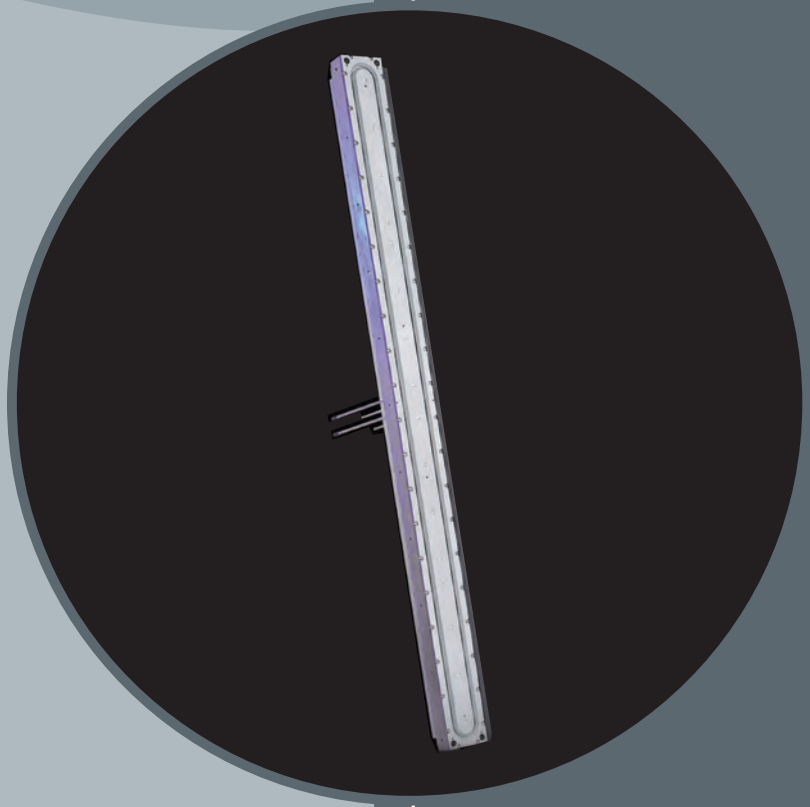


Classic Gridless Ion Beam Sources

Linear ion beam sources

Industrial, low-maintenance ion-beam family of products

GPi

GENERAL PLASMA INC.™

Industrial, low-maintenance design

No filaments or hollow cathodes

No grids or ion optics

Reactive gas compatible

One field-proven power supply

Easily retrofittable

General Plasma (GPI)—the innovation leader in sources for vacuum thin film coatings offers a line of Classic Gridless Ion Beam Sources. These reliable, industry proven ion sources operate today in many thin film applications around the world. Proven for over 10 years, they are ideal for etching, pre-cleaning, and direct-deposition processes. Applications include solar energy, data storage, flat panel display, glass coating, and industrial coating manufacturing.

benefits

reliable, field proven design

Classic Gridless Ion Beam Sources have been operating in numerous production and research facilities around the world for many years.

no filaments or hollow cathodes

By eliminating the hot filament cathodes and thermionic emitters used in other designs, General Plasma's Classic Gridless Ion Beam Sources run cooler than other sources. The benefits of our simplified design include reduced maintenance, increased reliability, and decreased cost-of-ownership over the life of your system.

no grids or ion optics

Gridless ion-source technology avoids the expense, maintenance, and alignment problems that come with gridded sources. General Plasma's Classic Gridless Ion Beam Sources avoid the tight-fitting alignment pins, very small screws, and loose alumina beads that come with gridded ion sources.

reactive gas compatible

All units are compatible with a wide variety of gases (including 100% O_2), allowing materials to be processed in a reactive-gas environment.

industrial, low maintenance design

The simplified GPI design eliminates several vulnerable parts and reduces the consumable material used in other ion sources. This increases reliability, source life, and time between maintenance.

easily retrofittable

General Plasma's flexible mounting options bring the benefits of GPI ion-source technology to both new and retrofit systems. Mounting options include:

- *Flange mount — mounts directly to the chamber wall through existing ports on your system*
- *Remote mount — mounts in any orientation in your chamber using flexible line to connect to existing feedthroughs*

GPI's applications expertise

General Plasma's dedicated applications group can help your process engineers with critical — yet delicate — characterizations of process parameters. With our applications group as your development partner, you can optimize existing process efficiency, increase quality, and develop new processes.

regulatory compliance

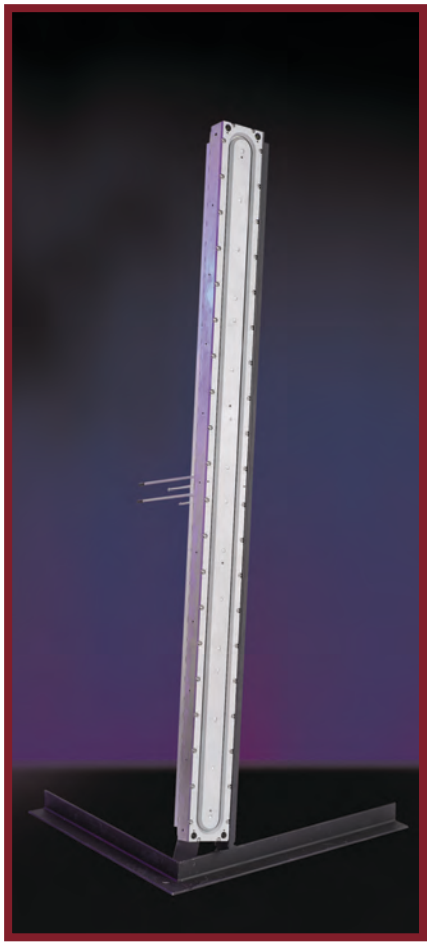
General Plasma's Classic Gridless Linear Ion Beam Sources have been designed and reviewed for compliance with EC Council directive 73/23EEG, SEMI S2-93, and industry safety standard EN500178.

manufacturing capabilities

Each GPI source is helium leak tested, operated, and characterized prior to shipping.

warranty

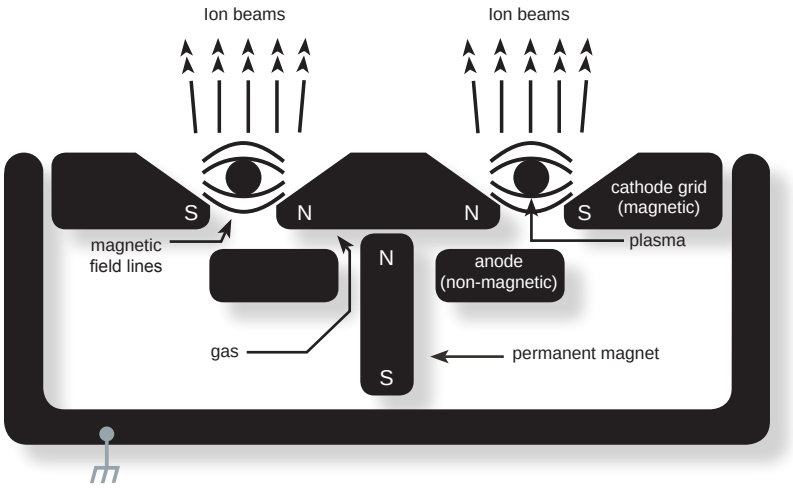
All ion sources carry our standard two-year limited warranty for parts and labor.



classic gridless linear ion beam source

theory of operation

Gas flows through the ion source between the anode and cathode. A positive voltage is applied to the anode. This voltage, combined with the high magnetic field between the tips of the internal and external cathodes, allow the plasma to start. Ions from the plasma are repelled by the anode electric field. This creates an ion beam.



classic gridless linear or single-cell ion beam source

applications

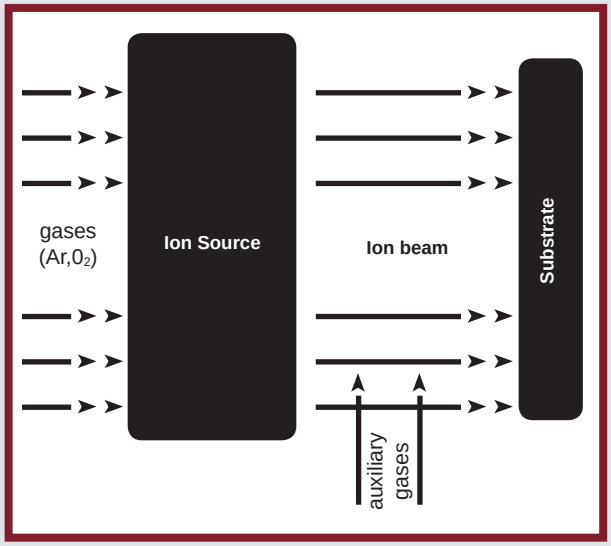
substrate pre- & post treatment

In situ clean with inert gases (e.g., Ar) and reactive gases (e.g., 0_2) as well as chemically assisted in situ etch

- *Contamination removal*
- *Altering surface-wetting properties*
- *Surface texturing*
- *In-line Ar or O_2 glass cleaning*
- *In-line web cleaning*
- *Flat-panel displays*

benefits

- *Improves film adhesion*
- *Reduces film contamination by removing hydrocarbons and other residuals*
- *Non-selective — works with both metallic and dielectric substrates*
- *Higher throughput*
- *Reduces system downtime*



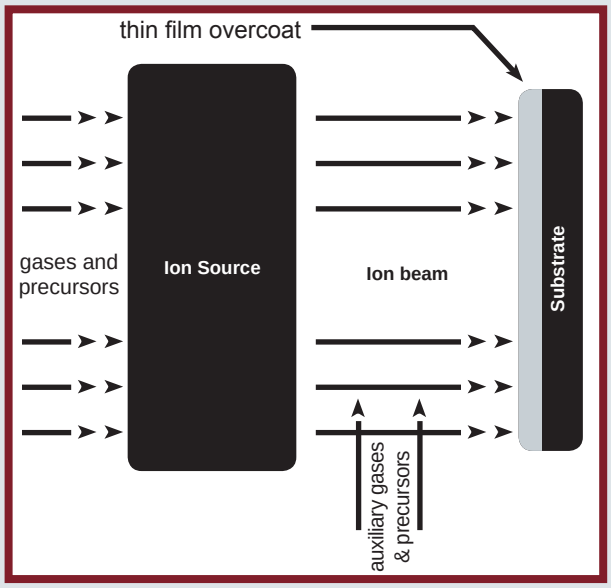
direct deposition

Direct deposition of films and overcoats using precursors (e.g., hydrocarbons and metallic-organic compounds)

- *DLC overcoats*
- *Optical coatings*
- *Thin films*
- *Barrier coatings*

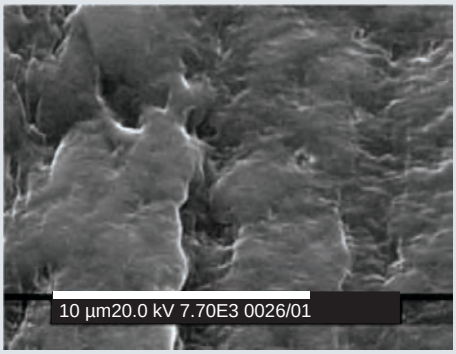
benefits

- *Increases film density, producing continuous, pinhole-free DLC coats < 50 Å*
- *Produces non-porous films*
- *Magnetic media*
- *Read/write heads*
- *Increases deposition rates*
- *Eliminates the need for sputter targets*
- *Permits new materials and process development*

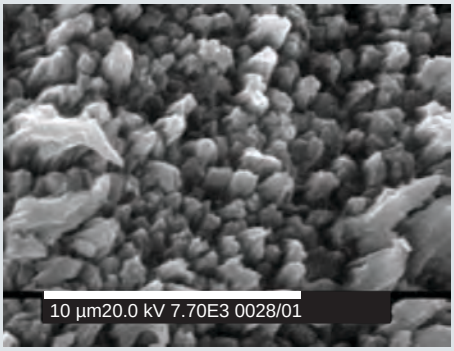


example

Surface treatment - these SEM images show the surface of PTFE substrates before and after ion treatment with an oxygen and argon mixture. Note the increased roughness of the treated sample (below right).



Untreated PTFE substrate at 7700x magnification



Ion beam treated PTFE substrate at 7700x magnification

operating specifications

General Capabilities	LIS 38 cm		LIS 65 cm		LIS 94 cm		LIS 120 cm	LIS 150 cm
	Diffused Beam	Collimated Beam	Diffused Beam	Collimated Beam	Diffused Beam	Collimated Beam	Collimated Beam	Collimated Beam
Discharge Voltage	220 V to 500 V	600 V to 3000 V	250 V to 500 V	600 V to 3000 V	250 V to 500 V	600 V to 3000 V	600 V to 3000 V	600 V to 3000 V
Beam Mean Energy	150 V to 250 V	300 V to 1500 V	150 V to 250 V	300 V to 1500 V	150 V to 250 V	300 V to 1500 V	300 V to 1500 V	300 V to 1500 V
Discharge Current	≤ 8 A	≤ 0.75 A	≤ 8 A	≤ 1 A	≤ 8 A	≤ 2 A	≤ 2 A	≤ 1.7 A
Max Power	2.25 kW		3 kW		4.5 kW		5 kW	6 kW
Ion Beam Current	≤ 25% of discharge current	≤ 90% of discharge current	≤ 25% of discharge current	≤ 90% of discharge current	≤ 25% of discharge current	≤ 90% of discharge current		
Operating Pressure	$\leq 10^{-2}$ Torr							
Gas Flow	20 sccm to 150 sccm		40 sccm to 180 sccm		50 sccm to 300 sccm		50 sccm to 150 sccm	50 sccm to 150 sccm

mean free path of collision

The collision of two atoms in a vacuum system can result in a transfer of energy between them. The same phenomenon may also occur when an ion in an ion beam collides with an atom from the background gas. This can cause the ion to lose energy, which may decrease the amount of ion energy that reaches the substrate.

The average distance an ion travels before a collision is called the mean free path of collision. This is derived from the equation $\lambda = {}^{1}/_{Q_n}$, where Q is the charge exchange cross-section and n is the density of atoms.

		Pressure			
		0.5 mTorr	1 mTorr	2.5 mTorr	5 mTorr
Gas Type	H_2	17.3 cm	8.6 cm	3.4 cm	1.7 cm
	He	26.2 cm	13.1 cm	5.3 cm	2.6 cm
	Ne	19.1 cm	9.5 cm	3.8 cm	1.9 cm
	N_2	8.9 cm	4.5 cm	1.8 cm	0.9 cm
	O_2	9.7 cm	4.8 cm	1.9 cm	1.0 cm
	Ar	9.7 cm	4.8 cm	1.9 cm	1.0 cm
	Kr	7.3 cm	3.7 cm	1.5 cm	0.7 cm
	Xe	5.4 cm	2.7 cm	1.1 cm	0.5 cm
	H_2O	10.2 cm	5.1 cm	2.0 cm	1.0 cm
	CO	9.0 cm	4.5 cm	1.8 cm	0.9 cm
	CO_2	6.0 cm	3.0 cm	1.2 cm	0.6 cm
	NH_3	6.4 cm	3.2 cm	1.3 cm	0.6 cm

* Beam current depends on the operating pressure because of the charge exchange process; operating pressure depends on pumping speed.

physical specifications

The Classic Gridless Ion Beam Source is offered by GPI linear ion source (LIS). The linear sources differ in geometry, scale, and application. The LIS is designed for drum and in-line systems.

	LIS 38 cm	LIS 65 cm	LIS 94 cm	LIS 120 cm	LIS 150 cm
Assembly Dimensions	7.7 cm x 10.2 cm x 38 cm 3.0" x 4.0" x 15.0"	7.7 cm x 10.2 cm x 67 cm 3.0" x 4.0" x 26.3"	7.7 cm x 10.2 cm x 94 cm 3.0" x 4.0" x 37.3"	7.7 cm x 10.2 cm x 120 cm 3.0" x 4.0" x 47.2"	7.7 cm x 10.2 cm x 150 cm 3.0" x 4.0" x 59.1"
Beam Uniformity	± 5% over 30 cm	± 5% over 57 cm	± 5% over 84 cm	+/-5% over 110cm	± 5% over 140 cm
Weight	16.8 kg (37 lb.)	25 kg (55 lb.)	30.4 kg (67 lb.)	42.6 kg (94 lb)	56.8 kg (125 lb.)
Mounting Options	Flange or internal (remote) to the vacuum chamber				
Magnetic Type	Permanent				

Pinnacle™ Power Supply	
Input Power	208 VAC, 3ø, 65 A; 400 VAC, 3ø, 25 A
Size	133.3 mm x 482.6 mm x 558.8 mm; 5.25" x 19" x 22"
Weight	27.2 kg (60 lb.)
Output Power	2 x 6 kW or 1 x 12 kW

water specifications

Resistivity	
Flange Mount Sources	> 10 kΩ (1 MΩ recommended)
Remote Mount Sources	> 1 MΩ

	LIS
Water Cooling	2 lpm (0.53 gpm)

All dimensions are approximate and subject to change

For inquiries, please contact:

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General Plasma is an innovation leader in vacuum thin film coating. GPI's patented and patent pending plasma inventions provide superior performance for applications such as solar energy, architectural glass, data storage and scientific research.
Contact GPI for your ion source and sputter magnetron solutions today!