TMC VIBRATION CONTROL

STACIS®

# SEM-Base® VI

## Active Piezoelectric Vibration Cancellation Floor Platform for Scanning Electron Microscopes


## The SEM-Base® VI Advantage

**Hard-Mount Technology**
SEM-Base® VI is compatible with all internal SEM vibration control systems and aggressively mitigates low frequency floor vibration starting at 0.6 Hz

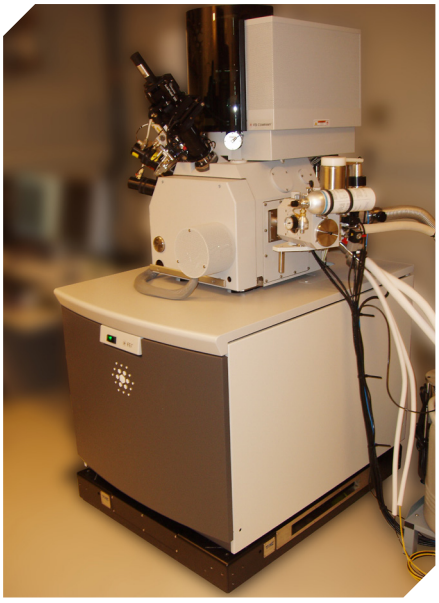
**Active Inertial Vibration Cancellation**
SEM-Base VI uses high sensitivity, low frequency inertial velocity sensors to achieve high levels of vibration attenuation, even on quiet floors.

**Serial Design with Piezoelectric Technology**
The unique serial design and proprietary high-force piezoelectric technology results in a wide active bandwidth from 0.6 Hz to 150 Hz and unmatched, inertial active vibration cancellation with 90% reduction starting at 2 Hz.

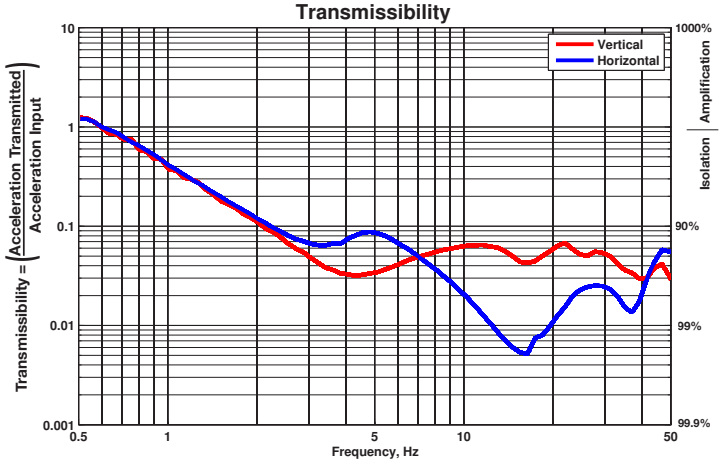
SEM-Base® VI is the next generation in STACIS active piezoelectric vibration cancellation. SEM-Base VI is designed to support all commercial Scanning Electron Microscopes (SEMs), as well as many Focused Ion Beam (FIB) and Small Dual Beam instruments. SEM-Base VI provides improved vibration isolation performance, a faster more robust controller, and an advanced graphical user interface (GUI). SEM-Base VI will enable more labs and facilities to achieve the level of floor vibration required to satisfy the specifications of the tool manufacturer.

SEM-Base VI uses a unique “serial architecture” in which the vibration sensors measure floor vibration, not payload vibration. This ensures that, unlike other designs, payload resonances do not inherently limit vibration isolation or cause instability. The vibration sensors are low frequency inertial velocity sensors for maximum sensitivity in the difficult to measure sub-hertz range. Combined with our unique piezo-actuator technology, SEM-Base VI achieves extremely high levels of vibration cancellation, even on already quiet floors.

SEM-Base VI provides, on average, 6 dB more vibration isolation than previous models. In addition, TMC’s next generation controller, the DC-2020, features a new dual-core processor and provides tool owners and researchers with a very simple and easy-to-use graphical interface for fast system assessment and operational peace-of-mind. When connecting over Ethernet, the DC-2020 creates the SEM-Base GUI in the user’s browser with no additional software or application program to install. Alternatively, the user can interface with the controller via an on-board menu-driven liquid crystal display (LCD).



*Example application*



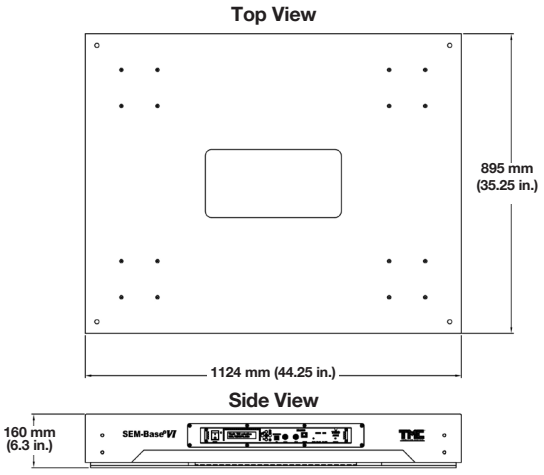

*1800 lbs (818 kg) payload tested with simulated vibration at VC-C (500 µin./s, 12.5 µm/s RMS)*

# Technical Specifications

# SEM-Base® VI

## Performance

| | |
|---|---|
| Active degrees of freedom | 6 |
| Active bandwidth | 0.6 Hz - 100 Hz |
| Passive natural frequency | 12 Hz nominal |
| Effective active resonant frequency | 0.5 Hz |
| Isolation at 1 Hz | 40 - 70% |
| Isolation at 2 Hz | 90% |
| Isolation at ≥ 3 Hz | 90 - 98% |
| Internal noise | <0.1 nm RMS |
| Operating load range | Standard capacity: 900 - 2,500 lbs \| 408 - 1134 kg<br>High capacity: 2,500 - 3,200 lbs \| 1134 - 1452 kg |
| Magnetic field emitted at max. 4 in. (102 mm) from platform | <0.02 µG broadband RMS |




## Design, Dimensions, and Environmental and Utility

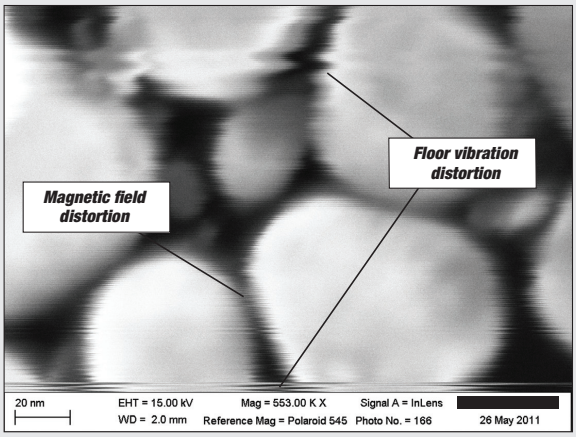
| | |
|---|---|
| Environmental and safety | CE and RoHS compliant |
| Active isolation elements | Piezoelectric actuators with minimum 3300 lb. (1500 kg) capacity receive signal from a high-voltage amplifier with an output of up to 800 VDC. Vertical actuators support the isolated payload. |
| Passive isolation element | Single stiff elastomer (no compressed air supply needed) |
| Vibration sensor elements | Downward facing geophone type inertial sensors that measure floor vibration below the isolator and deliver voltage proportional to the velocity of vibration motion |
| Active feedback control loop | Floor vibration is measured, processed and attenuated below the spring supporting the isolated surface |
| Dimensions (WxD) | 35.25 x 44.25 in. \| 895 x 1124 mm |
| Height | 6.3 in. \| 160 mm nominal<br>Doesn't change when SEM-Base is switched off |
| Operating temperature | 50° - 90° F \| 10° - 32° C |
| Storage temperature | -40° - 130° F \| -40° - 55° C |
| Humidity (operating) | <80% @ 68° F (20° C) |
| System power requirements | 100 - 240 VAC, 50-60 Hz, < 600 W |
| Floor displacement | < 800 µin. \| 20 µm below 10 Hz |

## Built-in Controller

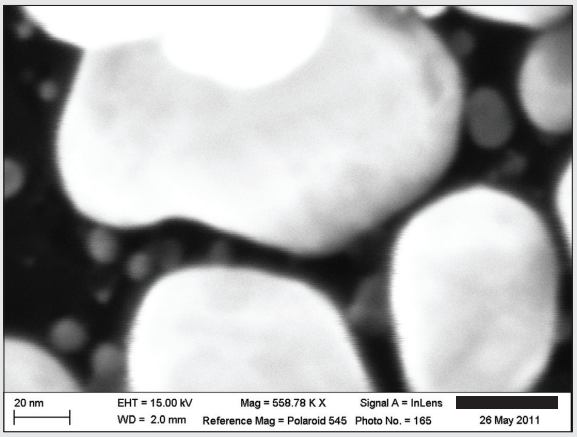
| | |
|---|---|
| Processor | 150/75 MHz dual core |
| Sampling rate | 10 kHz |
| Analog outputs | 16 channels |
| Analog inputs | 16 channels |
| Status light | Single LED |
| Front panel ports | 1x serial USB 2.0; 1x serial micro-USB; 1x Ethernet RJ-45; 2x BNC |
| User interface | Front LCD display; character menu on HyperTerminal; Extended GUI for Microsoft Windows; embedded ethernet GUI |

## Before and After Images
## Zeiss Auriga FIB-SEM on a SEM-Base® with Mag-NetX®
*actual customer supplied data*

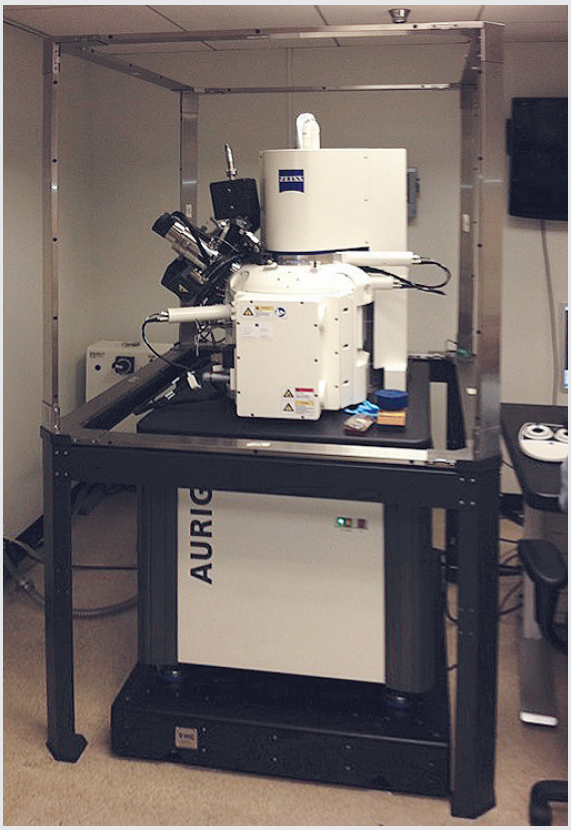
**Before**




**After**

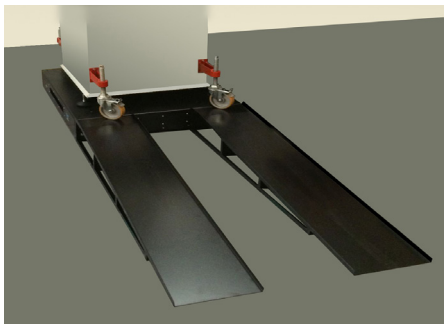



The before and after photos above are actual images taken from a Zeiss Auriga FIB-SEM installed in a non-ideal environment. The image on the left was taken with the newly installed TMC STACIS® SEM-Base® Floor Platform and Mag-NetX® Magnetic Field Cancellation systems powered-off. The image on the right was taken immediately after both active systems were powered-on.

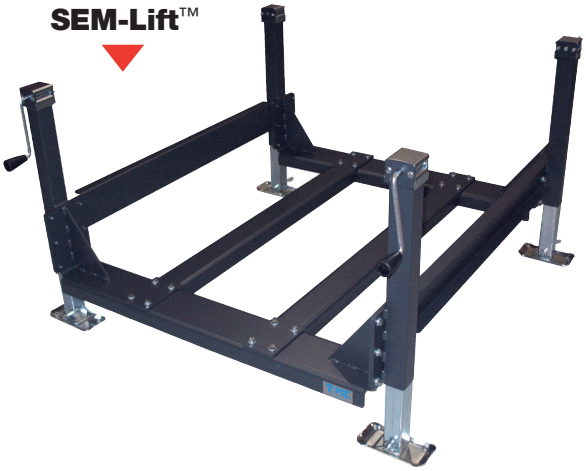


## Helpful options that ensure a smooth SEM-Base® installation

### SEM-Ramp™

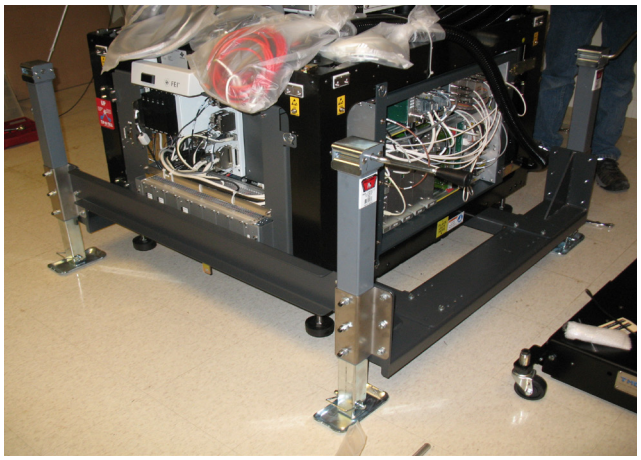


### SEM-Lift™



### Convertible Roll-Off Crate

*SEM-Base® (shown with optional retractable casters) is provided with a convertible roll-off crate. The crate cover converts to a sturdy ramp and the cover slats form a guide for the wheels.*



*SEM-Lift™ is a safe and sturdy lifting device for scanning electron microscope (SEM) columns. It simplifies and speeds SEM-Base™ installation on a previously installed SEM column. SEM-Lift raises the column several inches allowing SEM-Base® to be rolled into place.*

See SEM-Closure™, a total environmental solution designed specifically to protect SEMs. It can accommodate SEM-Base VI and Mag-NetX™ in a sealed acoustical chamber – protecting the SEM from vibration, magnetic field disturbances, and acoustic noise.



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