

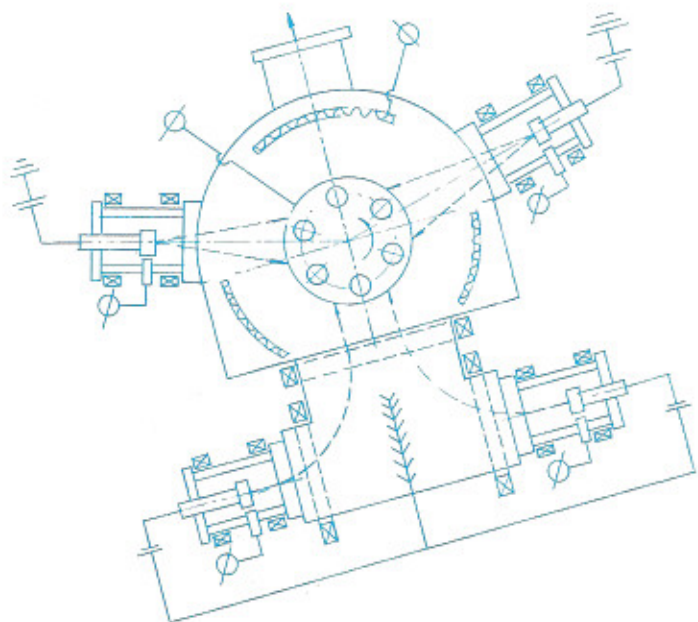


**UES, Inc.**

## ADVANCED SOURCES FOR CATHODIC ARC DEPOSITION EQUIPMENT

The cathodic arc sources from Arcomac Plasma Technologies represent a major advance in the technology of cathodic arc deposition. Conventional sources available in the market today are limited in size and capability in terms of plasma efficiency. When it comes to filtered arc sources, there is no other source on the market which can equal the performance of ARCOMAC™ Large Area Cathodic Arc Source (LACAS™) and Large Area Filtered Arc Source (LAFAS™).

For instance, one currently available filtered arc source typically provides an ion current of about 1A or less. The LAFAS™ source, on the other hand, provides an ion current of up to 4A. For a source with a window of 20 cm x 40 cm, this translates into an ion current density of 5 mA/cm<sup>2</sup>. The LACAS™ source can generate an ion current up to 8A, with an ion current density on the order of 9-10 mA/cm<sup>2</sup>. No other cathodic arc source, or for that matter, any other type of ion source, can claim such high ion current density.



What this extraordinary capability translates into is a highly productive deposition process. Typical deposition rate for TiN is on the order of 5 μm/hr using the *filtered*-arc mode. In the direct-arc mode, the deposition rate can be almost five times higher.

This unique arc source operates on the principle of vacuum arc plasma enhanced ionization of metallic and gaseous ions to provide a high plasma density. Extremely high ion currents are obtained with the metal ion species, with ionization efficiencies approaching nearly 100%. For the gaseous ions, the ionization efficiency has been measured as high as 30%.

Because of their robust construction, the ARCOMAC™ sources provide significantly longer service life and reliability. For instance, the filaments used in typical ion sources have a useful life time of only a few tens of hours in benign operating conditions. The vacuum arc source, by comparison, can last up to two orders of magnitude longer. Furthermore, the vacuum arc source can operate without problems in oxidizing and reactive atmospheres, making it eminently suitable for reactive plasma etching, deposition of oxide films and so on.

In the deposition mode, the filtered arc source provides a highly ionized flux of metallic and gaseous ions for the deposition of high quality, ultra-smooth coatings. When the deflecting magnetic field is turned off, it acts as an extremely efficient source of high-density electron current. In this mode, it facilitates the generation of a uniform, high-density plasma cloud in the deposition chamber, when used in conjunction with Arcomac's patented auxiliary anode assembly. This results in a "plasma-immersed" environment which is akin to plasma CVD, leading to uniform coatings on complex-shaped parts.



## TECHNICAL SPECIFICATIONS FOR LARGE-AREA DIRECT-ARC SOURCES FOR PVD SYSTEMS

MODEL #	LACAS-300C	LACAS-600R	LACAS-800R	LACAS-1300R
Deposition Chamber Size (dia. x height, mm)	600 x 600	800 x 800	1000 x1000	1000 x1500
Cathodic Arc Sources	70 mm dia circular cathode	150x600x30 mm rectangular cathode	150x800x30 mm rectangular cathode	150x1300x30 mm rectangular cathode
<p>The arc source assembly consists of an anode assembly with focusing, stabilizing and scanning coils, high-voltage impulse ignition system containing two arc-igniters, and water-cooled flanges. Mechanical igniters for graphite and sintered metal targets are optional. The utilization rate for the titanium (Ti) cathode is 80%. The sources also come with solid-state power supplies rated at 65 V OCV, 100 A. The rectangular sources are equipped with static and dynamic control sub-systems for a stable operation of the targets.</p>				

## TECHNICAL SPECIFICATIONS FOR LARGE-AREA FILTERED-ARC SOURCES FOR PVD SYSTEMS

MODEL #	LAFAS-600C	LAFAS-1000C	LAFAS-1000R	LAFAS-1500R
Plasma Guide Chamber Size (dia. x height, mm)	600 x 600	1000 x 1000	1000 x1000	1000 x1500
Cathodic Arc Sources	Two LACAS-300C circular cathodes	Two LACAS-300C circular cathodes	Two LACAS-800R rectangular cathodes	Two LACAS-1300R rectangular cathodes
<p>The plasma guide chamber consists of two rectangular ports with focusing and deflecting magnetic coils. The arc sources are equipped with focusing, stabilizing and scanning magnetic coils, and a high-voltage impulse ignition system. Each source is fitted with a water-cooled anode separator assembly, and a separate chamber water-cooling system with flow and temperature control package.</p>				
<p>The plasma power supply system consists of solid state power supplies for the arc sources, rated at 65 V OCV, 100 A. Separate power supplies are provided for the focusing, stabilizing and scanning magnetic coils. The rectangular sources are equipped with static and dynamic control sub-systems for a stable operation of the targets.</p>				
<p>The assembly also includes a computer process control package, consisting of a Mitsubishi A1S or equivalent integrated process control computer and standard process control software. A connectivity package for a Pentium class PC, and a Windows 95-compatible Surface Engineering Manager for Intelligent Process Control (IPC) of PVD coating design are available separately as options.</p>				

Specifications for larger chambers and custom configurations are available.

LACAS™ and LAFAS™ are registered trademarks of ARCOMAC Plasma Technologies, Toronto, Canada



**Advanced Coating Technologies**

Research, Development and Technology Transfer

Contact:  
**Dr. Deepak G. Bhat**  
*Manager, Technology Marketing & Commercialization*  
 4401 Dayton-Xenia Road, Dayton, OH 45432-1894  
 Tel: 937-426-6900, ext. 111 • Fax: 937-429-5413  
 E-Mail: dbhat@ues.com

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The ARCOMAC deposition equipment and Cathodic Arc Sources are covered by four U.S. Patents; additional patents are pending.