0.0018	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5530	0.551	0.0020	0.0045
	0.7555	0.753	0.0025	0.0045
	1.0761	1.073	0.0031	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5604	0.559	0.0014	0.0045
	0.7418	0.739	0.0028	0.0045
	1.0467	1.044	0.0027	0.0045



Calibration Results:  
Without Adjustment

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7533	0.748	0.0053	0.0080
257 nm	0.0000	0.000	0.0000	0.0080
	0.8745	0.869	0.0055	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2926	0.293	-0.0004	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6486	0.644	0.0046	0.0080
Stray light *				
Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)	
260.95 +/- 0.11 nm	261.0	0.9		2.046
392.04 +/- 0.11 nm	392.0	1.3		1.886
Spectral Resolution *				
Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	268.74	266.81	1.29	2.00
UUC: Wavelength (nm)	268.6	266.6		
Std Absorbance (A)	0.5137	0.3473		
UUC: Absorbance (A)	0.463	0.359		

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

The End of Certificate



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

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

ATOMIC ABSORPTION SPECTROMETER TEST CERTIFICATE

Certificate No : SV2310/21414  
Instrument Type : Atomic Absorption Spectrometer  
Model : AA240FS  
Serial Number : EL08043418  
Organization : Test Tech Co., Ltd.  
Address : 30,32 Soi 66 Rama II Rd., Samaedam Bangkokhunting, Bangkok 10150  
Date : 25 Oct 2023

Hollow cathode lamps used

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

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



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

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

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

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

\*\* for Flame system

\*\*\* for Zeeman system

\*\*\*\* for Graphite furnace system



CALIBRATION

APPROVED

Signature:

Signature:

Engineer : Suriya Nacharoen

Engineer : Suchai Sangrakiatichai

Date : 25 / Oct / 2023

Date : 25 / Oct / 2023



## MAINTENANCE AND TEST CERTIFICATE MODEL OPTIMA 8000

Customer : บริษัท เพรส เทค จำกัด  
Address : 30, 32 ซอยพระรามที่ 2 ซอย 63  
ถนนพระรามที่ 2 แขวงสมเด็จ  
เทพราช กรุงเทพมหานคร 10150  
User Name : คุณณัฏฐา สาระจันทร์  
Phone : 02-893-4211-17  
Fax : lab\_center@estech.co.th  
Date Tested: May 18, 2023  
Recommendation Recertification  
Period 12  
Recertification Due: May 17, 2024  
Date Last Certified: May 19, 2022  
Visit Number: 1 of 1  
PerkinElmer Phone: 02-719-6420 ext 206  
PerkinElmer Fax: 02-318-5597

### CONFIGURATION TESTED

MODEL  
OPTIMA 8000  
N0772045  
EQL-180

SERIAL NUMBER  
078S1411171C  
2F1441085

### TESTED EQUIPMENT

IPV Methods

### TEST STANDARD USED

Mixed standard 1/10  
Mixed standard 1/100

### CUSTOMER SUPPLIED

2 % HNO3  
10 % HNO3

### ACCESSORIES/COMPONENT NOT INCLUDED

WinLab32 Version 5.5.0.0714  
PN:6150T21E4Q1E

### EXPIRATION

### EXPIRATION DATE

NOV 30, 2023  
NOV 30, 2023

### CUSTOMER INITIALS

SERIAL NUMBER : 078S1411171C

DATE TESTED : May 18, 2023

### 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 purgefilters. ☐ OK
- C. Recheck optical alignment. ☐ OK

### 3. COOLING SYSTEM CHECKS

- A. Perform preventive maintenance on chiller. ☐ OK
- B. Flush out the chiller every six months. ☐ OK

### 4. PERFORMANCE CHECKS

- A. Torch View Alignment. ☐ OK
- B. Wavelength Calibration. ☐ OK





# MAINTENANCE REPORT AND IPV TEST CERTIFICATE OPTIMA 8000

SERIAL NUMBER : 078S1411171C      DATE TESTED : May 18, 2023

## 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.**

Authorized Representative :

( Khwanchai Siangwong )

Customer Support Engineer



# MAINTENANCE AND TEST CERTIFICATE MODEL OPTIMA 8000

SERIAL NUMBER : 078S1411171C      DATE TESTED : May 18, 2023

## PARAMETER

## SPECIFICATION

## FINAL VALUE

Spectral Resolution : UV	As	193.696 nm	≤ 0.009 nm	nm	0.00720	nm
	Ni	231.604 nm	≤ 0.011 nm	nm	0.00892	nm
	Ni	341.476 nm	≤ 0.015 nm	nm	0.01343	nm
Spectral Resolution : VIS	Ba	455.403 nm	≤ 0.020 nm	nm	0.01726	nm
Precision	Zn	206.200 nm	% RSD ≤ 1.0 %	%	0.35	%
	Mg	280.271 nm	% RSD ≤ 1.0 %	%	0.19	%
	Mg	285.213 nm	% RSD ≤ 1.0 %	%	0.19	%
	Ba	455.403 nm	% RSD ≤ 1.0 %	%	0.13	%
Detection Limits : Axial	Tl	190.801 nm	3(SD) ppb ≤ 10 ppb	ppb	1.54	ppb
	As	193.696 nm	3(SD) ppb ≤ 10 ppb	ppb	2.10	ppb
	Se	196.026 nm	3(SD) ppb ≤ 5.0 ppb	ppb	2.43	ppb
	Pb	220.353 nm	3(SD) ppb ≤ 3.0 ppb	ppb	1.40	ppb
Detection Limits : Radial	As	193.696 nm	3(SD) ppb ≤ 60 ppb	ppb	4.44	ppb
	Zn	213.857 nm	3(SD) ppb ≤ 2.0 ppb	ppb	0.12	ppb
	Mn	257.610 nm	3(SD) ppb ≤ 1.0 ppb	ppb	0.05	ppb
	La	379.478 nm	3(SD) ppb ≤ 3.0 ppb	ppb	0.21	ppb
BEC : Axial (IB X 1000)/(IS-IB)	Ba	455.403 nm	3(SD) ppb ≤ 0.3 ppb	ppb	0.01	ppb
	Ba	493.408 nm	3(SD) ppb ≤ 0.6 ppb	ppb	0.01	ppb
BEC : Radial (IB X 1000)/(IS-IB)	Mn	257.610 nm	≤ 30 ppb	ppb	6.83	ppb
	Mn	257.610 nm	≤ 30 ppb	ppb	9.29	ppb



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2719-9444



## Certificate of Calibration

Certificate No. : 23H2216  
Page : 1 of 2

Equipment: Dial Thermo-Hygrometer  
Manufacturer: Barigo  
Model :  
Serial No.:  
ID No.: EQL-084  
Condition As-Received: Used Item  
Received Date: 12 October 2023  
Calibration Date: 17 October 2023  
Reference: 2310-0447DN  
Ambient Temperature: ( 25 ± 3 ) °C  
Relative Humidity: ( 50 ± 20 ) %

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except with the prior written approval of the head of  
Corporate Services 3: Equipment Calibration and Testing Services.

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

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

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

### Condition of this result of calibration

1.Reference standards Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Handheld Thermometer With Sensor	1523	3240076	23R05	15 Mar 2024
2) Dew Point Hygrometer	Opildew 401	164756	TH-0158-22	13 Dec 2023

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

3.This Calibration is traceable to the International System of Unit maintained through:-

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008  
-National Institute of Metrology Thailand (NIMT)

Calibrated by : Surasit Phansudnoi  
Issue Date : 28 October 2023

Approved Signatory :

[ ] Chakrit Viroswatana  
[ ] Ponthippa Tameyajakul  
[ ] Viporn Tantiyawutti

B 0327545



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

### Result of Calibration:-

Humidity Measurement		Without Adjustment	
Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)
25.0	30.1	30.0	-0.1
25.0	40.1	39.0	-1.1
25.0	60.1	49.0	-1.1
25.0	60.0	59.0	-1.0
25.0	75.2	75.5	0.3
		Uncertainty of Measurement (±%R.H.)	
		1.5	
		1.5	
		1.7	
		1.7	
		1.8	

### Result of Calibration:-

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

UUC\* : Unit Under Calibration

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

-000-

a 1185882



CERTIFICATE No : 23M6754  
REFERENCE No : 69854-1

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE  
MANUFACTURER : SARTORIUS  
MODEL : BP210S  
SERIAL No : S0736477  
ID No : EQL-008  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : TEST TECH CO., LTD.  
30,32 RAMA II SOI 63, RAMA II RD.,  
SAMAEDAM, BANGKHUNTHIAN, BANGKOK  
10150

CALIBRATED BY : PRASERT D.  
CALIBRATION DATE : 13-Jul-23

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

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



CERTIFICATE No : 23M6754

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE  
MANUFACTURER : SARTORIUS  
MODEL : BP210S  
ID No : EQL-008  
SERIAL No : S0736477  
RECEIVED DATE : 13-Jul-23  
AIR PRESSURE : 1011mmbar  
CALIBRATION DATE : 13-Jul-23  
AMBIENT TEMPERATURE : 23°C ± 1°C  
RELATIVE HUMIDITY : 50% RH ± 10% RH

### CONDITION OF THIS RESULTS OF CALIBRATION

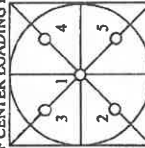
- THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING INTERNAL WEIGHT TO ADJUST. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN. THE INTERNAL WEIGHT WAS CHECKED BY USING 2. REFERENCE STANDARD INSTRUMENTS :
  - 1) STANDARD WEIGHT SET E2
  - 2) STANDARD WEIGHT E2
- THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
- THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
- THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
  - NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

- ZERO SETTING FUNCTION : NORMAL
- TARE FUNCTION : NORMAL
- REPEATABILITY OF READING AT 200 g WAS 0 g
- DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

### 5. OFF CENTER LOADING ERROR



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

INTERNAL WEIGHT ERROR: 0.0004999999999998177 g

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA  
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A  
COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



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



CERTIFICATE No : 2378798  
REFERENCE No : 70515-6

PAGE : 1 OF 2

## Certificate of Calibration

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

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

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

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

P-C010 REV : 03



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

CERTIFICATE No : 2378798

PAGE : 2 OF 2

## Calibration Report

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

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLA5 G-20 BY COMPARISON WITH CALIBRATED KTD P1000 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

### 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE :  
1) DATA LOGGER WITH KTD : HYDRA 2633A : 7301307 : 2378636 : 10-Jul-24  
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

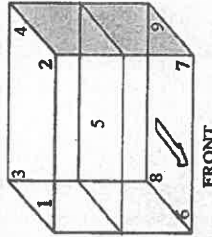
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

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

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

#### GENERAL INFORMATION

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



#### CHAMBER PERFORMANCE

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

#### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
104.0	104.0	104.46	104.13	104.43	104.28	104.57	104.67	104.60	104.58	104.67	0.38
180.0	180.0	180.27	179.85	180.41	179.93	180.19	180.54	180.41	180.51	180.13	1.1

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

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

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

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



CERTIFICATE No : 23T8799  
REFERENCE No : 70515-7

PAGE : 1 OF 2

## Certificate of Calibration

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

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

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

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

F-C010 REV : 03



CERTIFICATE No : 23T8799

PAGE : 2 OF 2

## Calibration Report

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

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TIAS G-20 BY COMPARISON WITH CALIBRATED RTD PH100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

### 2. REFERENCE STANDARD INSTRUMENTS :-

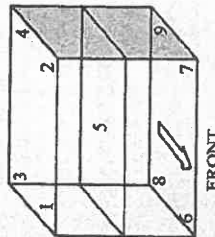
INSTRUMENT : DATA LOGGER WITH RTD  
MODEL : HYDRA 2635A  
SERIAL No : 7301307  
CERTIFICATE No : 23T6636  
DUE DATE : 10-Jul-24

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

#### GENERAL INFORMATION

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



#### CHAMBER PERFORMANCE

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

#### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
104.0	104.0	104.16	104.13	104.20	103.98	103.76	103.76	104.06	103.71	103.93	0.38
180.0	180.0	179.73	179.89	180.04	179.54	179.30	178.98	179.75	178.97	179.77	1.1

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

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

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

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



## Certificate of Calibration

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

**Environment Condition:** Temperature 23 °C ± 2 °C  
Humidity 50 %RH ± 15 %RH  
**Calibration Place:** Environment Laboratory, DKSH Technology Limited,  
2533 Sukhumvit Road, Bangkok,  
Phrakhanong, Bangkok 10260 Thailand  
**Calibration By:** Miss.Orawan Khaiphloi  
**Calibration Date:** 14 September 2023  
**The Method used:** In house method, CAL-WI-23, base on Hach Manufacturer Method 8195  
**Traceability:** This certificate is traceable to Primary standard Fromazin and StabCal accepted by  
United States Environmental Protection Agency (EPA) through Hach Company  
Certificate No. A1075 , A1074 , A1091 , A1074 , A1074 , A1074

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

DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260  
Phone: +66 2638 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C08-08: 20 Jul 2022



Certificate No.: C08230153

Page 2 of 2

### Calibration Results:

#### Before Adjustment

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

#### After Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.050	0.084	-0.034	0.0	0.070
20.40	20.4	0.00	0.0	1.0
205.0	205	0.0	0.5	10
1028.0	1026	2.0	0.5	50
4068.0	4063	5.0	0.5	200

The End of Certificate

DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260  
Phone: +66 2638 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C08-08: 20 Jul 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. 0-2719-9464



NEC-TSI-TS17925  
CALIBRATION 0085

Cert.No.: 24CH59

Page.: 1 of 3

## Certificate of Calibration

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

Calibrated by :

Warakorn Lergagtrakul

Approved by :

(✓) Sathip Meangmai  
( ) Warakorn Lergagtrakul  
( ) Porpan Palpim

Approved Signatory

Issue Date :

17 January 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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ใบรับรองการสอบเทียบ "เครื่องวัดความนำไฟฟ้า"  
(Calibration Certificate of Conductivity Meter)

A 0062587



Cert.No.: 24CH59

Page.: 2 of 3

Condition of this result of calibration :-

1. Reference Standard Instrument :-
- | Instrument               | Serial No. | ID No.   | Certificate No. | Due date    |
|--------------------------|------------|----------|-----------------|-------------|
| 1) Thermometer           | 1963878    | 130RC095 | 231051          | 05 Sep 2024 |
| 2) Ref. Std. Thermometer | 4982054    | 110RC044 | 231908          | 26 Jul 2024 |
- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :-

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

Conductivity Solution

Conductivity Solution	Manufacturer	Lot No.	Exp. date
147.0 µS/cm	CPA Chem	913595	14 July 2024
1.413 mS/cm	CPA Chem	931955	30 Sep 2024
12.880 mS/cm	CPA Chem	913597	14 July 2024

- Control Conductivity calibration solution temperature by Water bath (25±0.1) °C  
3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration results

Function : Conductivity Measurement

(\*) After Adjustment at 147.0, 1413.0, 12880 µS/cm

Conductivity Electrode Serial No.: 806F0005

Standard Conductivity Solution	After Adjustment UUC* Reading	Uncertainty of Measurement (±)	Coverage factor k
147.0 µS/cm	147.1 µS/cm	0.99 µS/cm	2.00
1.413 mS/cm	1.413 mS/cm	0.0092 mS/cm	2.00
12.880 mS/cm	12.88 mS/cm	0.086 mS/cm	2.00

Remark - UUC\* = Unit Under Calibration

- Adjustment Cell constant = 147.0 µS/cm 96.8 m<sup>-1</sup>, 1.413 mS/cm = 98.0 m<sup>-1</sup>, 12.880 mS/cm = 99.4 m<sup>-1</sup>

a 1197672



Cert.No.: 24CH59

Page.: 3 of 3

Calibration Results

Function : Temperature Measurement

(\*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : CT-58101B

- Serial No. : 806F0005

Dimension of probe:

- Length : 114 mm

- Diameter : 12 mm

- Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (± °C)	Coverage factor k
25.0	25.003	25.0	-0.003	0.13	2.00

Remark : - UUC\* = Unit Under Calibration

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

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a 1197671





Metrology

SCI ECO Services Company Limited

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

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

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

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



Certificate No. T240070

Page 1 of 4

## Certificate of Calibration

Equipment : Chamber ( Cooling Room )

Manufacturer : -

Model : -

Serial No. : -

Customer Code : EQL-167

ID No. : T1447A1

Customer : Test Tech Co.,Ltd

30, 32 Rama II Soi 63, Rama II Rd., Samaedam,

Bangkhunthian Bangkok 10150

Customer Location : LABORATORY FLOOR 3

Date of Receipt : 12 January 2024

Calibrated By : Sutiar Naknakred ( Site Calibration Manager )

Approved By : Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 24 JAN 2024

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

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

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ใบรับรองการสอบเทียบ "ห้องเย็น"  
(Calibration Certificate of Cool Room)



Metrology

SCI ECO Services Company Limited

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



Certificate No. T240070

Page 2 of 4

## Calibration Report

Equipment : Chamber ( Cooling Room )

Date of Calibration : 16 January 2024

Environment : Temperature : 19.4-24.1 °C

Line Voltage : 221.3-226.1 V

Relative Humidity : 55 - 65 %RH

### Condition of this results of calibration :

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

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

2. Reference Standard Instrument :

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

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

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

5. Adjustment :

( ) without adjustment ( X ) after adjustment

Approved By



Approved By



FM-LIS 118/18-08-66

FM-LIS 118/18-08-66



Metrology

SCI ECO Services Company Limited

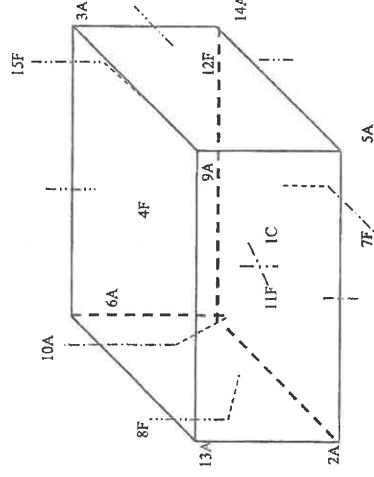
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T240070

Page 3 of 4

## Calibration Report



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

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

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



Metrology

SCI ECO Services Company Limited

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



Certificate No. T240070

Page 4 of 4

## Calibration Report

### Measurement Results:

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

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

\* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

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

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

Approved By. \_\_\_\_\_



Metrology

SCI ECO Services Company Limited

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

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

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

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



Certificate No. T240161

Page 1 of 4

## Certificate of Calibration

Equipment : Chamber ( Cooling Room )

Manufacturer : -

Model : -

Serial No. : -

Customer Code : EQL-181

ID No. : T0399A5

Customer : Test Tech Co.,Ltd

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

Customer Location : LABORATORY FLOOR 4

Date of Receipt : 24 January 2024

Calibrated By : Preecha Phisassuthikul ( Temperature Calibration Manager )

Approved By : Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 31 JAN 2024

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

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

## Calibration Report

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

### Condition of this results of calibration :

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

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

### 2. Reference Standard Instrument :

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

### 3. This certificate is traceable to :

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

### 4. Condition of calibrated item : good

#### Equipment Description :

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

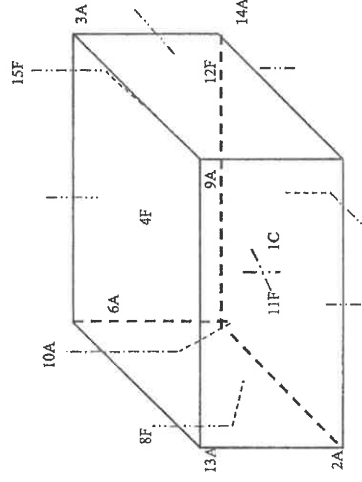
### 5. Adjustment :

( X ) without adjustment ( ) after adjustment

Approved By

[Redacted Signature]

## Calibration Report



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

1C =	TN161
2A =	TN162
3A =	TN163
4F =	TN164
5A =	TN165
6A =	TN166
7F =	TN167
8F =	TN168
9A =	TN169
10A =	TN170
11F =	TN171

12F =	TN172
13A =	TN173
14A =	TN174
15F =	TN175

Approved By

[Redacted Signature]



Metrology

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



NSC-TS1-118 17025  
CALIBRATION 0244

Page 4 of 4

Certificate No. T240161

## Calibration Report

### Measurement Results

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

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

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


Approved By. \_\_\_\_\_



**MAINTENANCE AND IPV TEST CERTIFICATE MODEL**  
**OPTIMA 8000**

SERIAL NUMBER: 078S1411171C		DATE TESTED: May 14, 2024	
PARAMETER		SPECIFICATION	FINAL VALUE
Spectral Resolution : UV			
As	193.698 nm	≤ 0.009 nm	0.00735 nm
Ni	231.604 nm	≤ 0.011 nm	0.00913 nm
Ni	341.476 nm	≤ 0.015 nm	0.01386 nm
Spectral Resolution : VIS			
Ba	455.403 nm	≤ 0.020 nm	0.01721 nm
Precision			
Zn	208.200 nm	% RSD ≤ 1.0 %	0.35 %
Mg	280.271 nm	% RSD ≤ 1.0 %	0.27 %
Mg	285.213 nm	% RSD ≤ 1.0 %	0.46 %
Ba	455.403 nm	% RSD ≤ 1.0 %	0.48 %
Detection Limits : Axial			
Tl	190.801 nm	3(σd) ≤ 10.0 ppb	1.00 ppb
As	193.698 nm	3(σd) ≤ 10.0 ppb	3.32 ppb
Se	196.026 nm	3(σd) ≤ 5.0 ppb	3.88 ppb
Pb	220.353 nm	3(σd) ≤ 3.0 ppb	1.45 ppb
Detection Limits : Radial			
As	193.698 nm	3(σd) ≤ 60.0 ppb	3.41 ppb
Zn	213.857 nm	3(σd) ≤ 2.0 ppb	0.30 ppb
Mn	257.610 nm	3(σd) ≤ 1.0 ppb	0.03 ppb
La	378.478 nm	3(σd) ≤ 3.0 ppb	0.27 ppb
Ba	455.403 nm	3(σd) ≤ 0.3 ppb	0.05 ppb
Ba	493.408 nm	3(σd) ≤ 0.6 ppb	0.06 ppb
BEC : Axial (IB X 1000)/(IS-IB)			
Mn	257.610 nm	≤ 30 ppb	10.70 ppb
BEC : Radial (IB X 1000)/(IS-IB)			
Mn	257.610 nm	≤ 30 ppb	21.54 ppb

**MAINTENANCE AND IPV TEST CERTIFICATE MODEL**  
**OPTIMA 8000**

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