JAMP-9510F (V6c)

使用注意事項及開關機步驟

Y2021

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SED Mode 設定

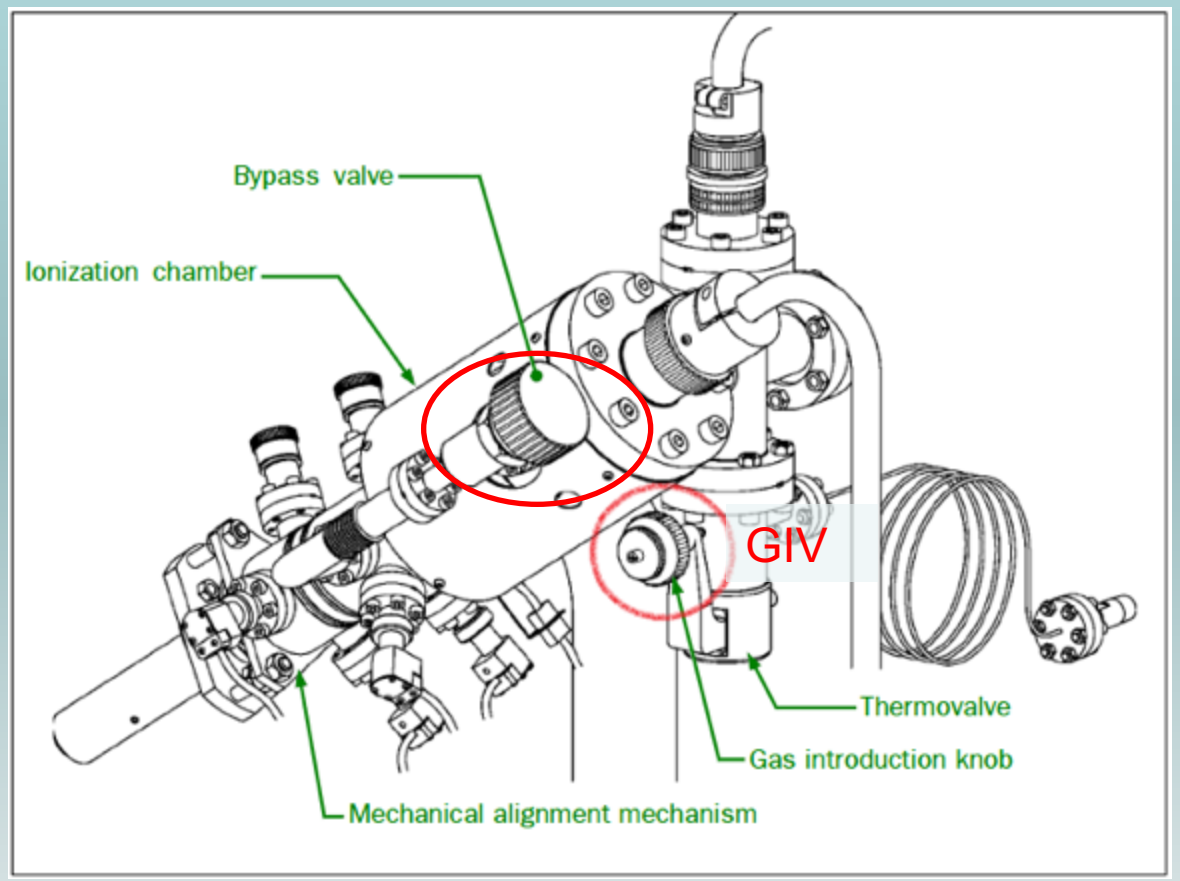
	Mode	Probe Current	
Auger Analysis	0	PC> 7	Auger一般分析使用
SEM Resolution	3	PC< 6	只適合觀察SEM高倍率影像時

※若於Auger分析時使用Mode 3,容易造成二次電子偵測器內部損害.

ION GUN CH設定

CH	Emission (mA)	Purpose	設定時機	說明
0	0	Don’t use	下班之後	燈絲冷卻(保持壽命)
1	10	Bake out	Baking時	Outgas
2	20	Warmup	一般使用前	(先預熱)

FMIED (Floating Micro Ion Etch Device)



◉兩個手動閥門位置（Bypass Valve 及 Gas Introduction Valve）

Gas Introduction Valve (GIV)
使用方式

AVC Power SW ON [AVC]鈕壓亮燈,ON	步驟順序 →			
使用時 (Ar 壓力設定為: $8x10^{-2}$Pa or $6.5x10^{-2}$Pa)	AES Software : $8x10^{-2}$ Pa 按[SET]	手動緩慢調整GIV至$8x10^{-2}$Pa (若$12x10^{-2}$Pa則出現P-H ERR訊息)	穩定在 $8x10^{-2}$Pa 附近	可進行Ion Gun功能
交換樣品 **(或暫不使用)**	AES Software: 按[CLOSE]	待真空約接近 10^{-3}Pa.	或手動調回GIV約半轉至10^{-3}Pa	可進行樣品交換
不使用時 **(參考下頁說明)**	AES Software: 按[CLOSE]	手動調回GIV約半轉至10^{-3}Pa	AVC Power SW OFF AVC]鈕壓滅燈,OFF **等 5分鐘冷卻**	手動緩慢調整GIV至全閉(10^{-4}Pa) (※且不要轉太緊)

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GIV全關閉

(不使用Ion Gun,關機或Bake out時,需Full Close)

若在使用位置時:

1.Ion Gun Control軟體按[Close].

2.AVC Power SW OFF.

3.GIV順時針轉回半圈(約10^{-3}Pa).

4.等5分鐘冷卻.

※若沒有冷卻而關閉,此Valve可能損壞.

5.GIV再順時鐘轉兩轉(Full Close位置).

※注意,GIV不可轉緊.箭頭朝上位置即可.若轉過緊,此Valve可能損壞.

Holder and Tilt Limit

Holder Size (直徑)	最大傾斜角度 (Tilt)	樣品容許厚度 (Thickness)	背向電子 (RBED) 使用時的最大Tilt角度	Auger分析最佳角度
12mm	90	4mm	不能超過30度	30,60,75
20mm	55	5mm	不能傾斜	30
Cross section Holder	60	4mm	不能傾斜	30,60
90mm (選配)	55	2mm	不能傾斜	30

※Tilt 0度時,不可移動Z軸.

HSA 分析模式設定

Type	Mode	Energy Resolution	Sensitivity	Function
CRR	M5	0.5%	High	定性,定量 Auger Image
CRR	M4	0.35%	Middle	定量,化學態
CRR	M3	0.15%	Low	化學態
CRR	M2	0.05%	Low	能損圖譜
CAE	M1	EP 10~500eV	Low ~ High	Auger Image

※ DHSA2(AP-54200)

Auger 分析條件

SEM條件	一般定性定量	高倍率面分析 (Auger Image)	絕緣材料	化學態分析	EELS (Z<12)
TYPE	M4,M5	M5, M1(500)	Neutralizing	M2,M3	M2,M1(10)
加速電壓 (Vacc,KV)	10	30	5	10	2
電子束電流 (Beam current,nA)	10	4	4	150 ~ 200	0.5
傾斜角 (Tilt,度)	30,60,75	30,60,75	75	30,60,75	30,60,75

※絕緣材料可以配合Neutralizing+Tilt 75度功能可大幅減少Charge-up.

避免污染的樣品進入Auger

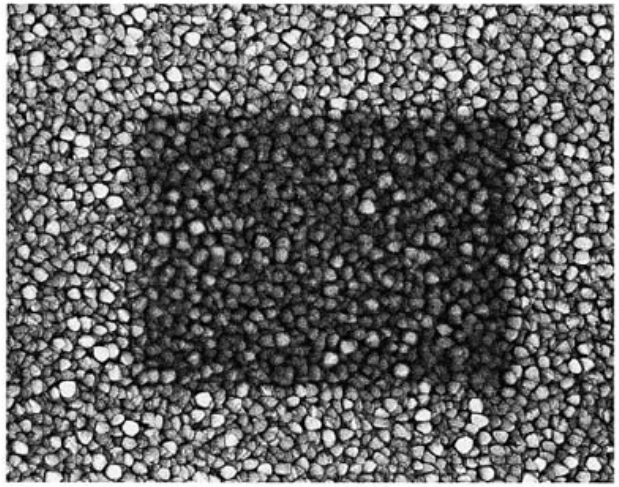


Fig.1 Specimen: ITO
This example shows that after scanning the electron beam for a long time at the magnification of ×36,000, the magnification is lowered to ×18,000 and an image is taken. Compared with the clear portion in the peripheral region, in the central region, the contrast is reduced and the image sharpness is lost.

Sometimes, the specimen contamination is attributed to the instrument, and at other times, it is caused by the specimen; but you can reduce it by using a little ingenuity.

(1) Clean a specimen sufficiently using organic solvent. This method is effective in such a case as the specimen surface is stained with oil and you need to replace the solvent to clean the specimen a few times, and finally heat the specimen to sufficiently dry it.

(2) In order to sufficiently degas the organic gas from the conductive paste for bonding the specimen, heat the specimen at 60 to 100°C. Sometimes it takes a few hours to heat the specimen itself at about 200°C to completedy outgas. This method is effective for a thermally stable specimen.

(3) It is also effective to heat a specimen at 110°C using the heating specimen holder in the specimen chamber of the SEM, however, because specimen drift occurs, it sometimes takes a few 10 minutes until the thermal equilibrium is attained.

(4) You can reduce specimen contamination by installing a (optional) cold fin for preventing contamination in the instrument.

(5) When the photographing region A is determined as shown in Fig. 2, perform the astigmatism correction and adjust the focus at the region B which is out side of the region A, and then return to the region A to take a photo.

◉使用熱風槍約250℃對樣品表面加熱約2分鐘,可有效去除表面污染.

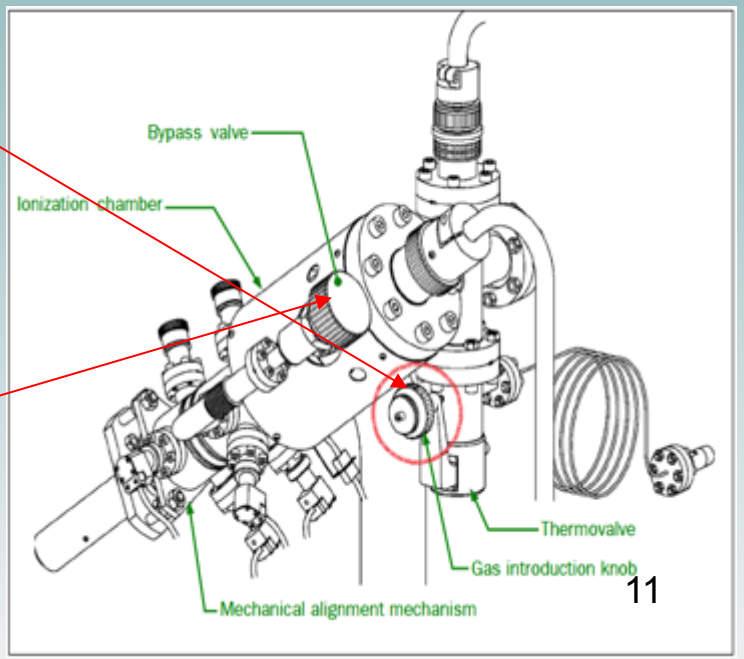
User Bake Out(Start)

使用時機：

1.當Specimen Chamber真空 ＞5X10^{-6}Pa(NIG讀值).
2.去除Main Chamber內的C.
3.Specimen Chamber破真空後之真空復原(需先操作真空復機程序).
4.定期每三個月做一次,可以於週五下班前.

使用步驟：

1.樣品取出,並設定Stage移動至Bake Out位置.
2. AVC Power SW OFF,5分鐘後,請關閉 GIV.
3.FE gun shut down.(PC-SEM軟體內)
4.檢查加熱帶插頭插上Bake Out專用插座.
5.設定 ⬆⬇Back Out Time: 48小時.
6.設定 V1 Close 按鈕燈亮.
7.設定 SPEC CHAM 按鈕燈亮.
8.設定 BAKE ωTMP 按鈕燈亮.
➔此時開始Baking,H2/H3 燈亮,加熱帶有微溫.
9.開啟Specimen Chamber之NIG(FIL ON 按鈕燈亮),
可得真空讀值,並保持開啟狀態,並開啟ION GUN Chamber之NIG(FIL ON 按鈕燈亮)
10.Ion Gun 的By Pass Valve 全開, ION GUN之Emission設10 mA. (CH 1).



User Bake Out(End)

(TSP 步驟,請先關閉Introduction Valve, Page6)

Bake Out完成(需冷卻8小時以上):

1.確認Cooling完成.

2.確認Specimen Chamber 真空讀值為<10^{-7}Pa(NIG)

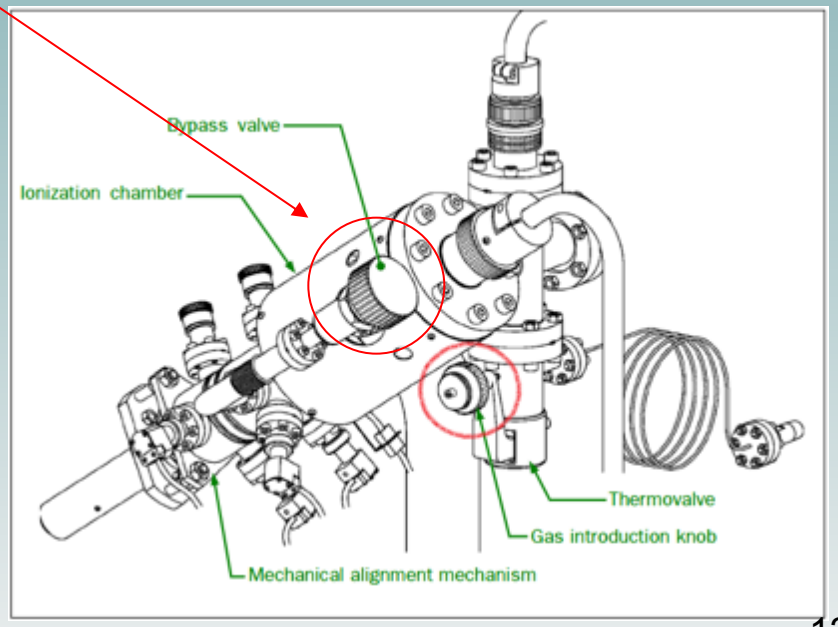
3.取消 [V1 Close] 及 [SPEC CHAM] 按鈕(燈滅).

4. 完全關閉 Ion Gun 的 By Pass Valve.

5.SEM Emitter start up

6.Stage移動至 Exchange Position.

7. 可執行TSP.



TSP執行步驟

◉執行前須先關閉Ar. (手動關閉GIV) P6
◉TSP ON (Max 50A).(若真空為10^{-8}Pa,則不需做TSP)
◉此步驟可除去在Main Chamber內的O.

1. 按ON鈕,燈亮.慢慢調旋鈕至20A位置,等一分鐘,再慢慢調至50A.觀察真空度指示針,不要超過10mA.若太大(outgas),請調回至20A等久一點一點待真空好轉後再慢慢調至50A位置為止.
2. 5分鐘後➔燈閃.再按一次ON鈕以取消TSP.
3. 再重複一次,可慢慢調至50A位置.
4. 5分鐘後➔燈閃.再按一次ON鈕以取消TSP.

網路設定

	SEM PC(JAMPSM)	Auger EWS(JAMP)	OFF-Line PC(JAMPUSER)
OS	Windows 10 64Bit	Linux Red Hat	Windows 10 64Bit
PC Model	HP Z4	HP Z440	HP ProDesk
Ethernet On Board (eth1)	192.168.1.10 (HUB)	192.168.1.1 (HUB)	192.168.1.21 (HUB)
Ethernet Extend Board (eth0)	28.28.28.2 (28.28.28.1 on SEM MPU)	192.7.1.1 (192.7.1.11 on Auger SC)	10.86.116.140
Files Share	可連線JAMP	可連線JAMPSM	可連線 JAMP/JAMPSM
User	Login:aes PW:aes	Login:aes PW:aes111	Login:JAMPUSER PW:JAMPUSER
Root	Login:SEMUser PW:SEMUser	Login:root PW:jeoljamp	同上

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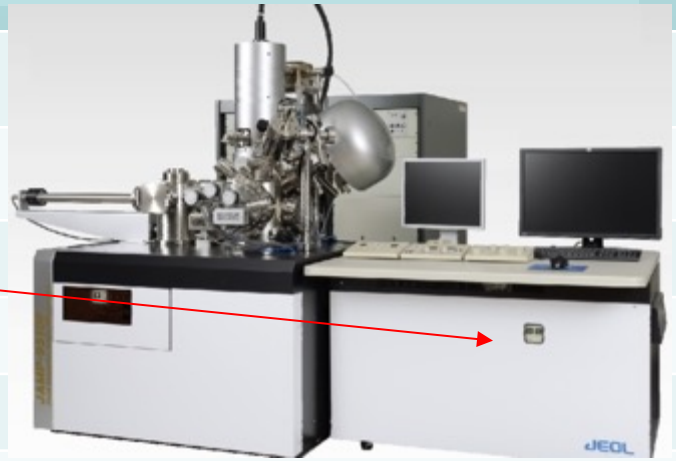
電腦關機/復機

	關機
1.	Auger Master 軟體 EXIT
2.	PCSEM軟體EXIT.(PCD IN / SED OFF)
3.	PC(JAMPSM)作業系統Shut Down(關閉SEM電腦)
4.	EWS(JAMP)作業系統Shut Down(關閉EWS工作站)
	開機
1.	開啟EWS電源
2.	開啟 SEM PC電源
3.	等待Keyboard/mouse連線(Synergy….).
4.	在PC(Win10)桌面上執行PCSEM軟體,軟體開啟後.
5.	在EMS(Linux)桌面上執行Auger Master.(需PC-SEM軟體先開啟完成後才可連線)

P16 關閉/開啟操作系統(OP)

(節電,但真空系統運作)



關機(OP POWER OFF) 步驟:

1. 同上頁,先執行電腦關機步驟.

2. 按OP POWER [0] 按鈕,燈亮.

◉當OP POWER 關閉,STAGE POWER,DHSA POWER及ION GUN POWER,也會自動關閉.

開機(OP POWER ON)步驟:

1. 按OP POWER [I] 按鈕,燈亮.(◉STAGE POWER,DHSA POWER自動同時開啟,但**ION GUN POWER需要另行開啟**)

2. **ION GUN Power ON(燈亮)**
(需熱機約30分鐘以上再使用Ion Gun功能)

3. (參考電腦復機步驟)

P17 全電源關閉(含DPS)

1.	**SEM Emitter Shut Down** (Maintenance=>Electron Gun/Vacuum=>Shutdown)
2.	執行一般關機步驟(電腦關機) **...P15**
3.	執行全關閉GIV步驟,執關閉操作系統步驟(OP Power OFF) **...P6 , P16**
4.	a.關閉操作系統(OP)後面中央的SIP POWER Breaker=>OFF(無熔絲開關) b.關閉操作系統(OP)後面,左下方的MAIN POWER Switch=>OFF(小型撥動開關) c.關閉操作系統(OP)後面左上方的MAIN POWER Breake=>OFF(無熔絲開關) …P18
5.	**DFS(Differential Pumping System)關閉**: (若無此系統則省略步驟5.) a. [V5] 按鈕OFF(燈熄), b. [Pump]按鈕OFF(燈熄). c.等待TMP 轉速至0.等待約5分鐘.d. DFS主機後面總開關OFF.
6.	打開真空手動面板,**確認各真空開關(Switch)方向皆往下撥(Close) P19**
7.	取消[Go To Auto]按鈕 (燈熄).(真空指示燈**只剩Pig1,2,3燈亮,其餘全滅**) **...P19**
8.	在Vacuum Rack上,TMP控制面板上按[STOP] 1秒,等待約5分鐘TMP完全停止(LCD顯示的轉速降至0Hz) **...P19,P23**
9.	Vacuum Rack 上的Main Power 按鈕,按[0]燈亮 **...P19,P23**
10.	關閉Vacuum Rack後AC200V及AC100V Power Breaker **...P23,P25**
11.	關閉總配電盤上AC220V Power Breaker(標示JAMP9510F),關閉UPS 總電源.
12.	關閉循環水槽電源,關閉主動式防震台(TCN50X)電源.(若無此裝置請省略)
13.	關閉氮氣閥及空氣壓縮機閥(or CDA).(鬆開壓力表或關閉流量閥).關閉Ar 閥門.

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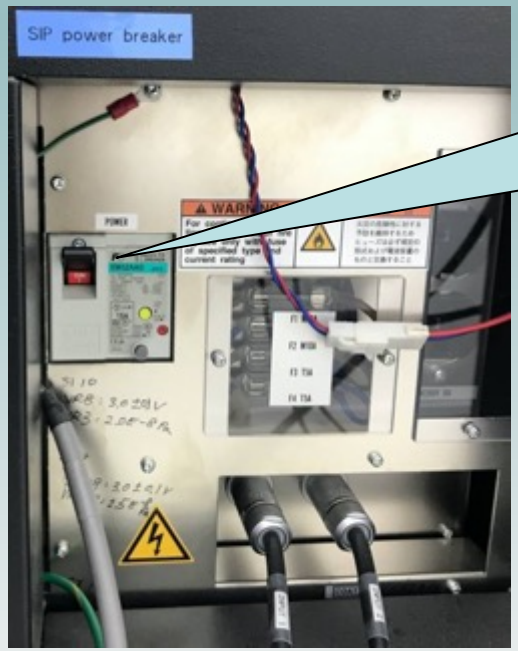
OP背面Power 位置

此兩Breaker always ON

c.Main Power Breaker
(ELCB1)

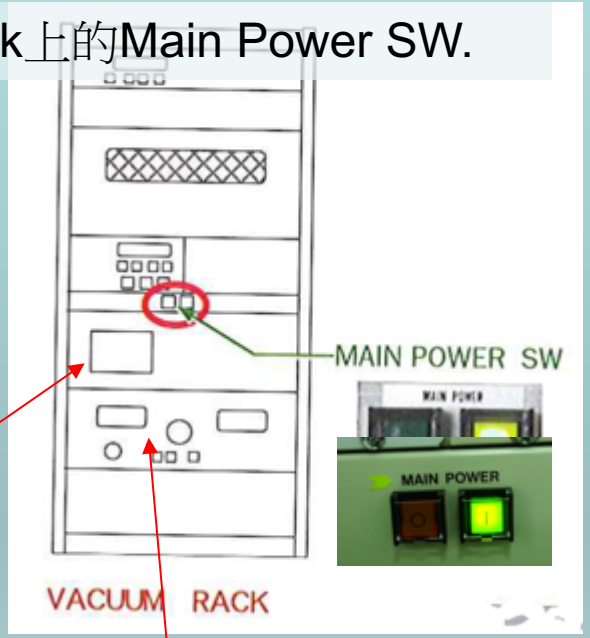
b.Main SW ON/OFF
Vacuum SW always ON



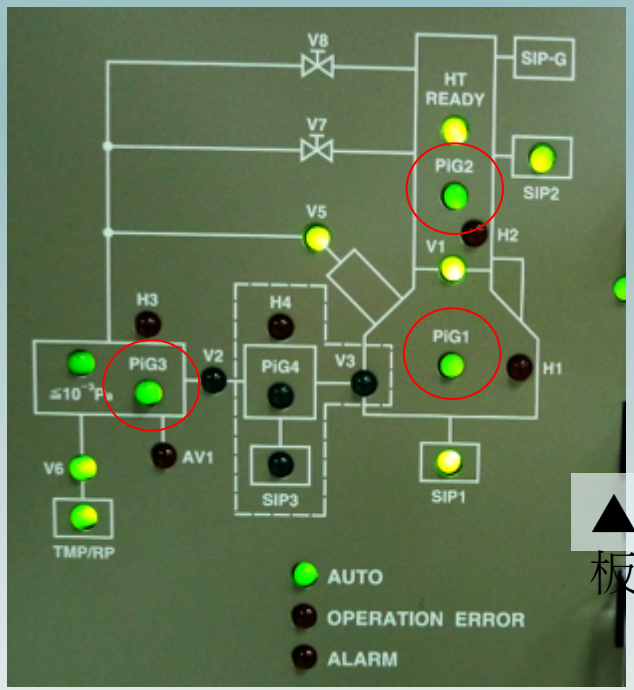
a.SIP Power Breaker

P19 其他控制器電源位置

▼Vacuum Rack上的Main Power SW.



▼真空手動開關面板



▲真空指示燈

▲Vacuum Rack上的TMP控制面板

▶PUMP PS Unit面板 (for SIP1)

P20 全電源啟動-1

1.	開啟氮氣閥/空氣壓縮機(or CDA)閥(設定壓力至5Kg/cm2,),Ar錶頭壓力1.5Kg/cm2.
2.	開啟循環水槽電源.
3.	開啟總配電盤上AC220V POWER Breaker(標示JAMP9510F)及UPS電源, 檢測穩壓器(UPS)輸出指示表200VAC.
4.	開啟Vacuum Rack後AC200V及AC100V Power Breaker **….P19,P23,P25**
5.	打開真空手動開關面板,確認各真空開關(Switch)方向皆往下撥(Close) **….P19**
6.	Vacuum Rack上的 Main Power ON 按鈕按[1]燈亮,此時RP會先啟動 **….P19,P23**
7.	開啟操作系統(OP後方) Main POWER Break ON及Main POWER Switch ON (往上) **…P18**
8.	開啟操作系統(OP後方)SIP POWER Breaker ON.(真空面板之真空指示燈Pig 2燈亮) **….P18**
9.	於Vacuum Rack,按TMP控制板上的[START]1~2秒.TMP啟動,等TMP加速至680Hz.(約3分鐘,Normal燈亮) **…P19**
10.	真空控制面板內手動開啟真空開關 **TMP/RP SW ON**(往上撥),這指示LED燈亮 **….P19**
11.	真空指示板**Pig1,2燈**也亮.(若Pig1,2燈不亮,請停止步驟,並通知捷東工程師. 林子雄0932941826/Taipei Office 0223952978,董信政 0955677970/ HsinChu Office 035734788) ◉請勿擅自開啟V2,可能造成TMP故障.
12.	**V6 SW ON**(往上), V6 LED燈亮.
13.	等**Pig3燈亮, PEG SW ON**(往上),等待**<10^{-3}Pa LED燈亮**.右邊Penning Gauge可讀值,至綠色範圍(**L 燈亮**). 手動開啟真空開關**SIP2,SIP1,** (往上撥),SIP2,SIP1指示燈亮. 若SIP1燈不亮, 請先關閉SIP1,並等待8小時後再啟動一次SIP1,若狀況一樣,請聯絡捷東公司.
14.	SIP1燈亮,此時檢測PUMP PS Unit 面板,(同TSP控制面板位置)請旋轉Meter Range旋鈕至10mA處,並觀察真空指示錶須**<2mA**.表示SIP1真空正常.(若真空沒有達到,請再等待8小時)**….P19,P23**
15.	再次確認<10^{-3}Pa 燈亮及 SIP1,SIP2燈亮且SIP1真空指示<2mA,然後**V1 SW ON**(往上),**V5 SW ON**(往上) **(※請再確認此階段 TMP/RP,SIP1,SIP2,V1,V5,V6,PEG SW 皆往上,其餘往下, 且燈號 TMP/RP,V6,Pig1,2,3,<10^{-3}Pa ,SIP1,2,V1,V5皆亮燈)**
16.	按**[Go To Auto]**按鈕,此燈亮.(若此燈沒亮,請檢查左側錯誤燈號訊息,並聯絡捷東公司) **….P19,P24**
17.	**[Go To Auto]燈亮之後,全部真空閥開關SW OFF**(往下撥).開啟PCSEM軟體,Emitter Startup.

全電源啟動-2(含DPS)

若無次裝置請忽略此步驟

18.	d. DPS主機後面總開關OFF. **DPS(Differential Pumping System)開啟**: a.DPS主機後面總開關(Breaker) ON. b.確認主機上真空計[L],燈亮. 指針在綠色範圍.(若[L]燈沒亮,請確認全電源啟動-1之13,這兩步驟是相關的) c.按 [Pump]按鈕ON(燈亮). d.等待TMP 轉速至高速(Normal 燈亮). e.按 [V5] 按鈕 ON(燈亮).
19.	開啟主動式防震台(TCN50X)電源.
20.	執行開啟操作系統步驟(OP Power ON).
21.	執行電腦開機機步驟(電腦開機).
22.	進入連線PC-SEM 軟體, Maintenance=>Electron Gun/Vacuum, 檢查SIP-G 真空 <5e-7pa, SIP-2 真空<5e -6pa.
23.	**SEM Emitter Startup**(Maintenance=>Electron Gun/Vacuum=>Startup)

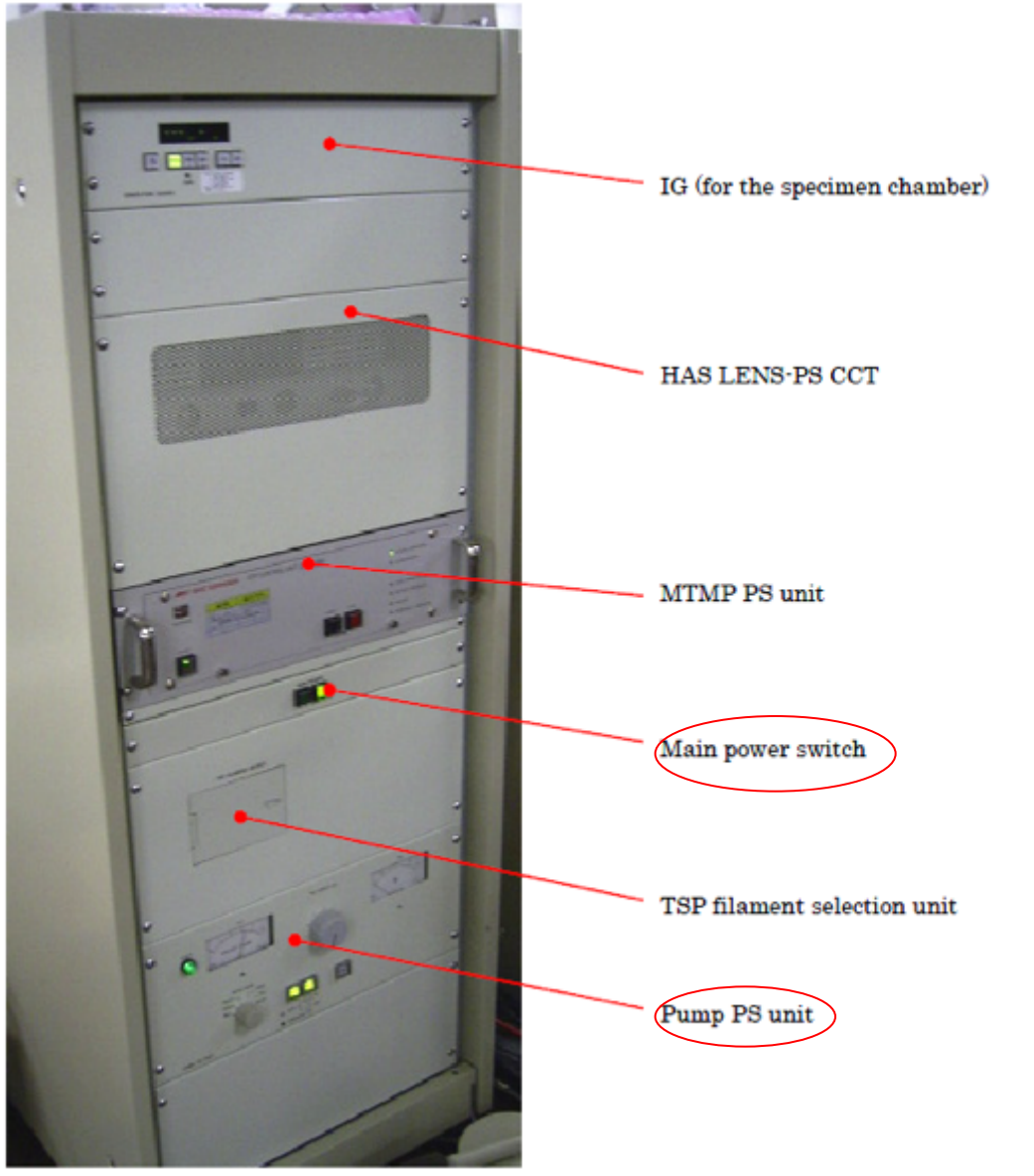
電力突然中斷後之啟動步驟

1.	若發生突然斷電之情況，請依全電源關閉執行 4,6,10,11,12,13 步驟**....P17**
2.	待電力復原後,請依全電源啟動-1之步驟執行 **…P20**
4.	於操作真空手動開關面板時,可能會於步驟 15 播 **[V1] [V5]** or 步驟16按**[Go To Auto]**按鈕後,此燈不亮,且出現錯誤訊息燈號," MAN operation error". **….P24** **（或發生於某真空開關SW往上播ON之順序不對時,出現此錯誤燈號)**
5.	若發生此狀況,請再把全部真空開關(Switch)方向皆往下撥(Close) **….P19**
6.	確認**[Go To Auto]**按鈕處於凸出的狀態. **(在真空SW皆往下撥OFF的狀態下,[Go To Auto]按鈕可以試按幾次以確認是凸的狀態,或錯誤燈號熄滅為凸狀態)**
7.	後續步驟請執行全電源啟動之第10 – 17步驟. **….P20**

◉若有DPS裝置, 請再把[V5 open]按鈕按兩次,以開啟V5閥門 ,此按鈕燈亮表示V5已經開啟。

P23

Vacuum Rack



P24

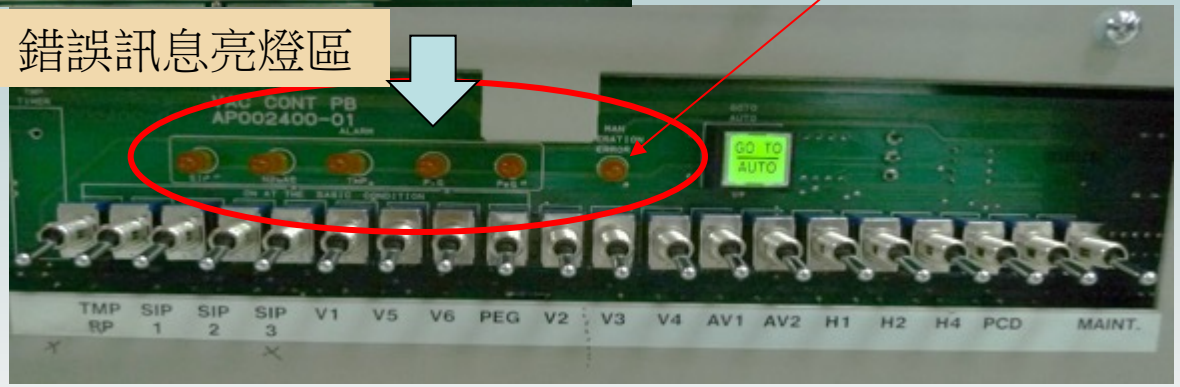
真空指示面板及錯誤訊息區

正常亮燈情況

MAN Operation ERR

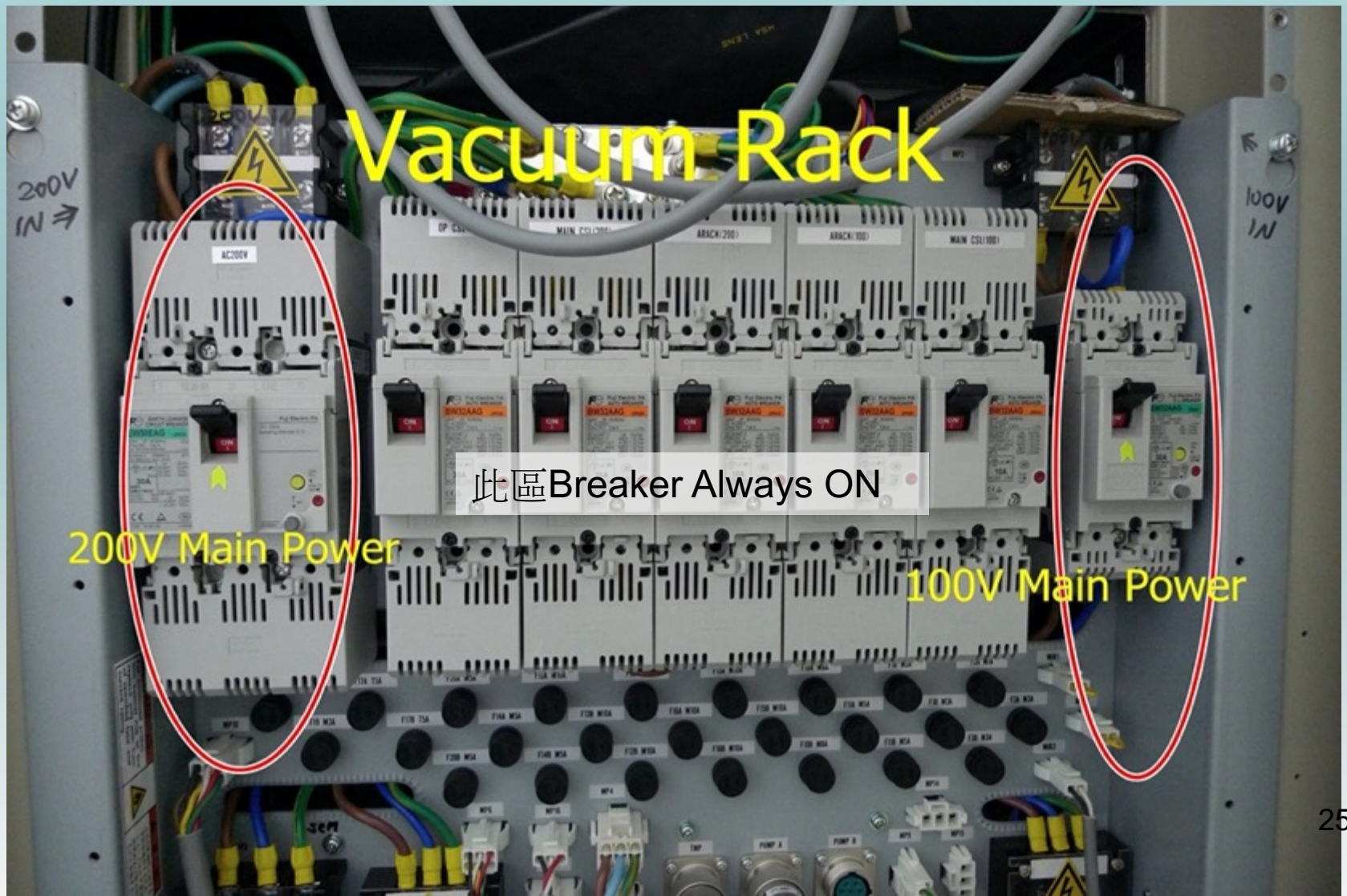
SIP, N2 gas, TMP, PiG, PeG

錯誤訊息亮燈區



P25

Main Power Breaker

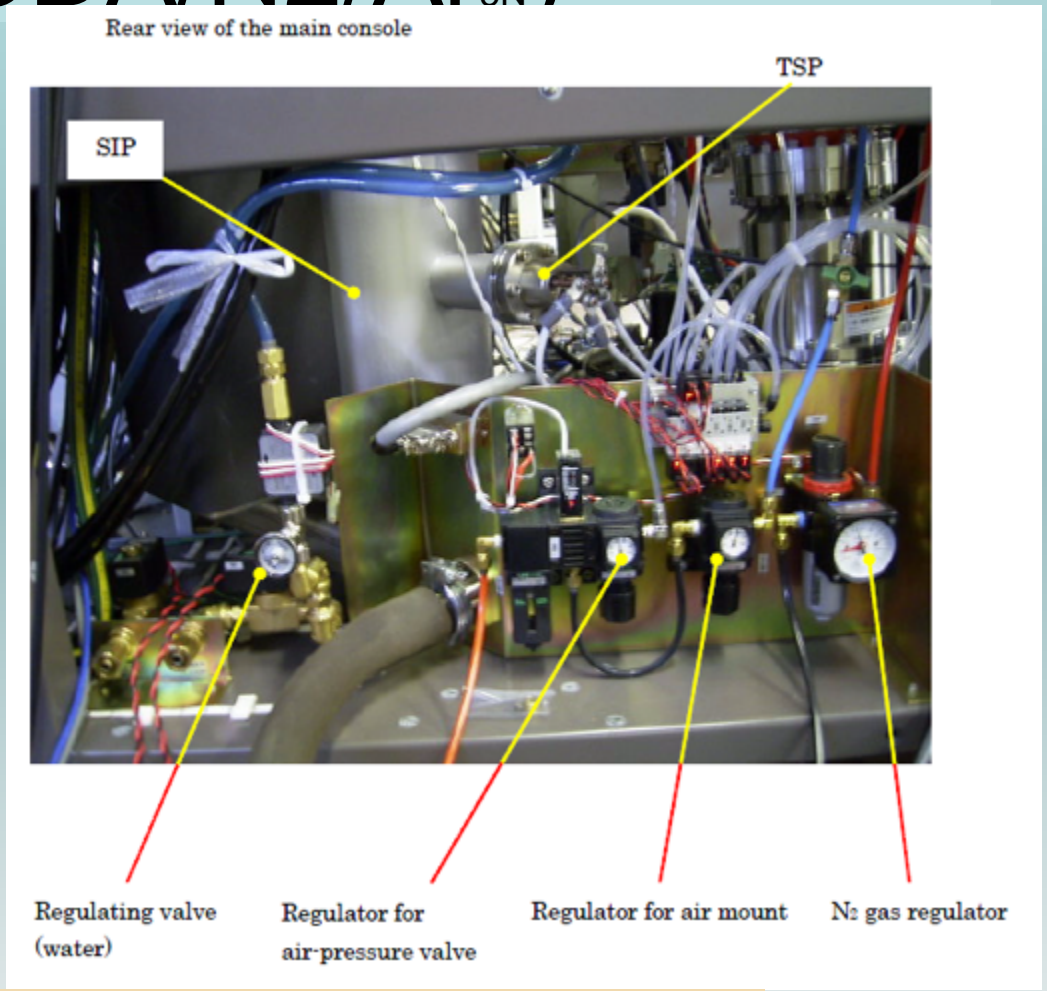


Cooling Water and GAS(CDA/N2/Ar_{5N})

CDA>5Kg for Air Mount and Valve

SCF-25
800Kcal/h
3Kg
1.3L/m
20±0.1℃

Cooling Water for OL



Ar >0.3Mpa for FMIED
N2 >0.5Mpa for Chamber Purge

Performance 檢測項目

Adjustment	Sample	**Specification**	Purpose
E-Gun Mechanical and Resolution	Au (S)	Mag 100K (depend on environment)	SEM Resolution
BEI/Auger Image	Cu/Ag	Contrast/Mapping	Function Check
HAS Lens Tuning at 2KV/10KV	SiO2(100)@2KV Cu@10KV	Up-Down ratio: 70~120% Resolution(M5): 0.4~0.65% b/a≧1.2,c/a≧1.7	HSA Centering
CEM HV, Ratio of PB	Cu	PB ratio≧0.75 Sensitivity(M5) ≧120kcps/ch	Detection Sensitivity
Ion Gun Center	SiO2(100)		Etching Position Correction
Energy Axis	Au/Cu	Au:2011.1eV±1ev Cu:914.1eV±1ev	Energy Position
Etching Rate at 3KV/2KV/1KV/500V	SiO2(100), SiO2(20)	Etch Rate ≧ 15nm (3KV) Area ≧ 300um (3KV)	Etching Rate Confirmation