

# HERZAN

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## Acoustic, Vibration, and EMI Isolation Specialists

# AVI-400 Series

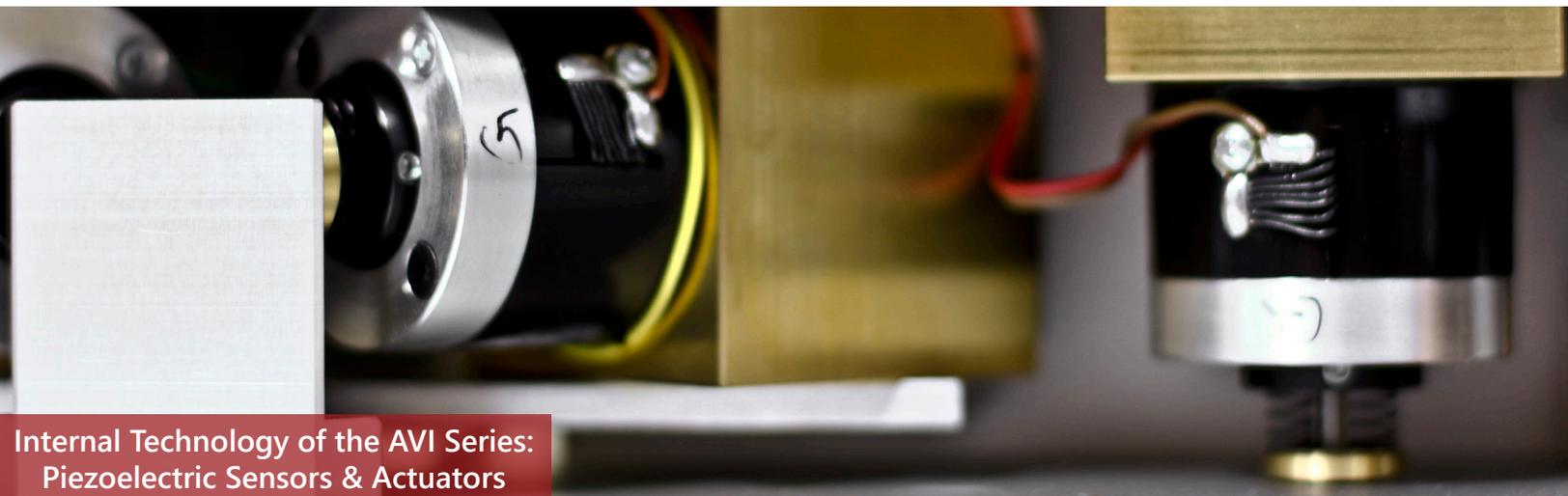
## Overview

The AVI-400 platforms provide industry-leading active vibration isolation performance (starting at 0.5 Hz) for electron microscopes and similarly large research instruments. The AVI-400 platforms help users achieve more from their microscopes by removing disruptive low-frequency vibration noise from affecting their measurements. The AVI-400 platforms incorporate a low-profile and modular design, simplifying the installation process by not requiring lifting equipment for installation for a majority of instruments (including most SEMs).



AVI-400M Isolators and AVI-400 Controller

The AVI-400 is available in three standard sizes: **AVI-400S**, **AVI-400M**, and **AVI-400XL**.



Internal Technology of the AVI Series:  
Piezoelectric Sensors & Actuators

## Product Highlights

- Active Isolation from 1 to 200 Hz (*0.5 Hz with the LFS System*)
- Passive Isolation Beyond 200 Hz
- Isolates vibrations in all six degrees of freedom
- No low-frequency resonance
- Advanced piezoelectric sensors & actuators
- Internal feedback loop damps resonances
- Compact, modular form factor
- Easy to install, no persistent maintenance
- Minimal impact on the overall profile of the supported microscope
- Easy to customize for unique requirements
- And More!

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## Popular Applications

The AVI-400 platforms support a wide range of high-load microscopes and other research instruments sensitive to low-frequency vibration noise. The most common application for the AVI-400 platforms is **electron microscopy**, where they have supported both scanning electron microscopes and transmission electron microscopes with great success. End users and OEMs around the world find the low-profile nature of the AVI-400 platforms favorable versus competing solutions as it simplifies the installation process and removes the need for persistent maintenance.

In addition to SEMs and TEMs, the AVI-400 platforms often support:

- Ultra-High Vacuum Scanning Probe Microscopes (UHV-SPM)
- Lithography tools
- High precision metrology tools
- Spectrometry instruments
- And More!



Hitachi S-4800 SEM Supported By An AVI-400M Platform



Photo #9 - Oblique of Titan

### AVI-400S-4 Supporting A FEI Titan TEM

Due to the modular design of the AVI-400 platform, a TEM weighing 3500 Kg can be supported by a four isolator configuration. This image depicts a FEI Titan TEM supported by the AVI-400S-4 platform, which was previously limited by low-frequency vibration noise, but now is thriving when performing high magnification measurements.



### AVI-400M Supporting A FEI QEMSCAN 650 SEM

The AVI-400 platforms are often supported by scanning electron microscopes, which come in a variety of sizes and form factors. The significant benefit of the AVI-400 platforms is that they do not require lifting equipment or rigging systems for installation, simply needing the SEMs internal leveling feet to raise high enough (5") to position the isolators underneath. In this image, a FEI QEMSCAN 650 SEM was quickly installed on top of an AVI-400M platform, which supports the SEM frame directly. After the installation, the SEM quickly began achieving greater resolution from its measurements.

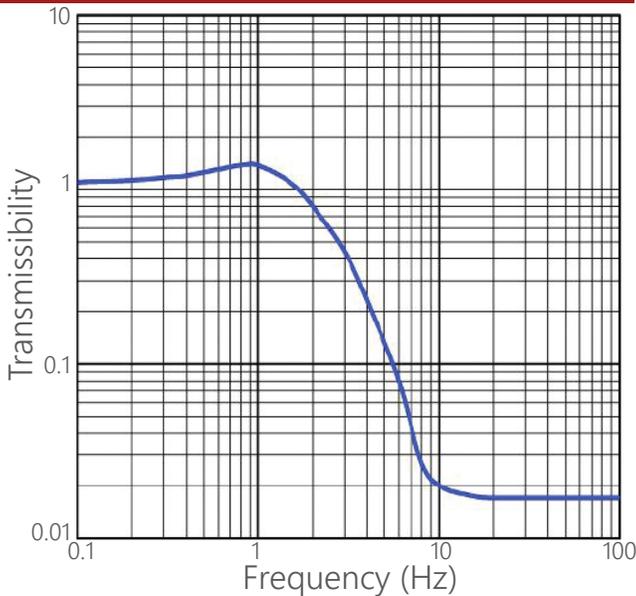


### AVI-400M Supporting A Carl Zeiss SIGMA VP SEM

Carl Zeiss scanning electron microscopes are the most commonly supported instrument for the AVI-400 platforms. Due to their uniform design and easy access internal frame, the AVI-400 platform can be installed within an hour without the need of lifting equipment. This image depicts the Carl Zeiss SIGMA VP supported by the AVI-400M platform.



## TRANSMISSIBILITY

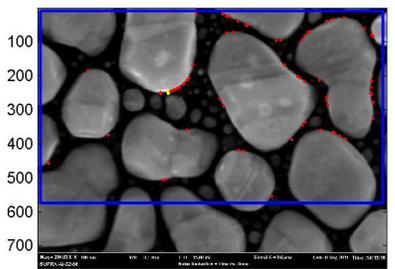


## Performance

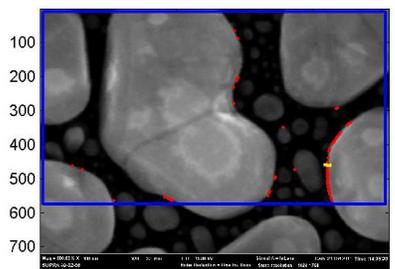
The transmissibility graph represents the vibration isolation performance of the AVI-400 Series over a frequency domain. The performance data is representative of all rotational modes of vibration (all six degrees of freedom) and should serve as a conservative estimate of performance customers can receive when pairing their instrument with an AVI-400 platform.

### Performance Upgrade - LFS System

The AVI-400 Series can improve its low-frequency vibration isolation performance by pairing it with the LFS System (Low Frequency Sensor). This upgrade enables the platform to isolate vibrations starting at 0.5 Hz and can be easily retrofitted for existing systems in the field. More details on the upgraded performance can be found below.



Without Vibration Isolation



With Active Vibration Isolation

## Performance Comparison Images

A researcher operating an SEM imaged a sample under two unique conditions: **without a vibration isolation system** and **with an AVI-400M platform**. The resulting images demonstrate a significant improvement in image quality and overall measurement clarity when an AVI platform is used to support an SEM.

## PERFORMANCE HIGHLIGHTS

Product Series	Resonant Frequency	Isolation Starting At	Isolation % at 2.5 Hz	Isolation % at 5 Hz	Isolation % at 10 Hz	Max. Isolation %	Isolation Performance	Active Vibration Isolation Bandwidth
<b>AVI-400 Series</b>	None	1 Hz	90%	97%	99%	99.8% at 70 Hz	Greater than 40 dB	Up to 200 Hz
<b>AVI-400 Series with LFS System</b>	None	0.5 Hz	95%	99%	99.5%	99.8% at 20 Hz	Greater than 55 dB	Up to 200 Hz

### Note On the LFS System

The LFS System is an external feedforward sensor engineered to target low-frequency vibrations (0 - 50 Hz). The LFS System complements the AVI-400 Series by interfacing with the isolators directly, enabling the platform to delivery industry-leading low-frequency vibration isolation in all six degrees of freedom.



LFS-3 Sensor



## Technical Specifications

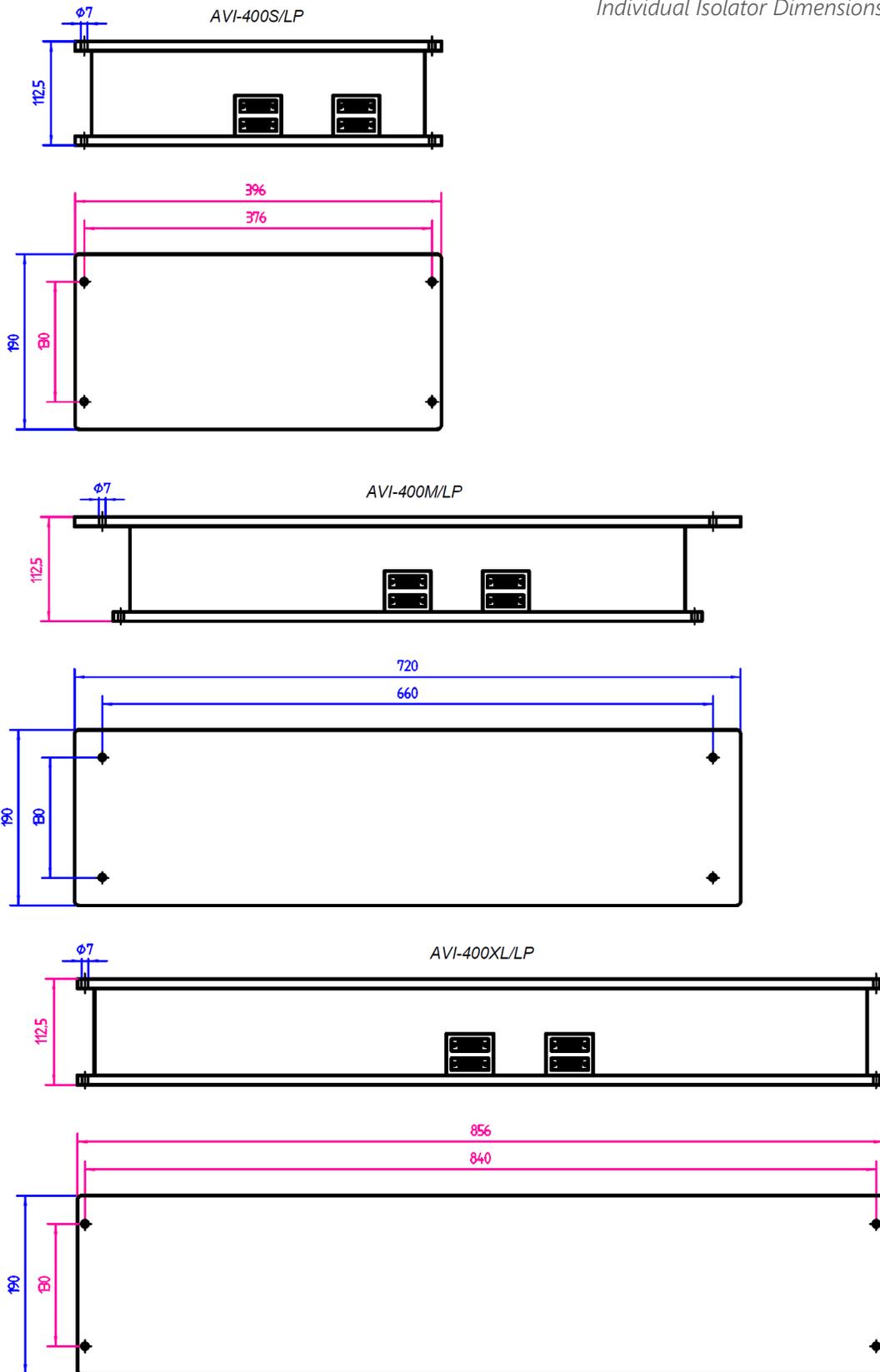
SPECIFICATION		AVI-400S	AVI-400M	AVI-400XL
<b>Dimensions (W x D x H)</b> <i>(Single Isolator Dimensions)</i>	<i>Imperial</i>	7.5 x 15.6 x 4.4 inches	7.5 x 28.3 x 4.4 inches	7.5 x 33.7 x 4.4 inches
	<i>Metric</i>	190 x 396 x 112.5 mm	190 x 720 x 112.5 mm	190 x 856 x 112.5 mm
<b>Load Capacity</b> <i>(Two Isolator Platform)</i>	<i>Imperial</i>	1,400 Lbs	2,000 Lbs	2,000 Lbs
	<i>Metric</i>	636.4 Kgs	909.1 Kgs	909.1 Kgs
<b>System Weight</b> <i>(Two Isolator Platform)</i>	<i>Imperial</i>	83.6 Lbs	99 Lbs	99 Lbs
	<i>Metric</i>	38 Kgs	45 Kgs	45 Kgs
<b>Isolation Technology</b>	Piezoelectric sensors, actuators, and control electronics			
<b>Force Directions</b>	Active vibration isolation in all six degrees of freedom			
<b>Required Floor Flatness</b>	2 millimeters per meter			
<b>Isolation Characteristics</b>	Dynamic 1 Hz to 200 Hz, Passive beyond 200 Hz			
<b>Transmissibility</b>	See transmission curve and product highlights section for more details. Above 10 Hz transmissibility <0.017 decreasing rapidly			
<b>Correction Forces</b>	Maximum 8N horizontally, 16N vertically			
<b>System Noise</b>	Less than 50nG/√Hz from 0.1 - 200Hz in any direction			
<b>Static Compliance</b>	Approx. 1.7µm/N vertically, 3.4µm/N horizontally			

SPECIFICATION	AVI-400 CONTROLLER
<b>Safety Class</b>	1
<b>Power Consumption</b>	Typically 18W
<b>Input Voltage</b>	90-125VAC / 200-250VAC, 50-60Hz
<b>Fuses</b>	2 x 1.6A/250V slow. Located in the power socket on the rear side of the controller.
<b>Overload Indication</b>	16 LEDs indicate overload condition in input stage.
<b>Monitor Signal</b>	A multiplexed signal for display on oscilloscope shows vibration levels with and without isolation.



## Product Drawings

*Individual Isolator Dimensions (Values In Millimeters)*





## Popular Upgrades

The design of the AVI-400 Series enables the platform to integrate seamlessly with a variety of upgrades that improve the user experience and overall effectiveness of the platform. These upgrades relate to improvements in performance, form factor, operation, and more.



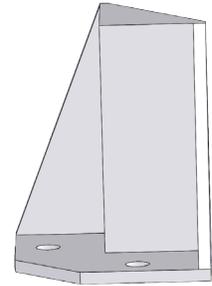
### LFS-3 System

The LFS-3 System is a low-frequency performance upgrade for the AVI-400 Series, enabling the platform to isolate vibrations at 0.5 Hz and beyond. The LFS-3 System is a dedicated feedforward sensor with internal temperature stability, providing absolute reliability and unparalleled low-frequency vibration isolation performance.



### Support Frames

Support frames are often used in labs where a sub-floor is present or in a cleanroom environment has an excavated area in preparation for a new instrument. Herzan specifically designs and engineers support frames to ensure the AVI-400 platforms and supported instrumentation are of equal height to the raised lab floor.



### Earthquake Restraints

Earthquake restraints are a standard requirement when installing many large-scale instruments (i.e. SEMs/TEMs). The AVI-400 Series has a standard solution for earthquake restraints that integrates seamlessly with the floor in the room and the tool on top of the platform.



### Exciter Box

The Exciter Box transforms the AVI-400 Series into a shaker system (in X, Y, and Z), making the platform a multi-faceted tool for researchers needing to introduce vibrations at exact frequencies and amplitudes. No separate power supply is required, but a sin wave generator will be needed for operation.



### Rack Mount Controllers

The AVI-400 Series can include rack mount controllers to save space in the lab when dedicated racks are available. The rack mount controller is designed in a 1U configuration, which is the most compact and common style for servers.



### External Load Capacity

External load bearing springs extend the relevance of any AVI-400 Series platform when a customer's instrument closely exceeds the standard load capacity or when the load is abnormally distributed. Each load bearing spring provides 40 Kg / 88 Lbs of additional load capacity.



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