

Advanced Air Isolation System for Precision Devices

Precision devices such as coordinate measuring machines (CMMs), microscopes, MRI machines, and other test/scanning equipment are highly sensitive to vibration, caused by other nearby equipment or even human activities. The adverse effects of vibration on such devices should be mitigated by properly isolating them from the surrounding via elastically mounting them on their support concrete or steel floors, reducing the transmission of floor vibration to within the machine's acceptable limits provided by the manufacturer.

The more flexible (the softer) the elastic elements are the better is their vibration isolation performance at lower frequencies. Air springs, offering the lowest stiffness of commonly available isolators without compromising their load carrying capacity, are highly suitable for isolating precision equipment. In addition to providing the highest level of low-frequency vibration isolation, air springs (due to their adjustability) offer the possibility of in-situ control of the isolation system and thus further improving their vibration isolation effectiveness.

High frequency vibration isolation is normally enhanced by increasing the mass of the isolated machine via the use of an inertia base. Such a base is a platform on which the isolated equipment sits and is supported by elastic vibration isolators. In addition to improving the high-frequency vibration isolation effectiveness, inertia blocks lower the center of gravity of the isolated device minimizing rocking (and hence maximizing stability) of the isolation system.

DEICON's *patent-pending Computer Controlled Air Isolation System* is an adjustable mounting system capable of meeting the demanding requirements of isolating precision machines/equipments. DEICON's air isolation system is designed with accurate mounting-height control (self-leveling). In addition to the pseudo-static level control, DEICON's air isolation system can be equipped with the optional dynamic, real-time adjustment of stiffness and damping of the isolation scheme using DEICON's proprietary active stiffness and damping control technologies.

DEICON custom designs low-frequency vibration isolation systems for precision machines integrating our semi-actively controlled pneumatic isolation scheme with rigid support cradles and electro-pneumatic controller (residing in a cabinet which along with appropriate solenoid and servo-valve subsystems are housed in a cabinet) constantly adjusting the dynamic attributes of the isolation system maximizing its effectiveness.

Ideal vibration isolation of any object depends on the dynamic characteristics of that object, its sensitivity to vibrations in all six coordinates, and spectral characteristics of vibration excitations from the floor in all six directions, neither one of which is readily attainable. These and the additional facts such as continuously changing vibration levels at installation sites, scatter in parameters of vibration isolators, variable weight and weight distribution, amongst others call for high-performance isolation schemes (realized by using very soft isolators) to reliably isolate critical objects such as precision devices.

