Tests of STACIS for Active Stabilization at SLAC

Gordon Bowden
SLAC
Gordon Bowden, SLAC

Tests of STACKS for active stabilization at SLAC

Active Vibration Isolation System

STACKS 2000 t.m.
STACIS off, Vertical Motion

STACIS on, Vertical Motion

Streckeisen STS-2 Seismograph

PEP II Quad 1500 kg

3 Stacis Feet

STACIS ON/OFF TRANSIENT

M/SEC

SECONDS
THE WORLD'S MOST ADVANCED ACTIVE VIBRATION ISOLATION SOLUTION

The Stacis 2000 delivers a truly unmatched level of vibration isolation, enabling ultra-precision semiconductor fabrication equipment to deliver the highest accuracy, the fastest system throughput and the highest device yields. In applications where vibration has been a problem in the past, the improved stability of the Stacis 2000 system has increased manufacturing throughput and yield by as much as 20%.

The Stacis 2000 is engineered and manufactured by Barry Controls, the world leader in active vibration control technology, and is exclusively distributed by Newport Corporation in North America.

Easy Installation

Never has active isolation been this easy to install and use. Just place the isolators under your system, hook up the power and signal cables, and flip the switch. Because there is minimal calibration and initialization, you never have to worry about using your system. Installation is also easier because the Stacis 2000 does not require compressed air, so there are no supply and exhaust lines to install and maintain.

The Widest Active Bandwidth Available

With isolation starting at just 0.3 Hz, the Stacis 2000 offers far better protection against the low-frequency vibrations that cause the most problems for photolithography, metrology, and other ultra-precision applications.
STACIS Design Evolution

**Sky Hook**

- **Soft Mount**
- **Soft Mount with Sky Hook**
- **Hard Mount**

**Velocity Feedback**

**Ordering Information**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>U.S. List Price</th>
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<tbody>
<tr>
<td>2000-41</td>
<td>System with 3 isolators 400-1000 lb capacity per isolator and controller</td>
<td>$29,995</td>
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<td>2000-42</td>
<td>System with 3 isolators 800-2000 lb capacity per isolator and controller</td>
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<td>2000-43</td>
<td>System with 3 isolators 1400-3500 lb capacity per isolator and controller</td>
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<td>System with 4 isolators 400-1000 lb capacity per isolator and controller</td>
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<td>X2001</td>
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<td>X2003</td>
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</table>

**Applications**

- **Support**
- Stainless steel vessels
- SEM and TEM
- **Laboratory**
- **Materials**
- **Jewelry**
- **Metal**
- **Glass**
- **Textile**
- **Glass**
- **Plastic**
- **Semiconductor**

**STACIS® 2000** is designed and manufactured by Barry Controls®.

For further information contact Newport or your local Newport representative:

Why is active μseismic control a challenge?

- Plant is not a point mass - 6 degrees of freedom.
- Plant is not a rigid body - internal modes
- Plant not separated from environment - floor modes
- Hard to close-couple sensor-actuator pairs.

- Microseismic signal/noise ratio is small

Velocity Transmission $V_p/V_{in}$

Differential Damping

$$\frac{V_p}{V_{in}} = \frac{\omega_n}{s^2 + 2\zeta\omega_n s + \omega^2}$$

Inertial Damping

$$\frac{V_p}{V_{in}} = \frac{2\zeta\omega_n s + \omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$$

Figure 4: Displacement noise spectral densities of three geophones conditioned with an OP27 amplifier. The geophone resonances is the most influential parameter on the low frequency noise.
Active Isolation Modules and Control System

Newport’s Elite™ 3 Series Active Isolators provide a digitally-controlled ultrastable platform support. Elite™ 3 technology, re-engineered specifically for very high resolution wafer production metrology and microcircuit applications. Piezoelectric actuators are designed into the isolator to support stiff work surfaces and actively cancel low frequency floor vibrations.

An optional kinematic docking system (horizontally) stabilizes equipment platforms during wafer transfer or other flexible motion. Elite™ 3 technology can be customized for integration into OEM systems. Elite™—focus on the future.

Key Features
- Active vertical vibration cancellation
- Feedback cancel sensor drive position
- Pendulum branch moment motion
- Docking both equipment platforms during load movement and parts "out of the picture"
- Available for OEM integration

Email tech@newport.com Web www.newport.com
NLC IP Environment

- High magnetic fields - Capacitive Sensors.
- Cryogenic Temperatures - Piezo or magnetostrictive actuators
- Noise sources internal to detector - Coolants
- Complex Detector structural dynamics
- Stabilization of feedback 'hunting'

**Final academic question:** Does active stabilization really remove motion? or only down shift it in frequency? Does it cool?