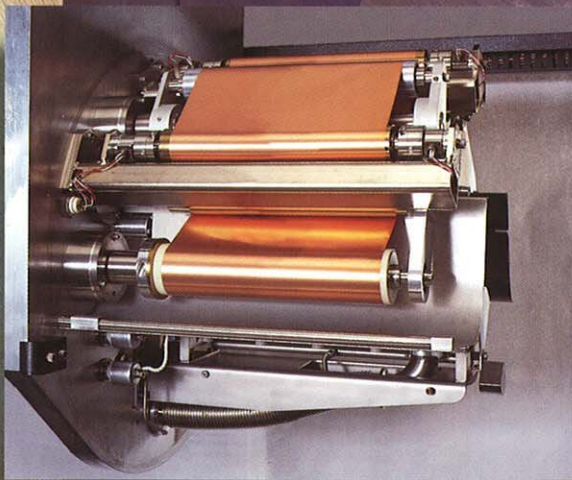


CHA INDUSTRIES MARK 50 WEB/ROLL COATER



CHA's Web/Roll Systems for the Converting Industry are individually designed to meet each customer's specific requirements. The system presented in this brochure allows the user to develop a process using state-of-the-art components and then go into production.

CHA's multi-process High Vacuum Web/Roll Coating Systems are designed to coat mylar, foil, and other thin plastic or metallic materials stored in continuous roll form. Systems are available with a wide range of options covering the spectrum from full computer control to operator control and from production runs to small R & D quantities.

CHA field-proven High Vacuum Deposition Systems have set world-wide standards in semiconductor, magnetic media, and optical coating applications. CHA Systems are economical, feature fast loading and unloading, offer broad process flexibility, and are equally productive in both sputtering and evaporation processing. *The basic Mark 50 System, an industry standard, is the foundation for this CHA Web/Roll Coater.* Simplicity in design, ease of operation, and unmatched reliability make it an excellent choice for a wide range of coating and other process applications.

Each CHA Web/Roll Coating System is individually configured to meet specific customer requirements.

PROCESS FLEXIBILITY

Typical process Stations within the high vacuum chamber might include a Sputtering Cathode, Electron Beam Gun, Thermal Source, Substrate Heater Array, Linear Ion Beam Gun, and a Plasma Process Bar for both reactive and non reactive glow discharge processes. Gas flow manifolds with pressure and flow controls are provided. A range of shields and

shutters are provided to ensure optimized processing and ease of maintenance.

Any of the system's deposition sources—Sputtering Cathode, EB-Gun, or Thermal Source—can be used *simultaneously* with the Linear Ion Beam Gun and Plasma Process Bar. Plasma pressure zones confine and isolate the ion beam from the Sputtering Cathode and Plasma Process Bar.

A *Linear Magnetron Cathode* with a 5 inch x 20 inch target is used for sputter deposition. A DC sputtering power supply is used for sputtering metallic targets. Alternately, an RF power supply with auto matching may be used for sputtering nonmetallic (and metallic) targets. Adjustable cathode to substrate spacing allows for *ion beam aided sputter deposition*. Reactive gases enable reactive sputtering of oxides, nitrides, and other compounds with closed loop pressure and flow control. Plasma total pressure and individual gas flow rates are displayed. The RGA monitor screen displays the partial pressures of the process gases. A shutter is provided to shield the sputter target during some process operations.

An *Electron Beam Gun* and a Thermal Source are used to deposit metals or dielectrics by evaporation or sublimation. The EB Gun's crucible has four 40cc pockets. The crucible is interchangeable with other capacities. The Linear Ion Beam Gun can be used with these sources for *ion beam aided deposition (IBAD)* and *ion beam etch (IBE)*. The sources can be provided with wire feeders for source material replenishment.

The *Thermal Source Holder* has water cooled feedthroughs, and allows for both expansion and contraction

of boats without stress breakage common for many designs. The clamping assembly is designed to accept most standard designs.

A *Deposition Sensor* and programmable Deposition Controller are provided. The sensor shutter and protective shielding assembly are mounted on the front door for quick and easy operator access. The Deposition Sensor mounting position allows it to monitor all deposition sources.

A *Substrate Heater Array* and Heater Power Supply for *high pressure operation* allows heater operation with any or all Process Stations operating. The heater may be used for substrate *out gassing* and cleaning to improve thin film adhesion. Film growth and specularities are also affected by substrate temperature.

A *Linear Ion Beam Gun* with a Plasma Bridge Neutralizer provides a rectangular 6cm x 40cm uniform



Front view of Web/Roll Coater showing swing-down access door and Web/Roll Fixture in process chamber. Shown with fixed operator console (right) and movable operator console (left).

CHA INDUSTRIES MARK 50 WEB/ROLL COATER

Rear view of Web/Roll Coater showing open process chamber and Web/Roll Fixture suspended from overhead trolley. The fixture is loaded and unloaded outside of the process chamber. Auxiliary boom mounted touch screen control panel for digital drive is shown in the foreground.

neutral beam of accelerated argon ions for substrate and deposition film modification. IBE is used to remove water vapor, oxides, and other contaminants from the substrate before depositions. IBAD is used to change film structure as it is being deposited, providing denser hydrophobic films. The adjustable ion beam mount allows the ion beam to impinge the substrate at different locations and angles. A shutter is provided to protect the Linear Ion Beam Gun when it is not being used during specific process sequences.

The Plasma Process Bar with a plasma containment chamber may be used for substrate modification (cleaning, etching, polymerization, texturing, etc.) to improve thin film adhesion. Deposited films may also be enhanced or modified by the Plasma Process Bar. This process tool provides a uniform plasma zone adjacent to the substrate. The pressure sensor is ported directly into the plasma zone with pressure process displayed digitally.

PROCESS STATIONS AND POWER SUPPLIES

Process Station components and Power Supply output ratings supplied with this system are shown below.

Process Station	Output	Power Supply	Output
Sputter Cathode	20KW	MDX-10	10KW
Electron Beam Gun	8KW	SR10-111	10KW
Thermal Source Holder	10KW	DPS-6000	6KW
Heater Array	4KW	HPS12-HP	12KW
Linear Ion Beam Gun	1500V@ 200 MA	MPS-5001	2000V@ 300MA
Plasma Process Bar	2KW	HV8000	2000V@ 200MA

PROCESS CONTROL SYSTEM

The entire air-to-air deposition process can be automatically controlled by an optional CHA Auto Tech Controller or by CHA's Siemens-based PLC/PC automation. The control systems permit one-button, fully automatic cycling of the system as well as providing multi-function, semi-automatic control for process development and maintenance-type functions. Separate process control and source control modules are mounted in electronic rack assemblies located in proximity to the deposition chamber. This allows process adjustments to be made *as the process is observed*.

The PLC/PC based control systems automatically control each step in the air-to-air process as well as providing a real-time interactive flat panel display of system and process status. DDE (Dynamic Data Exchange) is

utilized between the process controller and the flat panel display.

Visual and audio "pop up" screens keep the operator aware of system or process faults and include displays of suggested corrective action.

The PC-based computer employs the very popular Windows®, Wonder Ware/In Touch®, and Wedge® software, making operation of these systems extremely user friendly.

A bar code scanner for data entry and tracking or data logging is available. Stored process data is easily called up and displayed in a spread sheet format. Programming data is entered from a disk, slide out keyboard, mouse, or screen function keys. Operation and programming

access levels are controlled by security codes.

DIGITAL WEB/ROLL DRIVE CONTROL SYSTEM

The Fixture drive system is computer controlled and operates independently of the process control system. The operator interface with this system is via a touch screen.

Control of the digital drive system for loading, run preparation, and unloading is controlled from either the front or rear touch screen control panels.

WEB/ROLL FIXTURE

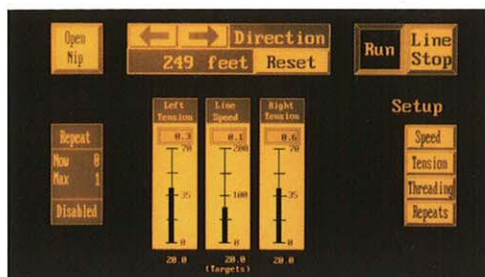
The Fixture is mounted on the rear door of the process chamber. True trammed vacuum compatible roll components are rigidly supported at both ends for precision alignment and stability. These feed the substrate material and control its temperature as it passes the various Process Stations.

Drum temperature is controlled by a water chiller which controls heat transfer between the drum and the substrate material.

A photo electric sensed edge guide system prevents "wander" and "telescoping" of substrate material. Idler rolls allow for "over winding" and "under winding" of the material on the substrate cores.

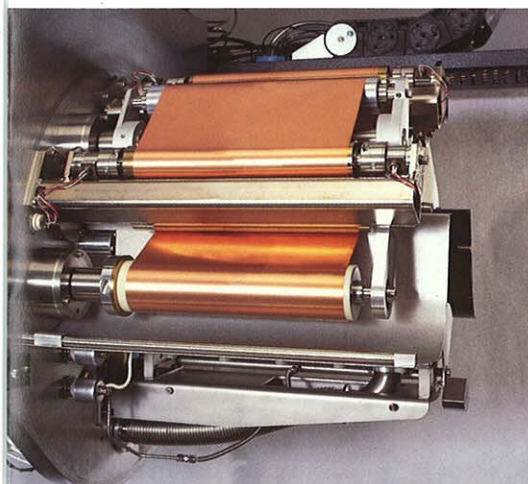


Computer screens provide a real-time, interactive display of the Web/Roll System.



The nip roll prevents substrate material slippage as it rides around the *temperature controlled* Processing Drum. Two tension rolls with load cells, using advanced strain gauge technology, control two tension zones at each winder and unwinder roll drive shaft. The load cells output is sensed by the computer and controls web tension by controlling the winder and unwinder roll speed and torque. A quarter turn of the core chuck head attaches the substrate core to the winder or unwinder drive shaft.

On the atmosphere side of the rear door, the Web/Roll Fixture uses a unique, dual speed three motor drive system. Brushless Servo Motors have integrally mounted digital encoders and speed reducers. Web tension is measured by transducers using a dual calibration range amplifier. The central Processing Drum drive provides primary speed control for the



Web/Roll Fixture, which mounts on the rear door of the process chamber, is shown with a roll of copper foil installed. Sputtering cathode and shielding are mounted on the door immediately below the fixture.

process. This drive system allows the Web/Roll fixture to accept almost any substrate material which is stored on rolls and process it roll to roll. The systems' 2,000-to-1 turndown ratio with 0.1% of set point speed control allows for extreme flexibility in processing. Foils from 9 microns to 2 thousandths of an inch have been run through the full speed range wrinkle free. Non metallic materials such as mylar, polyester, kapton, and other plastics have also been run and processed through the full speed range wrinkle free. With the fixture illustrated, the system can accommodate rolls up to 14 inches wide with a 2,500 foot average web length.

The fixture is easily inserted and removed from the process chamber with the aid of a fully-supportive, double-beam overhead trolley for easy roll loading. Overhead design allows for an obstruction free floor, increases productivity by reducing roll handling time and service, and plant safety is improved by eliminating common obstructions from the immediate work area.

PROCESS CHAMBER

The Web/Roll Coater's 32 inch by 36 inch water cooled stainless steel process chamber with deposition source well is based upon the world renowned CHA Mark 50 system. The chamber incorporates a unique, patented slide-down door on the front of the chamber to minimize floor space requirements while providing ease of access. A rear opening rolling door permits insertion and removal of the Web/Roll Fixture. The two doors permit total access to sources, shutters, shielding, and other fixturing components so they may be easily serviced. Front and side view ports allow the operator to observe the process and the Web/Roll components.

CHAMBER CRYO COIL

The Cryo Coil provides 50,000 L/Sec. pumping speed for water vapor and other condensable gases in the Process Chamber.

General Drive Specifications

Line Speed	
(High Speed Range)	1 to 200 FPM
(Low Speed Range)	0.1 to 20 FPM
Speed Accuracy	±0.1% of set point for either range
Acceleration	20 Seconds to max. machine speed
Tension	
(High Range)	7 to 70 Pounds total web tension
(Low Range)	3.5 to 25 Pounds total web tension
Tension Accuracy	
(High Range)	±5% of set point
(Low Range)	±10% of set point
Tension Taper Range	Adjustable 0-50%
Core Diameter	3 Inch Inside Diameter
Full Roll Diameter	7 Inch max. Outside Diameter
Material Thickness	Unknown
Web Width	14 Inches
Web Process Width	13 Inches
Finished Web Width	12+ Inches

PUMPING STACK

The Web/Roll Coater utilizes CHA's expanded 16 inch patented Pumping Stack. The Pumping Stack combines four components which are mounted to maximize conductance, which maximizes pumping speed. This pumping stack has four times the inlet port speed of individually mounted components and uses 75% less space with 1/3 the number of major vacuum to air seals. The simple elegance of CHA's 16 inch stainless steel High-Vacuum valve has the least moving parts of any valve in the industry and its vertical sealing plane eliminates high vacuum leaks caused by falling particles—a common problem with horizontal gate and other types of poppet valves. (Pumping options include diffusion, cryo, or turbo pumps.)

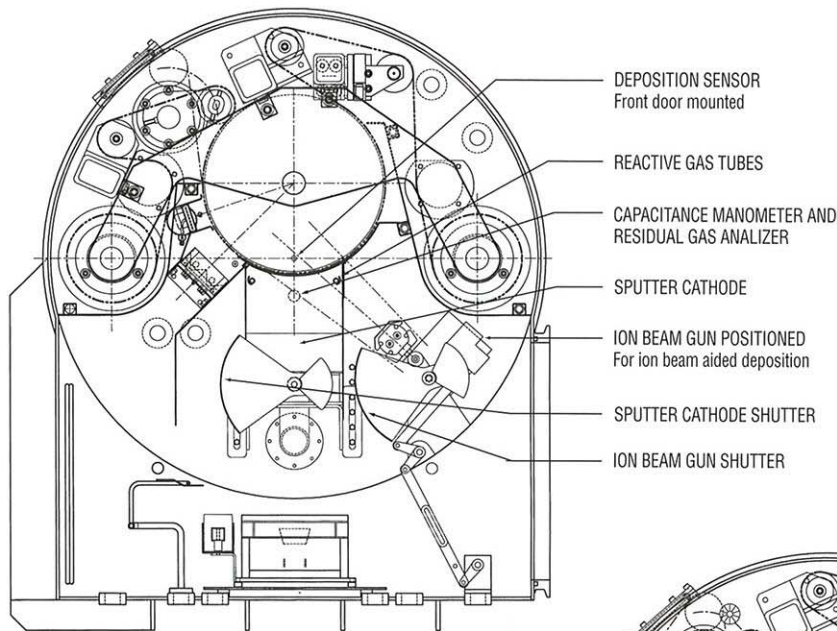
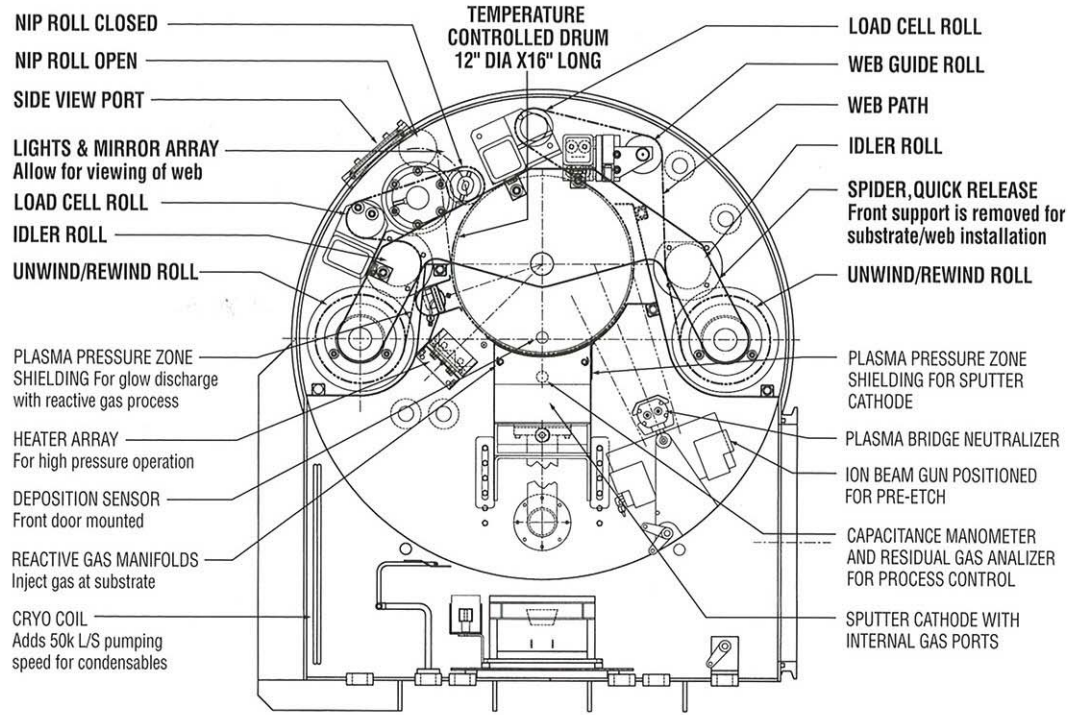
A 50 cfm Mechanical Pump is provided for roughing the Process Chamber and backing the High Vacuum Pumping Stack components. Mechanical Pumps with higher cfm ratings are available.

Pumps, pump fluids, and filters are provided for corrosive gases if required by process parameters.

WEB/ROLL COATER SYSTEM CHAMBER CONFIGURATIONS

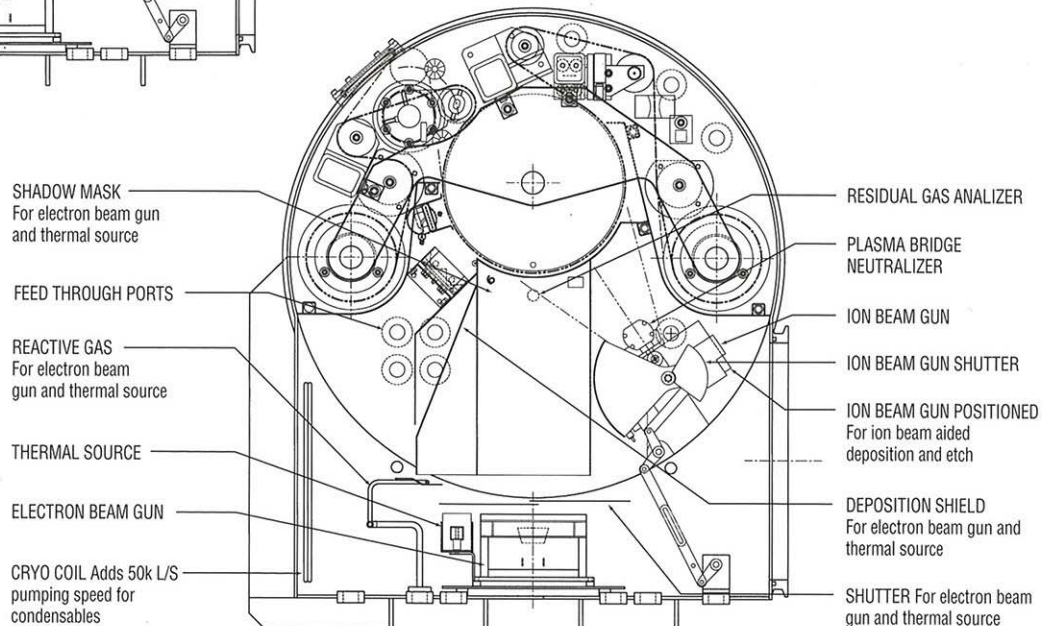
High vacuum chamber configured for sputter deposition with 3 plasma pressure zones. Pressure zones allow for simultaneous operation of Sputter Cathode with Plasma Process Bar and Ion Beam Gun. Substrate Heater Array available for process. Process Stations may be run with or without reactive gases.

Note: Features in bold are common to all.



High vacuum chamber configured for operation of Sputter Cathode with Ion Beam Gun positioned for ion beam aided deposition. Heater Array and Plasma Process Bar available. Sputter Cathode and Plasma Process Bar pressure zones. Process stations may be run with or without reactive gases.

High vacuum chamber configured for Electron Beam Gun and Thermal Source deposition. Linear Ion Beam Gun positioned for ion beam etch and ion beam aided deposition. Heater Array and Plasma Process Bar available. Process stations may be run with or without reactive gases.



HIGH PRODUCT QUALITY

The CHA Web/Roll Coater yields consistently high film uniformity from run to run. A computer-directed web drive system and the consistent operation of Process Stations allow for excellent run to run process cycles.

OPTIONAL ACCESSORIES AND EQUIPMENT

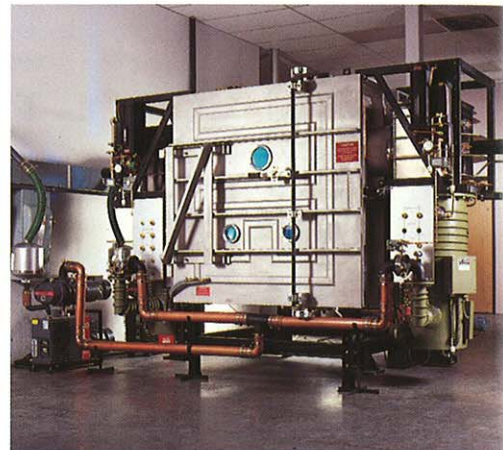
CHA can provide a complete range of deposition sources including Electron Beam Guns, Ion Beam Guns, Thermal Sources, and Sputtering Cathodes together with associated Heater Arrays, Shields, and Shutters. Systems can be furnished with Cryo Coil Assembly, Molecular Sieve Trap, and Liquid Nitrogen Level Control as well as hardware options such as Feedthroughs, Gauges, and Flow Controls.



CLEAN ROOM INSTALLATION

The Web/Roll Coating System is designed to be either free standing or for through the wall mounting to meet clean room requirements and conserve valuable clean room space. Both front and/or back door of the high vacuum chamber can be placed inside a clean room. This allows for loading and unloading of substrate materials from the rear as well as access to sources and fixturing from the front and rear. The pumping stack and other associated equipment are easily accessible outside of the clean room for maintenance.

CHA's Production Box Coater can accommodate Web/Roll fixtures for high volume production of roll materials. Unit can be operated in an evaporation or sputtering mode and is available with single or dual, 16-inch pumping stacks.



PRODUCTION BOX COATER

CHA's Production Box Coaters also accept Web/Roll Fixtures for high volume precision coating of a wide variety of roll materials. The unit can be furnished with single or dual pumping stacks. The typical 5' x 5' x 5' Box Chamber is provided with multiple access and viewing ports. The Box Chamber also incorporates full width doors on both ends for loading and unloading substrate materials. CHA also offers various sized high vacuum deposition chambers in round, rectangular, and square shapes to accommodate a wide range of process requirements.

CHA INDUSTRIES

CHA Industries has been serving domestic and international industries for over 40 years. Our dedication to quality, reinforced by comprehensive testing at all stages in the manufacturing cycle, ensures that all product performance standards are consistently met.

APPLICATION ENGINEERING

CHA's expert staff of application engineering specialists assists customers in the selection of the right equipment for their needs. Customers can draw freely on CHA's many years of experience in working with a wide variety of installations around the world.

OTHER CHA PRODUCTS

- High Vacuum Deposition Systems of Various Types
- Box Coaters
- Deposition Fixturing
- Deposition Sources
- Heaters
- Power Supplies
- Other Accessories



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