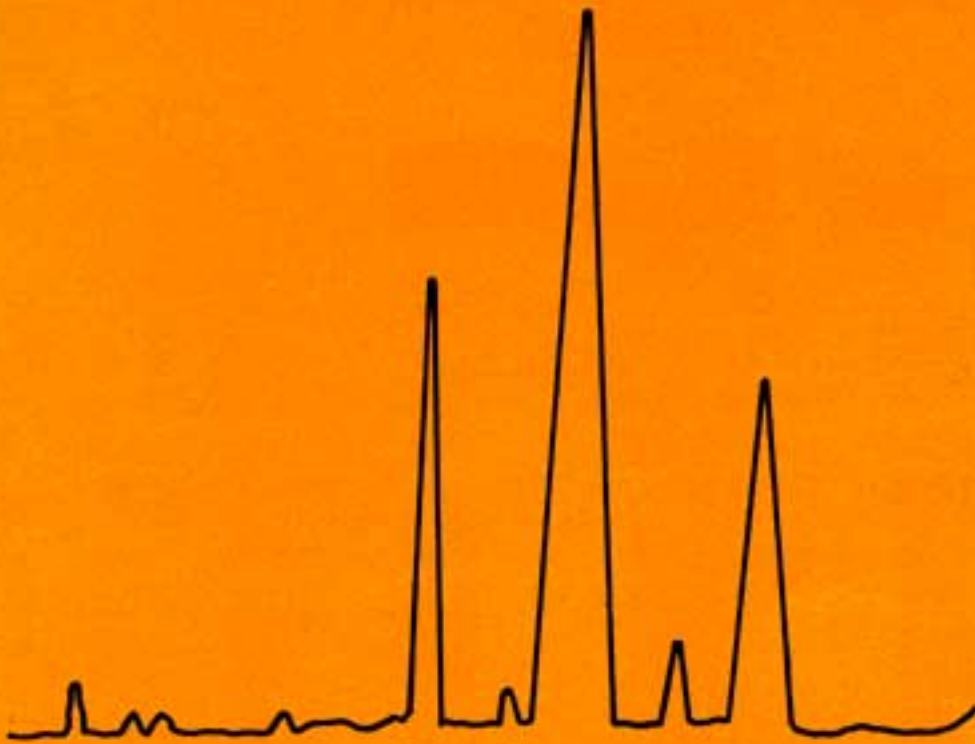


4000

SERIES

Translating the high energy implant capabilities of a research unit
into a production system.



Accelerators Inc.

®

The 400 Series Systems

The 400 Series Systems are the first of their kind to successfully translate the high energy implant capabilities of a research system into the reliability required for commercial wafer fabrication. The 400 Series indeed brings reliable high energy implantation to the production floor.

The 400 Series can be described in three words . . . flexible, maintainable, reliable.

FLEXIBLE

The 400 Series Systems are capable of the widest range of implant energies in the industry, from 20 to 400keV. The operator of the 400 Series can utilize it in the production of devices that require both low and very high ener-

gy implants. The 400 is also excellent for all research applications; especially where the energy requirements range from 40 to 800keV (using doubly-charged species).

The flexibility of the system is further enhanced by the variety of ion sources and end stations available. The optional hot filament ion source allows the user to implant virtually any element into a variety of substrates.

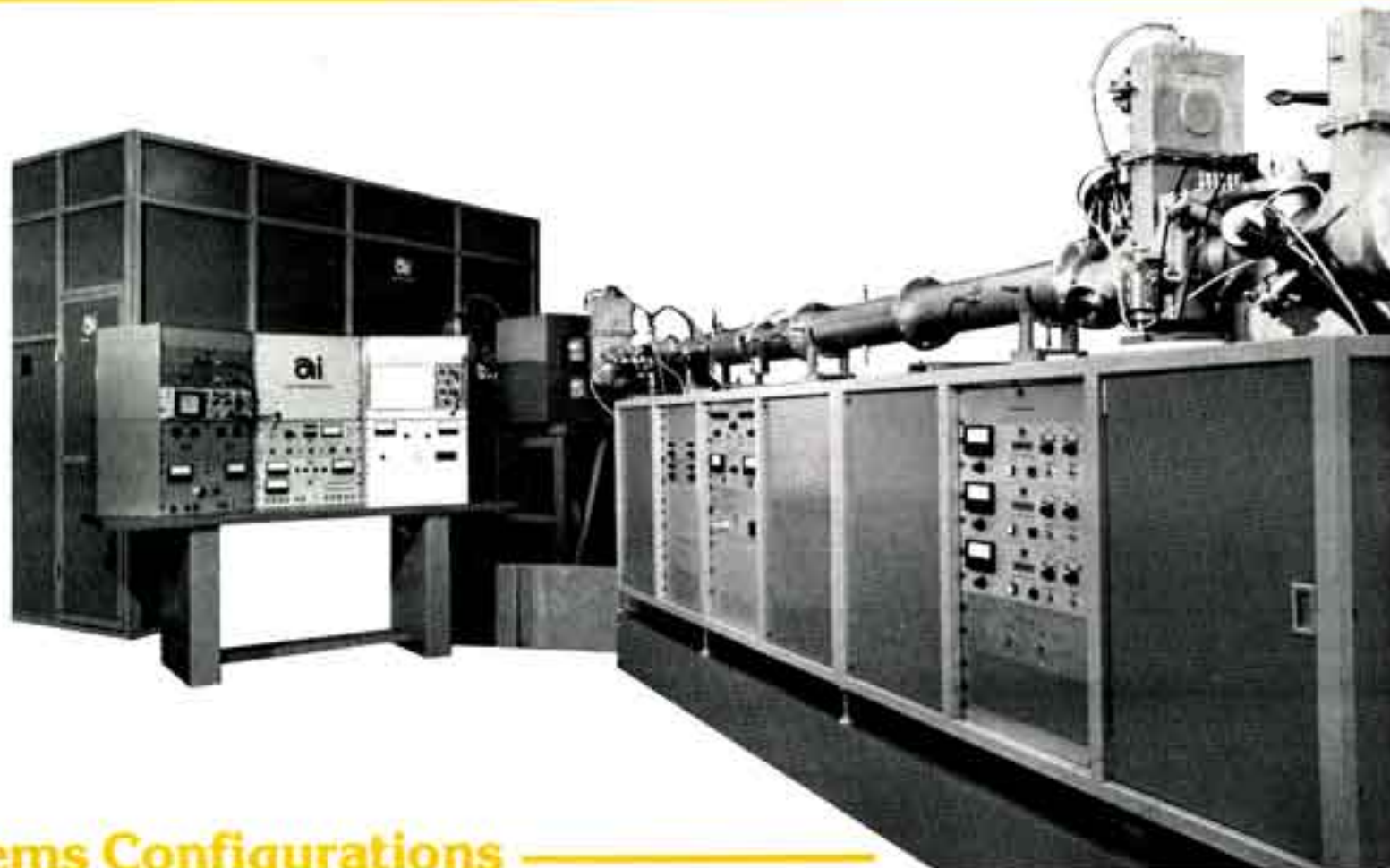
MAINTAINABLE

The 400 Series Systems are built with maintenance as a major consideration. Easy access is provided to *all* parts of the system. Maintenance can be performed in workable, uncramped quarters.

This easy access results in preventive maintenance being performed with very little down time.

RELIABLE

The 400 Series Systems have developed the enviable reputation in the marketplace as being extremely reliable. Great care was taken in the design of the 400 Series to reduce all causes of unscheduled down time. The result is a system that produces while the competition's is being serviced. The 400 features simplified controls to further its ease of operation. Start-up can be performed by semi-skilled technicians, and the 400 can be operated by unskilled personnel. The 400 Systems are fully interlocked for operator as well as component protection.



Systems Configurations

There are four basic system configurations for maximum flexibility.

400WE The 400WE incorporates the Ai Wafermatic® end station and is capable of processing up to 330 wafers per hour for high production requirements.

400HP This system features a carousel type end station in which the wafers are rotated at 100 RPM.

The beam is scanned along the Y-axis, which in combination with the carousel rotation, provides the Hybrid Scan. This configuration is primarily used in production.

400MP The 400MP is also a carousel system with all of the capabilities of the 400HP. In addition, it incorporates X-Y scan so that one or more wafers may be individually implanted with a different dose and/or energy.

This configuration is used when both production and R & D capabilities are required.

400R The 400R utilizes a research end station that accommodates any of three wafer holders described in the research end station section. This system uses X-Y scan and is predominantly used for research applications.

ION SOURCES

To achieve the flexibility required by the industry, the 400 Series is available with three different ion sources and target chambers.

COLD CATHODE ION SOURCE

The Ai Cold Cathode Ion Source, standard on all 400 series systems, is designed for use in production-type implanters where dopants such as B, P, and As are required. This source provides extremely stable beam currents and has an average operational lifetime in excess of 100 hours. Maintenance requirements are minimum. A simple replacement of the exit canal is all that is required to refurbish the unit. In the standard configuration, three different gas source lines (typically, B, P, and As) are plumbed into a common plenum which is attached to the source. Quick and easy changeover from one dopant to another is readily accomplished. All sources are interchangeable with no realignment required.



HOT FILAMENT ION SOURCE (Optional)

The Hot Filament Source is an extremely versatile unit of the electron impact type and is specially designed for use in research and production implantation systems. It can be used to provide ions from either a gaseous or solid source feed. Most elements in the periodic table have been run on this source and the resulting spectra have been published. An alternate version is available which incorporates a remotely controlled oven.



RF ION SOURCE (Optional)

The Radio Frequency Source is a highly flexible unit which provides a beam that is easily focused to a small diameter. It is particularly efficient for use with H, He, N, and Ar and is the source normally used for proton enhanced diffusion studies. Since it is capable of generating a large variety of dopants, researchers have found it extremely valuable.



TARGET CHAMBERS

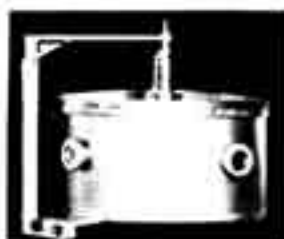
WAFERMATIC® END STATION

The Ai Wafermatic provides the user with the highest production through-put where the wafers are processed through the system without operator handling. The Wafermatic® accepts either III, IMS, or Fluoroware wafer cartridges and automatically unloads, transfers, implants, and reloads 2" to 4" diameter wafers. Operation is controlled from a single push-button for minimum operator intervention. The system is controlled by "Demand Logic" which assures trouble-free operation. Wafer through-put is in excess of 300 wafers per hour depending on dose. The implant angle is continuously variable from 0 to 10°. Both this and wafer size settings are adjustable with a single external setting. The Wafermatic® is a proven production machine that requires essentially zero maintenance.



CAROUSEL END STATION

This chamber carries two wafer carousels that can hold 20, 3" or 4" diameter wafers, or 30, 2" diameter wafers per carousel, for a total of 40, 3" or 4" wafers, or 60, 2" wafers. Carousels are normally set up for a 0° offset, but may be ordered with any special offset up to 10°.



RESEARCH END STATION

The research end station with its cylindrical shape will accept any one of the following three wafer holders:

- Standard target holder—contains six positions for up to 2" diameter wafers with offset angle of either 0° or 7°.
- Optional 4-position holder available for up to 3" diameter wafers with an offset angle continuously variable from 0 to 10°.
- The optional heated and cooled wafer holder—accommodates a single wafer up to 2" diameter with capability of maintaining the wafer at any temperature between -100°C. and +600°C. Offset angle is variable from 0 to 7°.

All three wafer holders are interchangeable.

Additionally, these inserts can be accommodated in the carousel end station lid to provide research capabilities in a production system.



OPTIONS

The 400 Series can be custom-tailored to fulfill a variety of production and research needs by selection from the wide variety of options and accessories available.

ANALYZING MAGNETS

The standard magnet provided on the 400 series is a homogeneous field doubly focusing unit with a mass energy product (MXE) of 38 at the 30° port and 152 at the 15° port. The magnet is water cooled and can analyze up to mass 95 at 400keV. Also available is the following:

MXE = 84 magnet capable of analyzing up to mass 210 at 400keV

HIGH SPEED PUMPING MODULE

(for carousel target chambers.)

A high speed diffusion pump and larger mechanical pump is provided for extremely rapid cycling of the target chamber.

ACCESSORIES

CAROUSELS

Extra carousels are available for wafer sizes from 2" through 4" diameter. These carousels can be fabricated to accommodate any special wafer sizes and any offset angles from 0 to 10°. Additionally, wafer clips can be mounted on the carousel to hold partial or broken wafers, if desired.



PARALLEL SCANNING SYSTEM

In the standard system, the ion beam incidence angle is kept to a very low degree. For some research applications it has been found desirable to reduce this angle to essentially zero through the use of additional parallel scanning plates which are offered as an accessory.

GAUSSMETER SYSTEM

A digital gauss meter can be provided to read the magnetic field strength directly in kilogauss. The standard magnet control is provided with a readout of magnet voltage and current.

RACK-MOUNTED ELECTRONICS

An optional 19" electronics rack is available for controls. A sit-down console is standard with the 400 Series.



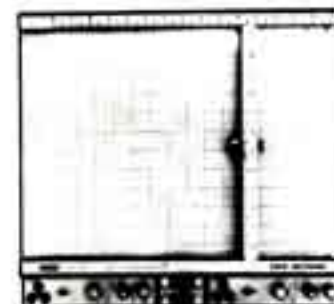
REAL TIME BEAM MONITORING SYSTEM

An oscilloscope-type of beam monitoring system is available to permit viewing of the X-axis, Y-axis, or complete beam profile during implant.



X-Y RECORDER

A console mounted X-Y recorder is available for making a graphic recording of the beam spectra and to aid in identifying various species.



BEAM VIEWER

A solenoid operated beam viewer can be positioned at virtually any point on the beam line, as required.

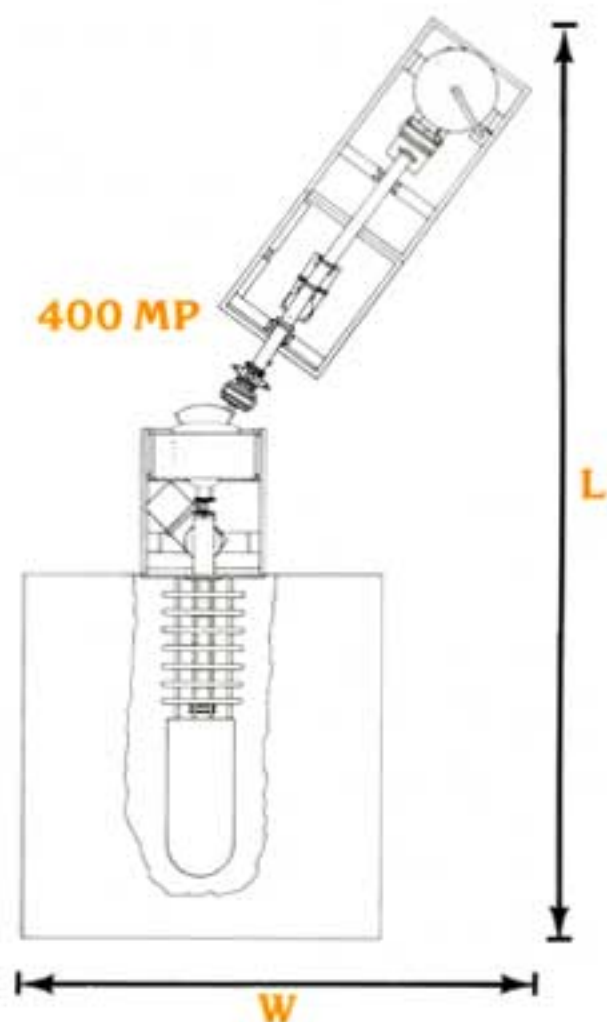
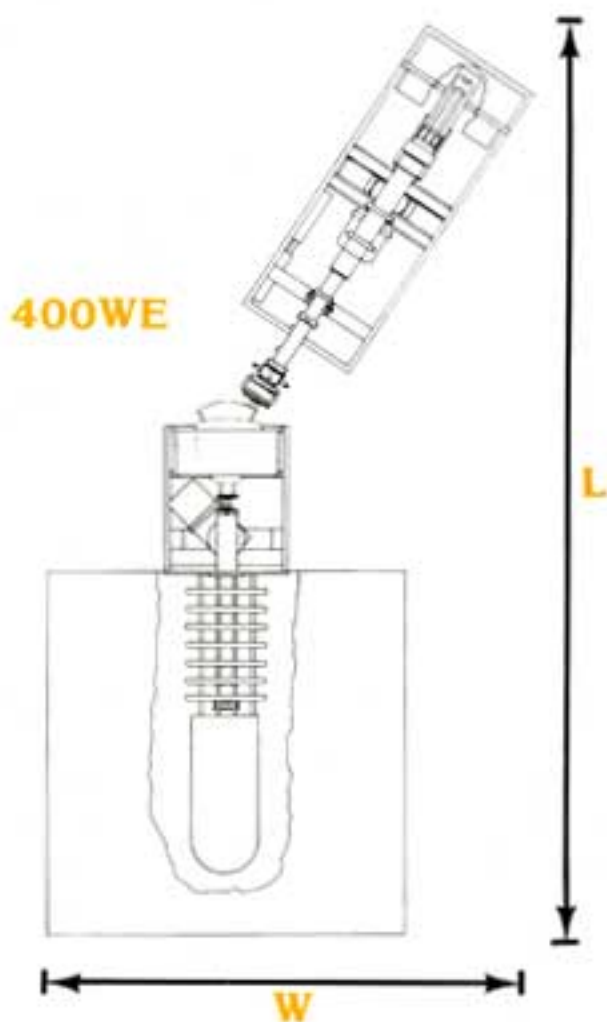


BEAM LINE ENCLOSURE

Sheet metal enclosures can be provided to cover beam line components located in frame No. 1 and No. 2. These enclosures are removable to allow easy servicing of the equipment.

SPECIFICATIONS

MODEL	400HP				400MP				400R				400WE				
Beam Energy	20 to 400 keV																
		40keV	150keV	300keV	400keV	40keV	150keV	300keV	400keV	40keV	150keV	300keV	400keV	40keV	150keV	300keV	400keV
Scanned	B	12	42	90	78	10	35	75	65	10	35	75	65	10	35	75	65
Current	P	6	24	48	42	5	20	40	35	5	20	40	35	5	20	40	35
Microamp	As	6	18	36	30	5	15	30	25	5	15	30	25	5	15	30	25
Process Station		Carousel				Carousel				Research				Wafermatic®			
Ion Source	Cold Cathode Standard — Optional RF and Hot Filament Available																
Dose Uniformity Over One Wafer	2" Diameter — $\sigma \leq 0.75\%$ 3" Diameter — $\sigma \leq 1.0\%$ 4" Diameter — $\sigma \leq 1.0\%$																
Repeatability	$\sigma \leq 1.0\%$ at currents above 50na																
Scanner Freq.	Y axis = 1000 Hz to 4000 Hz				Y axis = 1000 Hz to 4000 Hz X axis = 100 Hz to 1000 Hz												
Vacuum Systems	3 Oil Diffusion				3 Oil Diffusion				3 Oil Diffusion				3 Oil Diffusion				
Typical Dimensions		W	L	H	W	L	H	W	L	H	W	L	H	W	L	H	
Inches		155	325	110	155	325	110	155	325	110	155	325	110	155	325	110	
Centimeters		394	826	279	394	826	279	394	826	279	394	826	279	394	826	279	
Typical Weight:		15,700				15,900				15,700				15,950			
Pounds		7,121				7,212				7,121				7,235			
Kilograms																	
Utilities:	208/220 volts, three phase, 4 wire, 50 amps/phase maximum, 50 or 60 Hz.																
Electrical	208/220 volts, three phase, 4 wire, 50 amps/phase maximum, 50 or 60 Hz.																
Water	5 gpm with a minimum input/outlet pressure differential of 40 psi and a maximum inlet temperature of 75°F.																
Air	60 psi at 10 cfm maximum																
GN ₂	15 psi for backfill																
LN ₂	10 liters/hour maximum																
Vent	Exhaust in lead room rated at 600 cfm (285 l/sec.)																



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