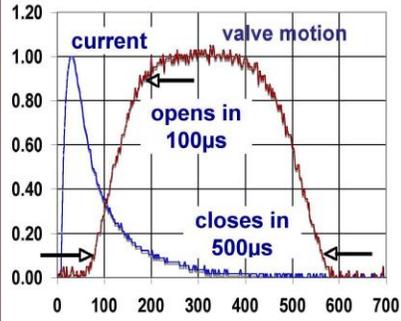




Alameda Applied Sciences Corporation

Ultra-fast, Supersonic Gas Jet Valve



PRODUCT INFORMATION

Technical Description:

Alameda Applied Sciences Corporation (AASC) offers a high-speed gas valve that operates on the principle of a conductive flyer plate accelerated by eddy currents induced by an adjacent coil. The low-mass flyer plate and backing spring combination provide a fast opening (<100 μ s) and closing (<500 μ s) time for the valve. In one embodiment, a nozzle structure directs a supersonic flow of gas into a rectangular jet of high-density gas suitable for interaction with a laser beam transverse to the jet, for the production of laser wake-field interaction, leading to very high-energy electrons from the gas jet.

Capability / Advantage over Other Technologies:

Typical solenoid valves open in 1 ms and close in several ms. The slow closing time limits repetitive operation at high pressures and demands very high pumping rates to maintain adequate vacuum between pulses. AASC's rapidly closing valve (5x faster than solenoid valves) allows operation at high repetition rates (10-100 Hz), even at 1500 psia plenum pressure.

Relevance to Customer / End User:

Numerous emerging fields require an electrically controlled gas valve with faster response time.

- Laser wake-field acceleration (LWFA) provides electron accelerators with unprecedented electric field gradients. Supersonic and highly collimated gas jets, or gas-filled capillary discharge waveguides are two primary targets of choice.

- Present gas jets have lengths of <4 mm at densities of $1-4 \times 10^{19} \text{ cm}^{-3}$, sufficient for electron acceleration to energies up to 150 MeV. A well collimated beam that is ≥ 10 mm in length, <500 μ m in width and with the ability to tailor the gas density profile to optimize the LWFA process is required to achieve >1 GeV.



- In flash x-ray machines, a supersonic shell of gas is compressed by high currents and forms a dense, hot plasma pinch that radiates the desired x-rays in a short burst. Photo at left shows one such valve/nozzle delivered by AASC to the DoD and to the French DGA.

- In other accelerators, it is sometimes desirable to inject a metered pulse of gas into a beam-line or test cell. One difficulty in the prior art is the requirement for precise control of the mass injected so that only the region of interest is filled with gas, while the rest of the accelerator structure can remain at high vacuum. For this application, the gas burst must be fast enough so that a high vacuum event may occur before the injected gas reaches the high vacuum region to perturb it.

Relevance to Other Applications:

The AASC fast valve might also be used to inject non-conducting liquids or high-pressure gases for automotive or other applications.

COMPANY INFORMATION

Company: Incorporated in 1994, AASC focuses on pulsed plasma devices. Customers include large multinational companies and research organizations.

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APPLICATION/INSERTION INFORMATION

Technology Readiness Level:

Prototypes may be custom built to suit user specifications. The basic valve architecture allows variations in nozzle size, operating pressure and repetition rate.

IP:

We have a patent application pending with the US PTO.

Price Upon Request