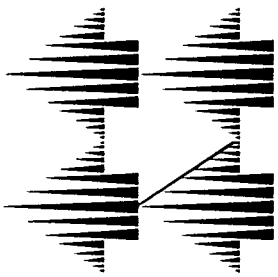

NOVELLUS

CONCEPT TWO

Novellus Concept Two
PVD MODULE

FACILITIES PLANNING AND INSTALLATION GUIDE

NTP 02-071 Rev. 0 25 Jan 93

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Section 1 GENERAL INFORMATION

THE CONCEPT TWO PVD MODULE is an inert gas plasma vapor deposition process chamber dedicated to handling wafers of either 150 or 200 mm diameter. This manual details the preparation required to ensure trouble-free installation and facilitization of the system. System dimensions and specifications for facility services are provided, along with step-by-step installation procedures and checklists.

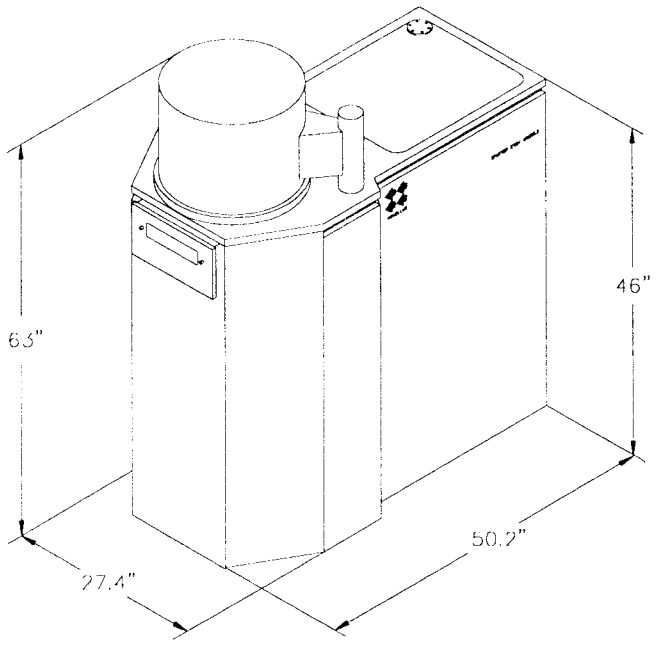
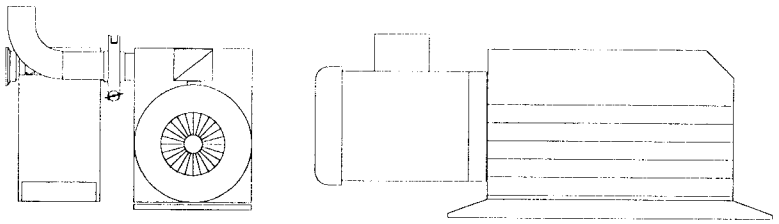


Figure 1-1. PVD Module

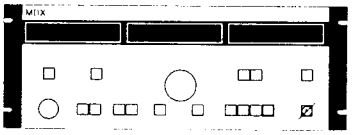
1.1 Physical Specifications

The Concept Two PVD Module measures 27 in. (68.6 cm) wide x 50 in. (127 cm) deep x 63 in. (106 cm) high and weighs approximately 900 lb. (409 kg). The PVD Module consists of a process module, including its mod-

ule controller, a Leybold D25BCS vacuum pumping package and an Advanced Energy MDX DC magnetron Power supply with up to two slaved supplies (see Figure 1-2).



Leybold D25BCS



MDX Magnetron
DC Power Supply

Figure 1-2. PVD Module External Components

The Plasma Products RF5S RF generator is an optional, built-in, component of the process unit, the MDX DC magnetron power supply and its slaves are located in the Power Supply Unit.

A top view of the module is shown in Figure 1-3. The shaded areas represent the clearances required for safe and easy maintenance. All connections to the system are made through the facility panel, which is located on the right side of the system. Details of the facility panel are shown in Figure 4-1, which locates all of the required facility connections.

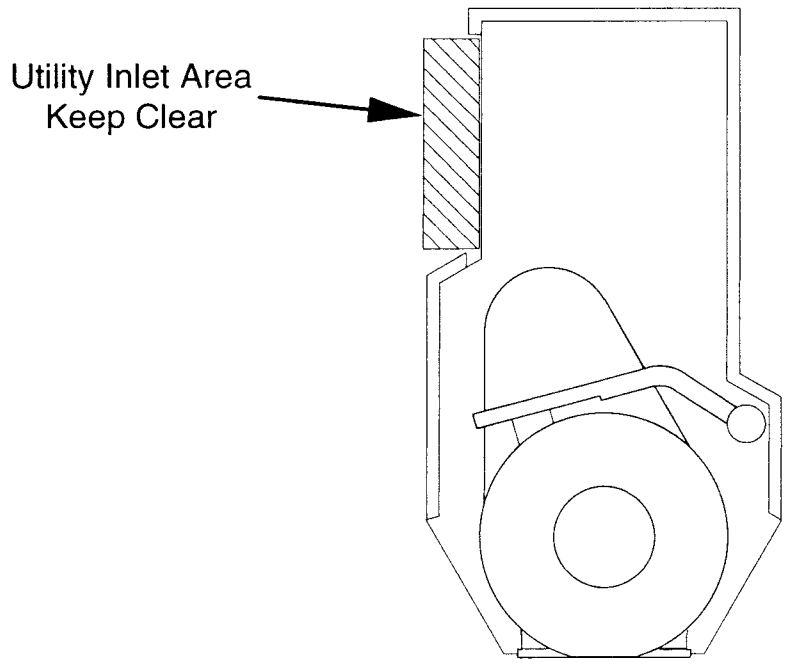


Figure 1-3. PVD Module Top View

Facility connections required at the process unit include cooling water, clean dry air, UHP argon, UHP nitrogen (optional), and house nitrogen. The Customer is responsible for providing electrical power connections from the process module to the remote AC panel, which is located at the pump unit. A vacuum foreline between the process module and the pump unit must also be provided.

1.1.1 Safety

All personnel working on or around the Novellus Concept Two system should be thoroughly familiar with good safety practices. Do not work on any portion of the system until you have read and completely understand the *Concept Two Safety Practices Manual.*

Section 2 FACILITIES REQUIREMENTS

THIS SECTION DESCRIBES the facilities requirements for the Concept Two PVD Module and its associated equipment.

2.1 Electrical Requirements

Electrical requirements for the PVD Module are given in Table 2-1, below.

Table 2-1. PVD Module Electrical Requirements

DC Power Supply Option	Electrical Facility Requirement
10 KW	208 VAC 3ϕ 70 A, Neutral, Ground
20 KW	208 VAC 3ϕ 90 A, Neutral, Ground
30 KW	208 VAC 3ϕ 150 A, Neutral, Ground

2.2 RF and DC Power Supplies

There are no direct facilities requirements for either the Plasma Products RF generator or the DC conductors between the remote power rack and the process module for the MDX magnetron DC power supplies.

2.3 Clean Dry Air (CDA)

Pneumatic valves and cylinders in the PVD Module are operated with clean dry air. CDA is brought into the PVD through a ¼-in. swage connector located on the PVD facilities inlet panel. If CDA is not available, house

nitrogen may be substituted with the same pressure and flow requirements. Plumbing may be constructed of ¼-in. seamless stainless steel tubing, thick-wall poly or copper tubing.

The CDA pressure must be regulated at 75 ±5 psig (517 ±34 kPa) at a maximum flow of 1 slm. CDA pressure must remain constant and unaffected by other in-house loads in order to ensure reliable valve operation.

2.4 Exhaust Requirements

The outlet of the D25BCS vane pump is fitted with KF40 flanges for connection to the house exhaust lines. The customer must provide exhaust lines with mating flanges and seal rings. The exhaust lines and exhaust system connected to Novellus Concept Two system modules must meet all local codes.

2.5 Cooling Water

The PVD Module (shield water) accepts ⅝-in. O.D. tubing for supply and ⅝ in. O.D. tubing for return. These lines connect to ⅜-in. NPT fittings located on the facilities inlet panel. Coolant flow, pressure, and temperature requirements are detailed in section two of this publication.

The PVD cathode requires a separate cooling water connection, located on the facilities inlet panel. The coolant inlet connector is a male, ¾-in. NPT brass fitting. The coolant outlet connector is a female, ¾-in. NPT brass fitting. Coolant flow, pressure, and temperature requirements are detailed in section 3 of this publication.

2.6 Vacuum Forelines

The customer must provide a 2-in. vacuum foreline, running between the pump unit and the process module. The vacuum foreline is limited to 60 ft. (18.3 m) in length, and may contain no more than four right-angle (90°) bends (see Figure 4-11).

2.7 House Nitrogen

The house nitrogen supply must be capable of maintaining a pressure of 20 ±5 psig (138 ±34 kPa) at a delivery rate of 2 slm. House nitrogen must have a minimum purity of 99.99%.

2.8 Process Gases

The PVD Module requires ultra high purity (UHP) argon (99.999%) for process. The process UHP argon supply must be capable of maintaining a pressure of 20 ±5 psig (138 ±34 kPa) at a flow of 2 slm.

As an option, the PVD Module may use ultra high purity (UHP) nitrogen (99.999%) for process. The process UHP nitrogen supply must be capable of maintaining a pressure of 20 ±5 psig (138 ±34 kPa) at a flow of 2 slm.

Section 3 PHYSICAL INSTALLATION

THIS SECTION PROVIDES A DESCRIPTION of the general procedures required to postion the Concept Two PVD Module and it's associated equipment. Included in this section is a list of required tools, test equipment, and material.

3.1 Customer Requirements

The Customer is responsible for providing the materials and labor necessary to install the Concept Two System and its subsystems. Customer supplied items are described below.

3.1.1 Material Requirements

The Customer is responsible to provide electrical conduit, wire, junction boxes, circuit breakers and fuses, piping for vacuum, process gases, CDA, cooling water, and scrubbed exhaust.

3.1.2 Installation Site Requirements

The Customer is responsible to provide all required process and support facilities to the system.

The entire floor area on which the Novellus Concept Two system is installed must be level to within $\frac{1}{8}$-in.

The installation site must provide adequate ventilation and lighting. Electrical power for small tools and extension lighting must be readily available and in service at the time of installation and startup.

3.1.3 Tools and Test Equipment

Table 3-1. Required Tools and Equipment

Description	Quantity/Size
Combination Wrench	3/4", 13/16", 1-3/8" 17 mm
Tubing Wrench	3/4"(2)
Crescent Wrench	6"
Hex (Allen) Wrench	7/64"
Pliers	6"
Wire Strippers	
Wire Cutters	
Screwdriver, Phillips	#1, #2
Screwdriver, Blade	1/4"
Level, Precision	As Required
Level, Spirit	As Required
Tape Measure (English/Metric)	As Required
Digital Multimeter	As Required
Helium Leak Detector/RGA	As Required
Fork-lift	As Required

3.2 Unpacking

Each Concept Two module is shipped in its own shipping container. Cables, documentation, installation materials, and spare parts are packaged separately.

Immediately inspect the entire shipment for evidence of damage during shipment and for completeness. Notify Novellus Technical Support (1-800-733-9750 or 1-408-733-9750) and the Shipper immediately by telephone if any discrepancies are discovered.

Certain modules are packaged in a cleanroom environment and are wrapped in a plastic bag. *Do not puncture or remove these bags until the modules are in their destination cleanrooms.* If any module is not to be installed immediately, is must be stored in an area which is free from extremes of moisture and temperature.

Section 4 FACILITIES CONNECTIONS

THIS SECTION DESCRIBES the procedures for connecting the facilities required to operate the Concept Two PVD Module.

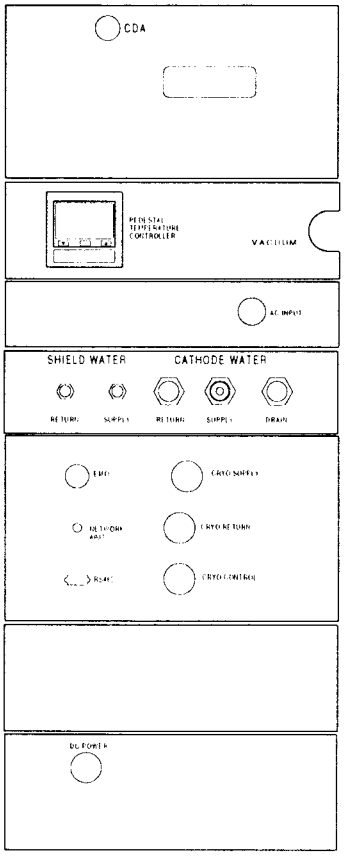


Figure 4-1. PVD Module Facilities Inlet Panel

4.1 Electrical Connections

The Concept Two PVD Module AC is supplied through an AC control unit (ACU) in the Power Supply Unit.

AC wiring is routed through a conduit exiting the top of the Power Supply Unit and entering the PVD Module through the AC inlet connector on the facilities inlet panel (see Figure 4-1).

1. Terminate the 1 in. sealtite conduit with an appropriate strain relief connector. The AC Inlet connector is attached through the facilities panel on the side of the module, it is labeled "AC INLET".

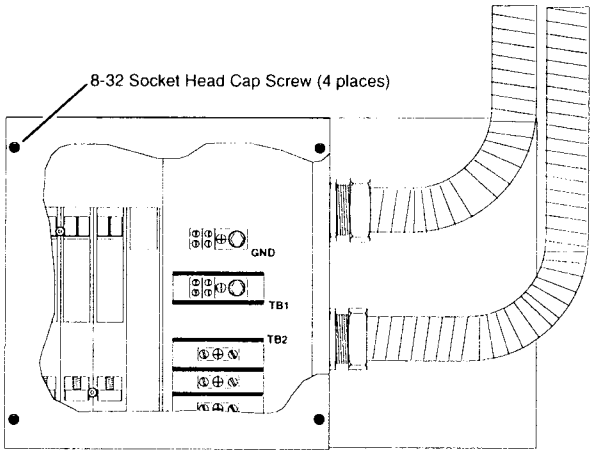


Figure 4-2. PVD ACU Screw Locations

2. AC wiring for the PVD Module varies, depending upon the type of PVD process. The appropriate facilities breaker and wire sizes are found in Table 4-1, below. Wiring should be THHN, copper conductor wire in accordance with National Electric Code. However, local electrical codes may vary, specifying a different wire size. Always use the larger wire size.

3. Remove the rear panel of the PVD Module AC control unit, located in the Power Supply Unit by removing four 8-32 socket head cap screws (see Figure 4-2).

4. Connect the three phase conductors to terminal block TB-2, the grounding conductor to the grounding block, and the neutral conductor to the neutral connector block (see Figure 4-3).

the supply line, unless the water is filtered better at its source. A pressure gauge and temperature gauge must also be installed on the supply line. A throttle valve is required on the supply line, and a flow meter (or pressure gauge) is required on the return line, in order to regulate water flowrate (or pressure drop).

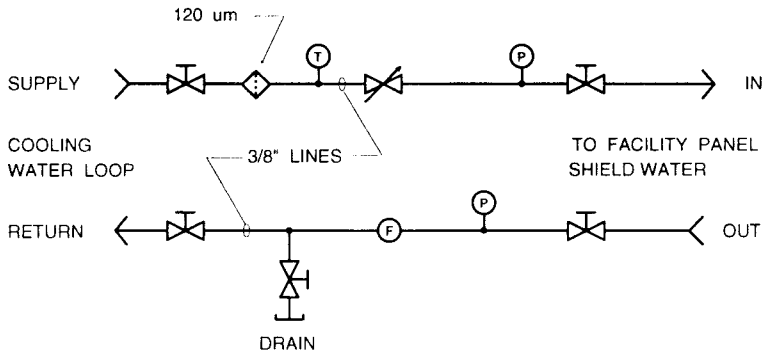


Figure 4-10. Recommended Cathode Cooling Water Plumbing

Turn on the cooling water

1. Verify that the water supply pressure is not more than 60 psig (414 kPa).

2. Open the facility water return valve.

3. Slowly open the facility water supply valve. Inspect the water supply lines and all connections for any leakage. Inspect the water connections inside the PVD Module for leaks. If a leak is found inside the module turn the water off and notify the Novellus Field Engineer immediately.

4. Adjust the throttle return valve to obtain a return pressure of not more than 5 psig (38 kPa). The flowrate of 30.3 lpm (8.0 gpm).

4.7 Vacuum Forelines

Figure 4-11 illustrates the required foreline connection. The vacuum foreline must be fabricated from either aluminum or stainless steel tubing, and each section must be fitted with the appropriate ISO-KF or MF type vacuum flanges. Minimum wall thickness must be $\frac{1}{8}$ in. for aluminum tubing, or $\frac{1}{16}$ in. for stainless steel tubing.

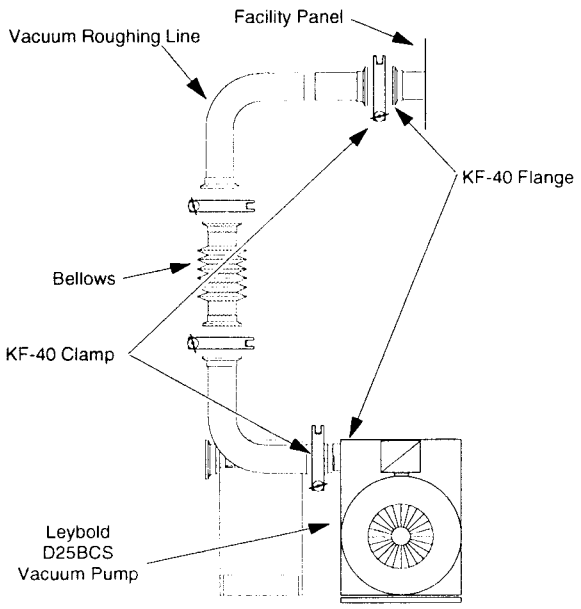


Figure 4-11. Vacuum Forelines

The Customer is responsible for fabricating the foreline, and for providing all required elbows, centering rings, and connecting clamps. It is recommended that all fittings be the same size and type to accommodate any re-orientation of the lines and elbows that may be desirable during installation.

4.7.1 Reactor Forline

Proper installation of all components is illustrated diagrammatically in Figure 4-12. The bellows section must be installed at the pump end of the foreline in order to isolate the reactor chamber from mechanical vibrations.