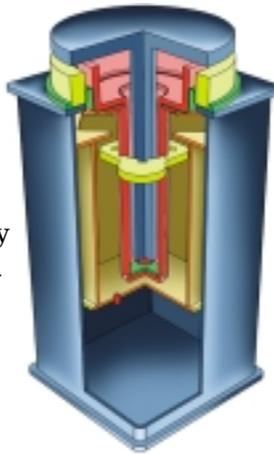


# Gimbal Piston™ Isolator System

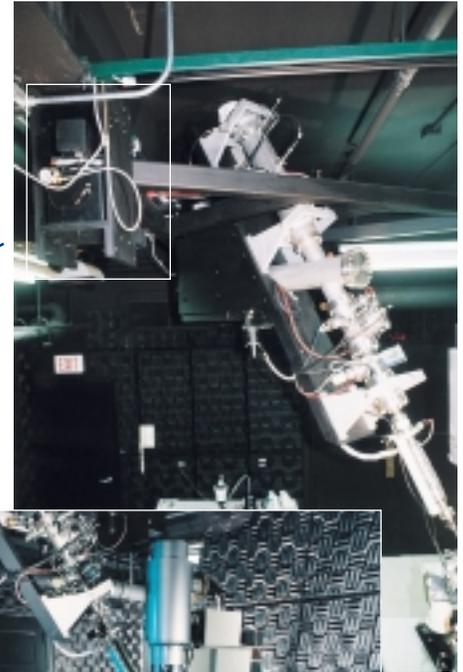
Argonne National Laboratory, Illinois

## APPLICATION:

A unique low-frequency vibration isolation solution uses three TMC Gimbal Piston™ high damping pneumatic isolators to help overcome imaging resolution problems in an intermediate voltage electron microscope (IVEM) used for ion accelerator in situ irradiation effects research. The specially designed system isolates the steeply sloped (60°) ion beamline interface (the accelerator is located one floor above the microscope) from the IVEM instrument in the laboratory.



Gimbal Piston Isolator



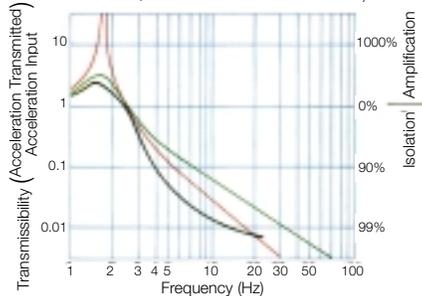
## PRODUCT:

TMC's patented Gimbal Piston Air Isolators provide excellent isolation in all directions for even low input broadband vibration levels.

## PERFORMANCE:

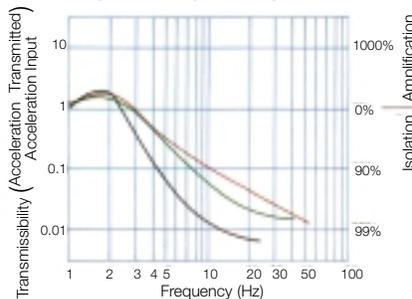
### Vibration Isolation vs. Pneumatic Damping

(source for theoretical curves: Harris & Crede, Shock and Vibration Handbook)



- Theoretical 1.5 Hz isolator with no damping
- Theoretical 1.5 Hz isolator with 0.2 damping coefficient
- Measured 63-500 Series Table with 40-microinch floor inputs (vertical)

### Low-Amplitude Input Response



- Measured 63-500 Series Table with 40-microinch floor inputs (vertical)
- Measured 63-500 Series Table with 4-microinch floor inputs (vertical)
- Measured 63-500 Series Table with 0.1-microinch floor inputs (vertical)

## BENEFITS TO USER:

- Vertical and horizontal vibration isolation starting below 2 Hz
- Up to 98% isolation by 10 Hz, over 99% isolation at 20 Hz
- Stable design accommodates even relatively high center-of-mass
- Aggressive pneumatic damping quietly settles even gross disturbances

Photo courtesy of Argonne National Laboratory

**BRIEF:**

Argonne Labs overcame a building air handling vibration problem by installing an isolation system on which they mounted the portion of the ion accelerator beamline interface closest to the Hitachi model H-9000NAR IVEM. Shown is the section of interface that connects the IVEM at the lower right to the ion accelerator located on the floor above. The cradle at the top center supports the 400 liter per second ion (vacuum) pump which in turn supports the entire interface section. Support is provided by a horizontal triangular tubular steel frame shown at the top, which cradles the beamline and associated ancillary equipment used for fine-tuning the interface to the IVEM. Three TMC Gimbal Piston isolators are used, one to support each corner of the rigid hanging frame. Most of the mass hangs below the frame which helps increase the stability of the three isolators. The result is a dramatic virtual elimination of the problematic low frequency vibrations and an instrument that meets Argonne's needs.

One of the isolators is shown in the upper left area of the photograph. The isolators provide damping which is up to five times greater than conventional mounts and the isolators are supported by overhead steel I-beams.

TMC's Gimbal Piston pneumatic isolators are specifically engineered to isolate vibration-sensitive instruments and equipment. The isolators were recently selected by the U.S. Department of Energy's Argonne National Laboratory near Chicago to help solve a vibration problem induced by the existing aggressive air handling system in the circa 1950s building. The vibration problems were not present earlier when older and less sensitive instruments were used at the lab.

A state-of-the-art 300keV Hitachi Model H-9000NAR IVEM was selected by the Argonne HVEM-Tandem Facility since it could meet their strict requirements for maximum mechanical inputs in an appropriate environment. It provides spatial resolution for imaging 0.25 nanometer features which is nearly an order of magnitude better performance than their older 1.2MeV HVEM (high voltage electron microscope) used at the facility. Although the new H-9000NAR is regarded as the most stable instrument in its class, it was not stable enough in this older building. To totally overcome resolution degradation problems caused by vibration, Argonne scientists designed a system on which to mount the portion of the beamline interface section closest to the IVEM.

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