MaxDamp® Vibration Isolation System

APPLICATION NOTES

APPLICATION:

OEM equipment with motorized X-Y stages or robots that require high performance vibration isolation and aggressive settling time for stage-induced motion of the isolated payload.

PRODUCT:

MaxDamp® is an internal modification to the TMC line of patented Gimbal Piston™ Air isolators and CSP™ Compact Sub-Hz Pendulum Air Isolators (U.S. patent no. 5,779,010).

PERFORMANCE:

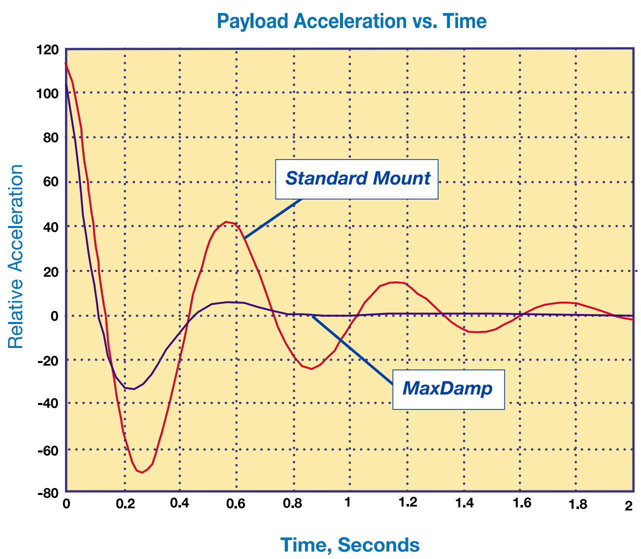

Figure 1: The time-domain impulse response for a system mounted on standard pneumatic mounts vs. TMC's MaxDamp isolators.

BENEFITS TO USER:

- Faster payload settling times
- Faster throughput and higher yields for semiconductor manufacturing/inspection tools
- "Stiffer" feel to isolated surface while maintaining high vibration isolation performance
- Less vibration induced by air currents and acoustic noise as well as "on-board" generated vibration

BRIEF:

TMC's MaxDamp line of high-damping pneumatic isolators is specifically designed to reduce the payload settling times in moving stage applications. These applications include semiconductor and flat panel manufacturing and inspection equipment, metrology tools, and coordinate measuring machines. These new isolators provide damping which is up to five times greater than conventional mounts. The result is a dramatic reduction in the settling time of platforms resulting in higher system throughputs.

The table below shows the typical settling times for the horizontal, vertical, and twist degrees of freedom for payloads mounted on conventional isolators vs. TMC's MaxDamp isolators. The tabulations indicate the time required to reach 1/10th, 1/100th, and 1/1,000th of the initial acceleration induced on the payload by a stage motion (for example).

Mount vs. Attenuation	0.1	0.01	0.001
Standard Mount (Twist)	1.8	3.7	5.5
Standard Mount (X, Y, Z)	1.1	2.2	3.3
TMC MaxDamp Mounts (X, Y, Z, Twist)	0.4	0.7	1.1

Comparison of Settling Times in Seconds: (Isolator/DOF vs. attenuation from initial acceleration)

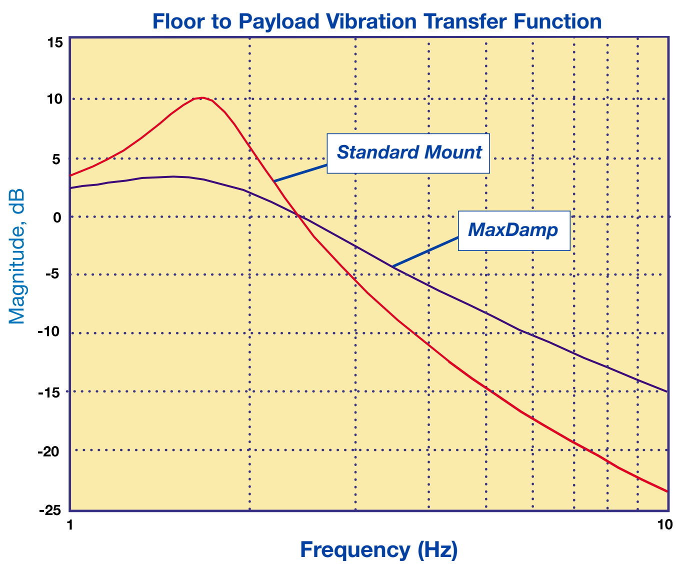

Figure 2

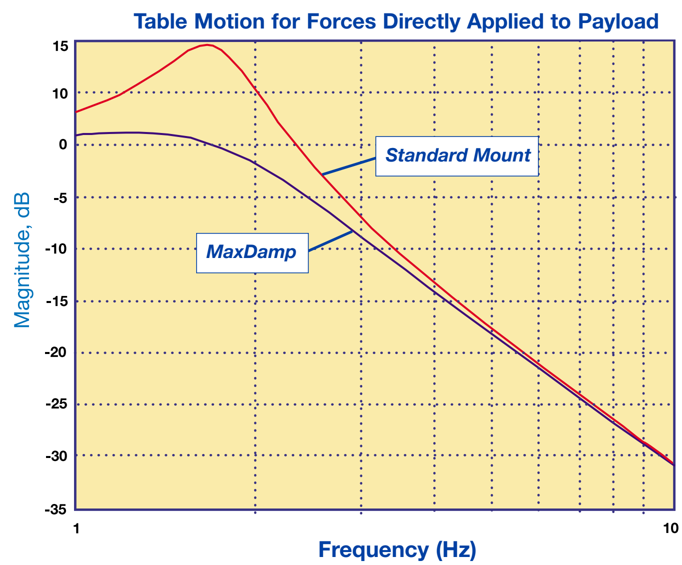

Figure 3

The above charts illustrate the motion induced on the payload for different types of external disturbances. Figure 2 describes the vibration transfer function for a standard mount vs. TMC's MaxDamp mounts. It shows more floor vibration being transferred to the payload. This, however, is often not the dominant noise source in semiconductor fabs. The aggressive air handling systems in cleanrooms can induce noise in the payload by causing pressure differentials across the area of the payload (i.e., acoustic coupling). At low frequencies, payload noise is generated by pressure differentials acting across the area of the pneumatic isolators themselves (since the pressure inside the isolators is fixed, changes in room pressure cause a net force on the pistons of the pneumatic mount). Figure 3 describes the motion of the platform for forces directly applied to the payload, such as those described above. These are often the dominant noise sources, and as Figure 3 illustrates, the MaxDamp mount moves considerably less in these situations. The actual performance of the system will be somewhere between these two limiting cases.

Vibration Solutions: quiet work surfaces for precision research and manufacturing