

Requirements for AMAT Multiple Chamber Tool Systems/Chambers To Be Refurbished, Reconditioned, and/or Reused

This guideline and checklist shall be used for AMAT cluster tool systems (P5000, Centura, Endura, etc.) or associated chambers that are being transferred to any AMAT facility for refurbishment, reconditioning, and/or reuse. It must also be used when Applied Materials employees perform decontamination efforts of Applied Materials tools at a customer site to be shipped to another customer site. After completion, this form must be signed by the person performing the decontamination (AMAT or Customer), the Applied Materials Site Manager(field) or Tool Owner(internal AMAT), the Local or Regional EHS Manager and the receiving facility EHS Manager prior to the system/chamber being transferred or shipped. If not provided, the equipment will be assumed to be still contaminated and cannot be moved/shipped. Decontamination is required prior to shipment and **ANY** charges associated with storage, decontamination, or resulting delays will be the responsibility of the originator. This checklist cannot be used for decontamination of Ion Implanters, CMP, or ECP tools which have specific procedures/forms.

Has this System/Chamber been exposed to process gases, liquids or solids? Yes No
 If yes, complete the following procedures and checklist. If No, this checklist is not required and only a completed copy of the Applied Materials System/Equipment Decontamination Form is required to be completed.

Note: A satisfactory pH⁻ survey result is between the range of 5 and 9.

System/Chamber Decontamination Checklist

PROCEDURE

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| 1 | Perform a plasma clean on all chambers if this capability exists | 10 JULY 2015 |
| 2 | Purge all chambers and exhaust systems with an inert gas for a minimum of 4 hours | 25 JUNE 2015 |
| 3 | Close and lock out all process gas and liquid delivery shut-off valves at the bottle source or facility valve manifold box. Set all MFC's and LFM's to max flow and pump out all gas/liquid delivery lines | 25 JUNE 2015 |
| 4 | <p>Pump and purge all gas and liquid delivery lines at least 30 times before removing or disconnecting any parts of the system. All lines must pass a satisfactory leak rate as specified in the applicable chamber maintenance manual.</p> <p>Low head pressure gases such as BCl₃, Cl₂, etc. should be purged at low pressure to prevent the gases from liquefying. For such gases, the number of pump/purge cycles must be increased to 60. Silane, TMB, TMP and TEOS liquid sources will also require additional pump/purge cycles as described in Section 6.1 (CORPEHS008.1.1) of the Applied Materials Equipment Decontamination Procedure (CORPEHS008.1).</p> <p>For dopant ampoules, perform a normal ampoule changeout procedure per the chamber maintenance manual prior to performing the pump/purge cycles. Isolate and remove the ampoules. Cap/plug the connections</p> | 25 JUNE 2015 |
| 5 | Complete regeneration of all cryo systems where applicable. Leave cryo heads at room temperature. | NA |
| 6 | Open all chambers and remove the process kits and Replace with cleaned kits | 10 JUNY 2015 |
| 7 | <p>Complete the chamber cleans in accordance with the applicable chamber maintenance manuals.</p> <p>Chamber surfaces must be checked for pH between 5-9. If the pH⁻ is outside of this range, cleaning must continue until it is within this range.</p> | 10 JULY 2015 |
| 8 | All bellows must be scrapped on site and replace with new ones | 10 JULY 2015 |
| 9 | All viewing port windows, inspection windows, plasma sensor port windows etc. must be cleaned and have new orings installed. | 10 JULY 2015 |

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| 10 | The manometer pressure sensor must be removed, cleaned and All o-rings and gaskets must be replaced. | 10 JULY 2015 |
| 11 | Disassemble and clean the chamber isolation valve, throttle valve and foreline components per Section 6.2 (CORPESH008.1.2) of the Applied Materials Decontamination Procedure (CORPESH008.1). All orings and gaskets that were exposed to process gases/exhaust must be replaced. Reinstall foreline components | 10 JULY 2015 |
| 12 | Remove, clean and decontaminate gate valve and gate valve area if applicable including turbo pump screen. Replace all o-rings. Reinstall gate valve. | 10 JULY 2015 |
| 13 | If the cryo pump will be shipped as attached to the tool/chamber, decontaminate the cryo head internals and exhaust connection. Cap the exhaust connection from the cryo pump to the foreline. | NA |
| 14 | Replace all filters in the process gas and liquid delivery lines including filters at the chamber final valves. | 10 JULY 2015 |
| 15 | Close all manual isolation valves in the gas panel, single line drop cabinets and liquid system delivery cabinets. | 25 JUNE 2015 |
| 16 | Perform an additional 15 pump/purge cycles of the process gas and liquid delivery panel components. | 25 JUNE 2015 |
| 17 | Disconnect the facility gas and liquid delivery lines from the tool and cap/plug the connections. | 25 JUNE 2015 |
| 18 | Open the process gas and liquid delivery manual isolation valves, pump down the lines to the plugged connections for facility process gas and liquid delivery input, then perform standard chamber and process gas delivery line leak rates to check for system leaks. | 25 JUNE 2015 |
| 19 | Shut the chamber isolation valve, throttle valve and gate valves. Remove the air lines to the isolation valve and gate valves. Unplug the throttle and gate valve power plugs. | 10 JULY 2015 |
| 20 | Lockout the electrical power to the turbo pump if applicable. | NA |
| 21 | Shut off the Chamber roughing pump and lock it out. | 10 JULY 2015 |
| 22 | Remove the chamber turbo pumps and roughing lines up to the chamber foreline valves. Cap the connections to the chamber. | 10 JULY 2015 |
| 23 | Clean and decontaminate the chamber turbo pump opening (ont he chamber, not on the turbopump) if applicable. Blank off turbo pump opening or install a new/refurbished pump. | 10 JULY 2015 |
| 24 | Drain all heating and cooling systems and associated lines. Blow them out with air and securely cap the connections. Any removed ethylene glycol/water mixture must be disposed of according to local waste regulations. | 28 JULY 2015 |
| 25 | Disconnect tool and chamber low point joint connections to check for residual liquid then reconnect them Remove self sealing quick-connect fittings to check for trapped liquid then reconnect them. | 28 JULY 2015 |

Sign and place this completed checklist with the Returns documentation and include an Applied Materials System/Equipment Decontamination and Transportation Form per Section 7.2 (CORPESH008.1.1.2) found in the Applied Materials Equipment Decontamination Procedure (CORPESH008.1).

_____ Sriram _____
 Full Name – Person Responsible for Decon (printed) Signature

_____ _____ _____
 Title Phone Number Date

Full Name – Region Site Manager (printed)
Or AMAT Tool Owner

Signature

Title

Phone Number

Date

Full Name – Region EHS Manager (printed)

Signature

Title

Phone Number

Date

Full Name – Receiving Facility EHS Manager (printed)

Signature

Title

Phone Number

Date

Equipment Decontamination Survey Results

System/Tool ID # _____

Location: _____

| Sample # | Location | Method | Results | Initials |
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Names of all personnel performing decontamination surveys:

 Name (Printed)

 Initials

 Date

 Name (Printed)

 Initials

 Date

 Name (Printed)

 Initials

 Date

 Name (Printed)

 Initials

 Date