

# 晶圓廠 TEL LPCVD-HTO 爐管 PM 保養程序

# Wafer Fab TEL LPCVD-HTO Tube PM

## Maintenance Procedure

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# 晶圓廠 TEL LPCVD-HTO 爐管 PM 保養程序

# Wafer Fab TEL LPCVD-HTO Tube PM

## Maintenance Procedure

#### 壹、目的:

I. Purpose:

使機台維持最佳狀況、降低 DOWN TIME。

Keep the machine in the best condition and reduce the DOWN TIME.

#### 貳、 適用時機:

- II. Applicable Timing:
  - 一、 大 PM: 300±30 run。
  - 1. Big PM: 300±30 run.
  - 二、機臺異常須 PM 時。
  - 2. Abnormal machine required to be PM.
  - 三、更換製程須 PM 時。
  - 3. Replace the process to PM.
  - 四、年度歲修須 PM 時 (一律大 PM)。
  - 4. Annual PM required repair (all large PM).
- \*\* 遇特殊情況時,在機臺狀況允許下,可適度將 PM 時機 "±值"放寬至三倍以內作 PM。
- \*\* In special circumstances, the machine conditions permit, it is appropriate to PM



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time "± value" relaxed to less than three times for the PM.

### 執行規則:

#### III. Execute the rule:

累積RUN數至執行大PM時機則做大PM。大PM執行完畢RUN數重新計算。

Accumulate the number of RUNs until the time to execute a large PM is to increase the PM. The number of RUNs is recalculated after the execution of the large PM.

#### 肆、使用材料:

#### IV. Use of materials:

IPA (異丙醇),無塵布,O-RING .....等。

IPA (isopropyl alcohol), clean cloth, O-RING ..... etc.

#### 伍、使用設備:

#### V. Use of device:

公制六角扳手,活動扳手,十字一字起子,TUBE SLIDER...等。

Metric hexagonal wrench, adjustable wrench, Phillips screwdriver, TUBE SLIDER ..... etc.

## 陸、安全事項:

## VI. Safety Precautions:

- 一、石英配件易碎,拆裝請小心,並請於拆裝石英過程,全程配戴棉手套 & 護目鏡,避免遭石英 割傷&造成眼部傷害。
- 1. Quartz accessories are fragile, please be careful when disassembling and assembling, and please wear cotton gloves & goggles during the process of disassembling and



assembling the quartz to avoid being cut by the quartz and causing eye damage.

- 二、MANIFOLD 及外管重量不輕,請注意拆裝之安全。
- MANIFOLD and the outer tube weight is not light, please pay attention to safety during disassembly
- 三、待內外管溫度低於 150°C (面板顯示) 時,才可執行拆管,並於拿取內外管時,請全程配戴 隔熱手套,以避免灼傷。
- 3. When the temperature of the inner and outer tubes is lower than 150°C (displayed on the panel), the tube can be dismantled. When handling the inner and outer tubes, please wear heat-resistant gloves to avoid burns.
- 四、請使用手推車搬運內外管於酸房與機臺之間,並將內外管放置於台車上時,請配戴隔熱手套, 以避免灼傷。
- 4. Please use a trolley to carry the inner and outer pipes between the acid room and the machine, and when placing the inner and outer pipes on the platform, please wear heat-resistant gloves to avoid burns.
- 五、測試 Main Valve 開與關請用專用治具,測試中切勿將手伸入 Main Valve 內部,以免夾傷。
- 5. Test Main Valve opening and closing with a special fixture, the test do not reach into the Main Valve internal to avoid crush
- 六、使用化學品,應穿戴防護器具。
- 6. Use chemicals, wear protective equipment
- 七、PM 拆下之零件並分解,再拿至震盪槽 CLEAN,震完後管內以 DI 沖洗再以 AIR 吹乾以上動作有水漬噴濺,必須穿戴護目鏡或防護器具,避免造成眼部傷害。
- 7. PM remove the parts and disassemble them, then take them to the shock tank CLEAN.

  After the earthquake, rinse the tubes with DI and then dry them with AIR. The above actions are splashed with water and must be worn with goggles or protective gear to



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avoid eye damage.

- 八、於PM 時使用 low vacuum clean 零件,必須配戴耳罩避免耳部噪音之傷害。
- 8. Use low vacuum clean parts for PM and wear earmuffs to avoid ear noise.
- 九、拆裝管 & 調整承接時請使用護墊保護膝蓋。
- 9. Use pads to protect knees when removing tubes & adjusting sockets.
- 十、烤箱溫度高於 50℃ 時,拿取 Parts 請全程配戴隔熱手套,以避免灼傷。
- 10. When the oven temperature is higher than 50°C, please wear heat-resistant gloves when handling Parts to avoid burns.

### 柒、操作步驟:

#### VII. Procedure:

- 大PM保養程序
- Big PM maintenance procedure
- 一、降温:將208V POWER OFF。
- 1. Cool down: turn 208V POWER OFF.
- 二、將 BOAT 上的 DUMMY WAFER 以 T-BAWL 取下(RUN MODE 下之DUMMY UNLOAD)。
- 2. Remove the DUMMY WAFER on the BOAT with T-BAWL (DUMMY UNLOAD under RUN MODE).
- 三、將PEDESTAL(圖一)取下,六角扳手將PEDESTAL TABLE 的螺絲鬆開取下 DUST TRAY、T/C PORT 、COVER後一同拿至洗管間供酸房人員清洗。
- 3. Take off the PEDESTAL (Picture 1), loosen the screws of the PEDESTAL TABLE with a hexagonal wrench, take off the DUST TRAY, T/C PORT, and COVER, and take them together to the pipe cleaning room for cleaning by the acid room personnel.
- 四、使用 VL-800 MANU MODE 下之MAUNAL 或 ADJUST 的 MOTION 5 將 BOAT CLAMP 鬆開後將 BOAT拿至洗管間供酸房人員清洗。



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- 4. Use the MOTION 5 of MAUNAL or ADJUST under the VL-800 MANU MODE to loosen the BOAT CLAMP, and then take the BOAT to the cleaning room for the acid room personnel to clean.
- 五、當爐管溫度降至150℃以下時可進行拆管,其步驟如下: (為促進降溫速度,可將 DOOR SHUTTER 打 開。其方法為 MANUAL 或 ADJUST 的 MOTION 3至P02->MOTION 4 至P02)
- 5. When the temperature of the furnace tube drops below 150°C, the tube can be disassembled, and the steps are as follows: (In order to accelerate the cooling speed, the DOOR SHUTTER can be opened. The method is MOTION 3 to P02->MOTION 4 to P02 of MANUAL or ADJUST)
- (1). 以 " 十" 字起子將遮蓋 MANIFOLD 的 PANEL 取下。 Remove the PANEL covering the MANIFOLD with a "+" screwdriver.
- (2). 以六角扳手鬆開 DOOR SHUTTER 的螺絲後取下 DOOR SHUTTER。 Loosen the DOOR SHUTTER screw with a hexagonal wrench and take off the DOOR SHUTTER.
- \*\* VL-800 之MOTION 3 及 MOTION 4 均須在 POSITION 2, MOTION 1 不可超過 POSITION 2。
- \*\* Both MOTION 3 and MOTION 4 of VL-800 must be at POSITION 2, and MOTION 1 cannot exceed POSITION 2.
- \*\* 鬆開螺絲時須用另一隻手扶著 DOOR SHUTTER 防止其掉下。
- \*\* When loosening the screws, hold the DOOR SHUTTER with the other hand to prevent it from falling.
- (3). 拆 SIH2CL2、N2O INJECTOR。 Remove SIH2CL2 and N2O INJECTOR.
- (4). 拆 PS1 接頭、VACUUM PIPE。 Disassemble the PS1 connector, VACUUM PIPE.
- (5). 拆內管,步驟如下(所提及的各部位名稱請參考圖二)

To remove the inner tube, the steps are as follows (please refer to Figure 2 for the names of the parts mentioned)



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- (5.1). 將 MANIFOLD INSTALLATION JIG 放在 CAPPING FLANGE 上。 Put the MANIFOLD INSTALLATION JIG on the CAPPING FLANGE.
- (5.2). 將INNER JIG 放在MANIFOLD INSTALLATION JIG 上,其 POSITIONING BLOCK 須對準 MANIFOLD INSTALLATION JIG 上的 LOCATION GROOVE。 Put the INNER JIG on the MANIFOLD INSTALLATION JIG, its POSITIONING BLOCK must be aligned with the LOCATION GROOVE on the MANIFOLD INSTALLATION JIG.
- (5.3). 將 ROTARY HANDLE 轉至 "LOCK "位置。 Turn the ROTARY HANDLE to the "LOCK" position.
- (5.4). 檢查 VL-800 MOTION 1 (SET → M01 → SPD )之速度是否為100,如果不是請改成100。 Check if the speed of VL-800 MOTION 1 (SET  $\rightarrow$  M01  $\rightarrow$  SPD ) is 100, if not, please change it to 100.
- (5.5). 將 VL-800 MOTION 1 往上升,注意與 MANIFOLD INSTALLATION JIG 交接是否平穩,如不平穩 請調整之,如果平穩則繼續上升。當MANIFOLD INSTALLATION JIG 接近 MANIFOLD 時請注意 INNER JIG上的POSITIONING BLOCK 須對準MANIFOLD 上的POSITIONING BLOCK, 當B/E上的 彈簧稍微壓縮時即停止上升。
  - Raise the VL-800 MOTION 1, pay attention to whether the handover with the MANIFOLD INSTALLATION JIG is stable, if not, please adjust it, if it is stable, continue to rise. When the MANIFOLD INSTALLATION JIG is close to the MANIFOLD, please note that the POSITIONING BLOCK on the INNER JIG must align with the POSITIONING BLOCK on the MANIFOLD. When the spring on the B/E is slightly compressed, it will stop rising.
- (5.6). 將 ROTARY HANDLE 轉至" FREE " 位置。 Turn the ROTARY HANDLE to the "FREE" position.
- (5.7). 將 VL-800 MOTION 1 往下降, 速度宜緩慢, 可自 VACUUM PIPE HOLE 中觀查內管下降情形,當 B/E 降至接近 TUBE SLIDER 時請小心,勿使內管晃動。



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Lower the VL-800 MOTION 1 at a slow speed. You can observe the lowering of the inner pipe from the VACUUM PIPE HOLE. When B/E is lowered close to the TUBE SLIDER, please be careful not to shake the inner pipe.

- (5.8). B/E 續降至 POSITION 1後取下內管、INNER TUBE HOLDER、INNER JIG。
  After B/E continues down to POSITION 1, remove the inner tube, INNER TUBE HOLDER, INNER JIG.
- (6). 拆 N2 INJECTOR。 Remove the N2 INJECTOR.
- (7). 拆 PADDLE T/C。 Remove the PADDLE T/C.
- (8). 拆外管·步驟如下(所提及的各部位名稱·請參考圖三)

  Remove the outer tube, the steps are as follows (for the names of the parts mentioned, please refer to Figure 3)

(8.1). 將 B/E 往上升,與 MANIFOLD INSTALLATION JIG 交接時須注意是否平穩,如不平穩請調整之;

- 如果平穩,則可繼續上升。接近 MANIFOLD 時需注意 LOCATION GROOVE 要對準MANIFOLD 的 POSITIONING BLOCK.當B/E 的彈簧稍微壓縮時即停止上升。
  Lift the B/E up, and pay attention to whether it is stable when handing over to the MANIFOLD INSTALLATION JIG. If it is not stable, please adjust it; if it is stable, you can continue to rise.
  When approaching the MANIFOLD, please pay attention that the LOCATION GROOVE must be aligned with the POSITIONING BLOCK of the MANIFOLD. When the spring of B/E is slightly compressed, it will stop rising.
- (8.2). 將MANIFOLD CHILLING WATER BELLOW 快速接頭與機台分離並纏繞於B/E旁,然後鬆開4顆固定 MANIFOLD 的螺絲 (LOCK HANDLE )。
  - Separate the MANIFOLD CHILLING WATER BELLOW quick connector from the machine and



wrap it around B/E, then loosen the 4 screws (LOCK HANDLE) that fix the MANIFOLD.

- (8.3). 將 B/E 往下降,需注意 MANIFOLD 是否一同下降,降至 POSITION 3 附近時須提防勿使 MANIFOLD 碰撞到 BOAT TRANSFER,在與 TUBE SLIDER 交接時亦不要引起太大晃動,當 B/E 降 至POSITION 1即停住。
  - Descend B/E, pay attention to whether the MANIFOLD drops together, and be careful not to let the MANIFOLD collide with the BOAT TRANSFER when it is near POSITION 3, and do not cause too much shaking when it is connected with the TUBE SLIDER. When B/E drops to POSITION 1 is to stop.
- (8.4). 鬆開固定外管的 BOLT 上的螺絲後取下 BOLT,TEFLON RING。

  Remove the BOLT after loosening the screw on the BOLT holding the outer tube, TEFLON RING.
- (8.5). 取下外管、O-RING、O-RING HOLDER、 MANIFOLD、MANIFOLD COVER。

  Remove the outer tube, O-RING, O-RING HOLDER, MANIFOLD, MANIFOLD COVER.
- (8.6). 拆下 VV1,VV2 以 IPA CLEAN 清潔後,使用 AIR GUN 吹乾。
  Remove VV1, VV2 and clean with IPA CLEAN, then blow dry with AIR GUN.
- \*\* 拆下的石英配件需拿至洗管間由酸房人員負責清洗並準備一套以進行裝管。
- \*\* The disassembled quartz fittings need to be taken to the pipe cleaning room for cleaning by the acid room personnel and a set is prepared for pipe installation.
- 六、將 VACUUM PIPING 上的 MANTLE HEATER 拆下,把 MANIFOLD、VACUUM PIPING 送至超音 震盪 2 HOURS 後拿起送至烤箱烘烤 2 HOURS 後即可供下次使用。
- 6. Remove the MANTLE HEATER on the VACUUM PIPING, send the MANIFOLD and VACUUM PIPING to the supersonic vibration for 2 HOURS, pick it up and send it to the oven for 2 HOURS before it can be used next time.

#### 十、組裝:

## 7. Assembly:

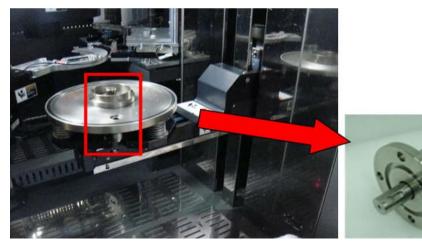


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程序與拆管程序相反,不再贅述,亦請注意安全。

The procedure is opposite to that of dismantling the tube, so it will not be described again, and please pay attention to safety.

- \*\* 測試磁性流體(轉子)轉動時,是否有異音及抖動狀況,若有異常則更換之
- \*\* When testing the rotation of a magnetic fluid (rotor), check for any abnormal noises or vibrations. If any abnormalities are found, replace it.



- \*\* 裝PEDESTAL前須以水平儀檢查 CAPPING FLANGE 邊緣對角四點之水平狀態,若有偏差則須調整至最 佳狀態。
- \*\* Before installing PEDESTAL, use a level to check the horizontal state of the four diagonal points on the edge of the CAPPING FLANGE. If there is any deviation, it must be adjusted to the best state.
- \*\* 裝完PEDESTAL後,以水平儀檢查其與 BOAT 接合面之水平是否合乎要求,若有偏差則須調整至最佳 狀態(參考技資G3363-1010),手壓鐵板測試 elevator 下方 EMG-STOP switch 功能正常(VL-800 需有 ID.63 alarm),再將 BOAT 置上保溫筒並伸入管內檢查是否會刮管,若有刮管之慮則須調整使之不刮管
- \*\* After installing the PEDESTAL, use a spirit level to check whether the level of the joint surface with the BOAT meets the requirements. If there is any deviation, adjust it to the best state (refer to technical material G3363-1010), and test the function of the EMG-STOP switch under the elevator by hand pressing the iron plate If it is normal (VL-800 needs ID.63)



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alarm), put the BOAT on the insulation tube and extend it into the tube to check whether it will scrape the tube.



- \*\* injector 安裝手法: 安裝時先將 gas bellow 接頭鎖入 2/3 以上; 以兩手內外輔助(內: 輕推 injector 至定位, 外: 扶住 bellow 接頭並往內鎖緊)至安裝完成。(如圖解)
- \*\*Injector installation method: When installing, first lock the gas bellow connector into more than 2/3; use both hands inside and outside to assist (inside: gently push the injector to the position, outside: hold the bellow connector and lock it inward) until the installation is completed. (as illustrated)





- 八、調整 BOAT 與 PEDESTAL承接時晃動的程度至最小後調整BOAT 及BOAT LOCK的位置。
  (參考技G3363-1010)
- 8. Adjust the BOAT and BOAT LOCK position after adjusting the shaking degree to the minimum when connecting BOAT and PEDESTAL. (reference technology G3363-1010)



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#### 九、測試氣聲:

- 9. Test vent sound:
- (1). 將CAP連同PEDESTAL升至P04位置。 Raise CAP together with PEDESTAL to position P04.
- (2). 將 MODEL 3200 切換成 MANUAL MODE。 Switch the MODEL 3200 to MANUAL MODE.
- (3). 關所有進 TUBE 的 GAS VALVE。 Close all GAS VALVE into TUBE.
- (4). 開 SV , ATM 燈熄面後馬上關 SV 並 通 N2 破 大氣。 Turn on the SV, turn off the SV immediately after the ATM light goes out and turn on N2 to break the atmosphere.
- (5). ATM燈亮起後將CAP緩緩下降,CHECK有管內壓力是否為大氣。 After the ATM light is on, lower the CAP slowly, and check whether the pressure in the tube is atmospheric.
- (6). 如果有氣往裡吸請檢查機台是否有閥關不死造成內漏 If there is air sucking in, please check whether the machine has a valve that cannot be closed and causes internal leakage
- (7). 重複動作直至無氣聲為止

Repeat until there is no sound of vent

(8). 氣聲測試完後請將cap升回P04,接著將N2流量由2000加大到12000,靜待5分鐘觀察其CHAMBER內 壓力是否維持在760 ~ 775,若超出範圍則VV1 & VV2 & Check valve整個VENT機構有阻塞疑慮,請 停機檢查做進一步確認。

After the vent sound test, please increase the cap back to P04, then increase the N2 flow rate from 2000 to 12000, wait for 5 minutes to observe whether the pressure in the CHAMBER is



maintained at 760 ~ 775, if it exceeds the range, VV1 & VV2 & Check valve are all The VENT mechanism may be blocked, please stop and check for further confirmation.

- 十、低溫PURGE:
- 10. Low temperature PURGE:
- (1). 將CAP連同PEDESTAL升至 POSITION 4。

  Raise CAP to POSITION 4 with PEDESTAL.
- (2). 將 MODEL 3200 切換成 MANUAL MODE。

  Switch the MODEL 3200 to MANUAL MODE.
- (3). 關所有進 TUBE 的 GAS VALVE。 Close all GAS VALVE into TUBE.
- (4). 開 SV 小抽·待管內壓力低於 5 TORR 時再開 MV大抽。

  Turn on the SV for small pumping, and then turn on the MV for big pumping when the pressure in the pipe is lower than 5 TORR.
- (5). 將所有 N2 GAS 打開。 Turn all N2 GAS on.
- (6). PURGE後即可進行低溫測漏。

Low temperature leak detection can be performed after PURGE.

- 十一、T-BAWL 傳送CHECK (參考技資G3363-1010)。
- 11. T-BAWL transfer CHECK (refer to O.I G3363-1010).
- (1). 每次 BPM need clean counter sensor with air gun。

  Every time BPM need clean counter sensor with air gun.
- 十二、低温測漏:
- 12. Low temperature leak check:
- (1). 關所有 GAS VALVE 直至壓力抽至 0.00 TORR。



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Close all gas valves until the pressure reaches 0.00 TORR.

(2). 關 SV、 MV 作測漏,規格為漏率小於0.03 TORR/ 130 SEC

Close SV, MV for leak detection, the specification is that the leak rate is less than 0.03 TORR/

- 十三、如果測漏不過則請進行抓漏,找出漏處並解決後再作測漏,直至漏率合乎規格。
- 13. If the leak test fails, please carry out leak detection, find out the leak and solve it before performing leak test until the leak rate meets the specification.
- 十四、低温測漏通過即可將208V POWER打開升溫。
- 14. If the low temperature leak test is passed, the 208V POWER can be turned on to heat up.

十五、升温PURGE:

15. Heat up Purge:

升溫PURGE方式同低溫PURGE,不同點是 B/E 需連同PEDESTAL 、BOAT一起至P04。

The way of heat up PURGE is the same as low temperature PURGE, the difference is that B/E needs to go to P04 together with PEDESTAL and BOAT.

十六、高温測漏:

16. High temperature leak check:

方法與規格皆和低溫測漏同,如果不過表示有漏須抓漏,直至通過方可進行下一步驟。

The method and specifications are the same as low temperature leak detection, if there is a leak, it must be caught until it is passed before proceeding to the next step.

- 十七、檢查各 TAPE HEATER 是否毀損,加熱是否正常。檢查 VACUUM PIPING 上的 MANTLE HEATER 否毀損,加熱是否正常。
- 17. Check whether each TAPE HEATER is damaged and whether the heating is normal. Check whether the MANTLE HEATER on the VACUUM PIPING is damaged and whether the heating is normal.
- 十八、將機台內部及四周用 LOW VACCUM 與 IPA 清潔乾淨。



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- 18. Clean the inside and surrounding of the machine with LOW VACCUM and IPA.
- 十九、SPM/BPM 請 Check CAP Flow Meter 浮球動作 & 機台 alarm 功能是否正常。
- 19. For SPM/BPM, please check whether the CAP Flow Meter float action & machine alarm function are normal.

CAP Flow Meter 浮球請確認調整在 0.8L/min 位置。

Please confirm that the CAP Flow Meter float is adjusted at 0.8L/min.



- 二十、BPM 檢查電磁閥有無漏氣或脆化,若有不良則更換。
- 20. BPM Check the solenoid valve for air leakage or embrittlement, and replace it if it is defective.
- 二十一、Normal-Open Valve 電磁閥每5年定期更換一次。
- 21. Normal-Open Valve solenoid valves are regularly replaced every 5 years.
- 二十二、將機台復歸為 STANDBY 狀態並執行 PG 程式,通知 EA FOLLOW TEST RUN,於記錄本上註明 做TEST RUN 並簽名。
- 22. Return the machine to the STANDBY state and execute the PG program, notify EA FOLLOW TEST RUN, mark the TEST RUN in the record book and sign it.
- \*\*TEST RUN:即 RUN 一個平常 RUN 貨的 RECIPE 以量測其厚度,PARTICLE。如果均合乎規格即可交給生產線 RUN 貨,大PM保養工作至此完成。
- \*\* TEST RUN: RUN a normal RUN RECIPE to measure its thickness, PARTICLE. If they all meet the specifications, they can be delivered to the production line for RUN delivery, and the maintenance work of the big PM is now complete.
- \*\* PM 完 CHECK 及調整 B/E DRIVER VOLTAGE(SPEC RUN/STOP: 0.38+-0.04/0.18+-0.02V), 若異常



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請更換新品。

- \*\* PM finished CHECK and adjust B/E DRIVER VOLTAGE (spec RUN/STOP :  $0.38\pm0.04/0.18\pm0.02V$ ), if abnormal, please replace with a new one.
- \*\* PM 後拆下機臺正面COVER CLEAN CARRIER & STAGE ASSEMBLY & 機台內部周圍環境(COUNT/ORIENT/BODY...)。
- \*\* After PM, remove the front COVER CLEAN CARRIER & STAGE ASSEMBLY & surrounding environment inside the machine (COUNT/ORIENT/BODY...).
- 二十三、機台 TEST RUN 後,設備工程師需於機台 STANDBY 時,確認 PS1 PRESSURE=30TORR。
- 23. After the machine TEST RUN, the equipment engineer needs to confirm PS1 PRESSURE=30TORR when the machine is STANDBY.

#### 捌、生效與修訂

## VIII. Effectivity and Amendments

本規範之公佈實施及其修訂核准層級皆依會簽/核決/分發依循範例為之。

The publication, implementation and revision approval levels of this specification are all based on countersignature/approval/distribution and follow the example.

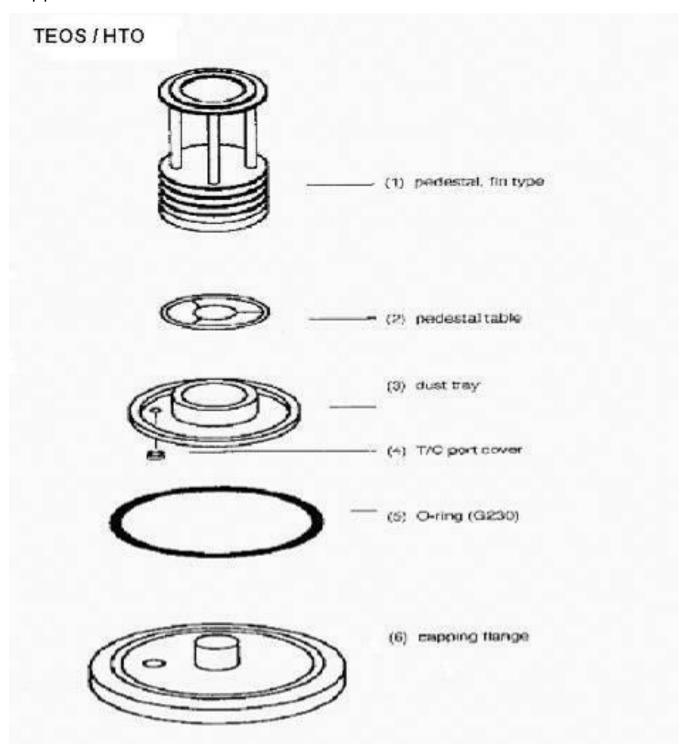
玖、附件

IX. Appendix



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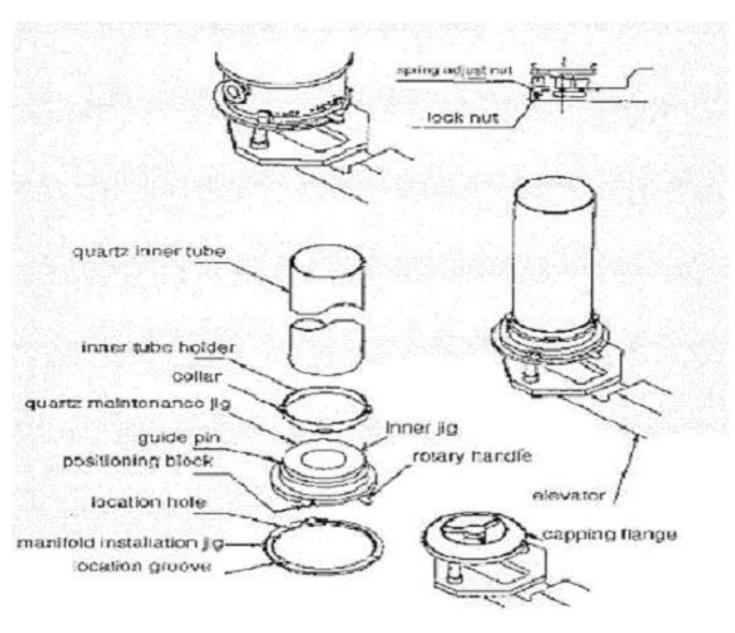
# 附件 Appendix



圖一 Fig 1



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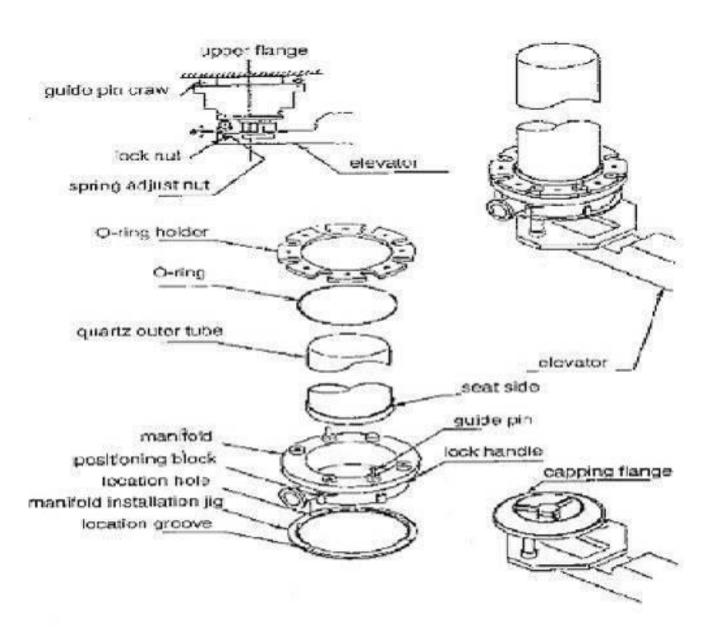
圖\_ Fig 2

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圖三 Fig 3

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