 TSRI 國家實驗研究院 台灣半導體研究中心 Taiwan Semiconductor Research Institute		DOCUMENT NO.:	TITLE:		
		Q3-NL04	Machine SOP (CF-RDT004 Rapid Thermal Annealing system)		
ISSUE DATE	2025-04-01	REVISION	1.1	PAGE	P. 0/4

Equipment : AW-810M Rapid Thermal Annealing Furnace

Model ID : RDT004


Department : Etching & Thin Film Department

Issued Date : 2025/4/01

Document Revision Record

NO	Release Date	Revised SOP Number	Revision Description	Revised Pages	Version
01	2015/02/04	-----	Initial Version Established	-----	01
02	2021/12/10		Modified Process Chamber Restrictions	03	02
03	2025/04/01		Revised Language Content	01~04	03
04					
05					
06					
07					
08					

Approved by	Reviewed by	Prepared by

 TSRI 國家實驗研究院 台灣半導體研究中心 Taiwan Semiconductor Research Institute		DOCUMENT NO.:	TITLE:		
		Q3-NL04	Machine SOP (CF-RDT004 Rapid Thermal Annealing system)		
ISSUE DATE	2025-04-01	REVISION	1.1	PAGE	P. 1/4

1. Purpose :

To define the operating procedures and specifications of the AW-810M Metal Rapid Thermal Annealing Furnace, ensuring operator safety and product quality.

2. Scope :

This SOP applies to the AW-810M Metal Rapid Thermal Annealing Furnace.

3. Responsibility :

1. **Organizational Responsibility:** Engineers are responsible for the establishment and revision of this SOP

2. **Personnel Qualification:** Only personnel who have passed the AW-810M operation qualification are allowed to operate the equipment.

4. Terminology :

None.

5. Related Documents :

AW-810M Metal Rapid Thermal Annealing Furnace Manual.

6. Standard Operating Procedure :

6.1. Verify Machine Status


- (1) Ensure the equipment status is "Operational" (Green Tag).
- (2) Check the usage log to confirm the previous user completed the process without issues.
- (3) Confirm the current process chamber.
- (4) Turn on the gas supply.
- (5) Check the gas valve status.
- (6) Verify the cooling water level. °

6.2. Log into MES System MES

- (1) After login, power on the monitor to access the main screen.

6.3. Set Process Parameters

- (1) Click "**Process for Engineer**" to enter the process screen.
- (2) **Allowed process temperature range is 150°C–1050°C.**
 - ◆ For $\leq 899^{\circ}\text{C}$: Holding time must be less than 5 minutes.
 - ◆ For $\geq 900^{\circ}\text{C}$: Holding time must not exceed 1 minute.
 - ◆ For special processes, consult with an engineer.
- (3) Heating rate: 10–200°C/sec. If heating rate above 150°C/sec may cause unstable temperature control.

 TSRI 國家實驗研究院 台灣半導體研究中心 Taiwan Semiconductor Research Institute		DOCUMENT NO.:	TITLE:		
		Q3-NL04	Machine SOP (CF-RDT004 Rapid Thermal Annealing system)		
ISSUE DATE	2025-04-01	REVISION	1.1	PAGE	P. 2/4

(4) Click "**RECIPE EDIT**" to enter temperature control settings. Correct parameters ensure a good temperature profile.

(5) Process Step Definitions :

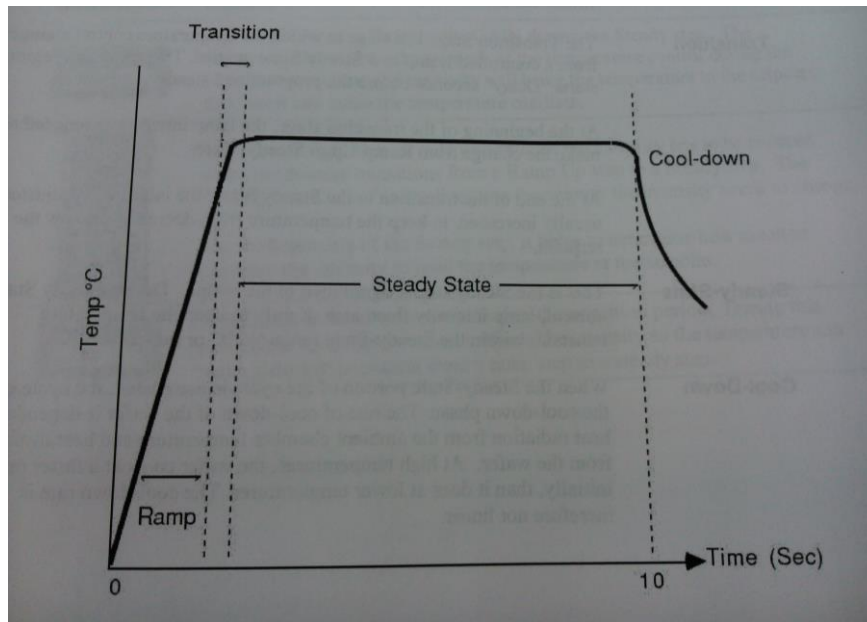
Delay : Gas flow time before process start or cooling time after process ends.

Intrn : Preheating step to raise temperature before ramping.

Ramp : Time required to raise temperature to the set value.

Steady : Temperature holding time.

General Temperature Profile:



(6) Temperature Control Parameter Meaning :

- Gain: Default is 1. Controls temperature feedback strength.
- Delay: Default is 1. Adjusts temperature curve smoothness.
- Steady Intrn Factor : 初 Default is 1. Fine-tunes temperature curve smoothness.
- For minor curve adjustments, only adjust Steady Intrn Factor. It is not recommended to modify Gain and Delay as it may cause large fluctuations.

OVERSHOT : End of Ramp: Lower Ramp Factor.

Start of Steady: Lower Steady Factor.


UNDERSHOT : End of Ramp: Increase Ramp Factor.

Start of Steady: Increase Steady Factor


(7) After modifying parameters, click "**RECIPE VALID**" and then "**SAVE**" to save.

(8) Click "**EXIT**" to return to the process main screen.

6.4. Load Sample

 TSRI 國家實驗研究院 台灣半導體研究中心 Taiwan Semiconductor Research Institute		DOCUMENT NO.:	TITLE:		
		Q3-NL04	Machine SOP (CF-RDT004 Rapid Thermal Annealing system)		
ISSUE DATE	2025-04-01	REVISION	1.1	PAGE	P. 3/4

- (1) Unlock the door latch.
 - (2) Pull out the door (*angle* <math><90^\circ</math>) and place the sample on the quartz holder.
 - (3) Push the door back and lock the latch.
 - (4) Cautions :
 - The quartz holder is fragile; handle samples with care.
 - Check chamber type before use. Chambers are marked with magnets. Restrictions:
 1. **Si Front-End Chamber**: Only Si substrates; metal-containing substrates are prohibited.
 2. **Ge Front-End Chamber**: Only SiGe or Ge substrates; metal-containing substrates are prohibited.
 - For temperatures $\geq 500^\circ\text{C}$, do not install thermocouple. For $< 500^\circ\text{C}$, thermocouple installation is required. (**Thermocouple not provided; user must prepare.**)
 - For special substrates or processes, consult equipment engineer.
- 6.5. Start Heat Treatment Process
- (1) On the process screen, select the desired recipe.
 - ◆ For 8-inch wafers: Use recipe starting with **8RTAXXX**.
 - ◆ For oxygen flow: Use recipe starting with **RTOXXX**.
 - ◆ Do not randomly use recipes with pyrometer temperature detection without calibration. Temperature curves are affected by wafer material and size.
 - (2) Press **LAMP POWER** to turn on heating lamp (LED light will turn on).
 - (3) Press **START PROCESS** to begin. **If you encounter a fault, press ESC immediately.**
 - (4) On the temperature curve screen:
 - ◆ **Pyro Temp**: Temperature detected by pyrometer.
 - ◆ **TC Temp**: Temperature detected by thermocouple.
 - ◆ **Real Temp**: Displayed temperature based on selected sensor.
 - (5) If any alarm occurs, press **YES** to stop the process.
 - (6) When using thermocouple at low temperature and **Pyro Temp** exceeds 550°C , press **EXIT** immediately and check thermocouple installation.
 - (7) Operators must stay near the equipment during ramping to ensure safety.
 - (8) This furnace is a rapid thermal annealing system, not for long-term heating. When using pyrometer, long heating may affect accuracy. For processes $> 500^\circ\text{C}$, temperature deviation can be maintained within 10°C for 60 seconds.
- 6.6. End of Process
- (1) When **PROCESS OVER** appears, press **EXIT** to return to the process screen.

 TSRI 國家實驗研究院 台灣半導體研究中心 Taiwan Semiconductor Research Institute		DOCUMENT NO.:	TITLE:		
		Q3-NL04	Machine SOP (CF-RDT004 Rapid Thermal Annealing system)		
ISSUE DATE	2025-04-01	REVISION	1.1	PAGE	P. 4/4

(2) For high temperature long processes (>700°C), **Post-Purge** time must be at least 5 minutes.

(3) Remove the sample.

6.7. Shutdown Procedure

(1) Turn off **LAMP POWER**.

(2) Turn off gas supply

(3) Confirm door latch is locked.

(4) Log out of MES.

(5) Fill in the usage log.

7. Forms & Attachments :