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STACIS® III

Piezoelectric Active Vibration Cancellation System

CE Marked



STACIS® III is the most advanced active vibration cancellation system. Employing advanced inertial vibration sensors, sophisticated control algorithms, and state-of-the-art piezoelectric actuators, STACIS cancels vibration in real time by continuously measuring floor activity, then expanding and contracting piezoelectric actuators to filter out floor motion.

Initially designed to isolate precision microlithography, metrology, and inspection equipment in advanced semiconductor factories, STACIS is now the industry standard solution for the most sensitive instruments in noisy environments, including but not limited to semiconductor fabs, failure analysis labs, nanotechnology research, nanofabrication facilities, materials and life science research.

STACIS III includes a new and improved digital controller, the DC-2020. This new advanced control system provides the user with a modern and easy to navigate Graphical User Interface (GUI). Alternatively, the system menu tree can also be navigated via an integrated front panel Liquid-Crystal Display (LCD) with push-button operation.

Two options are now available. The DC-2020e digital controller with Ethernet ports front and back is the standard controller for STACIS III. This option provides a simple to install web-based GUI (no additional application software to install) with the ability to connect multiple systems to a network hub. This networking capability allows for multiple systems to be monitored from a single remote PC.

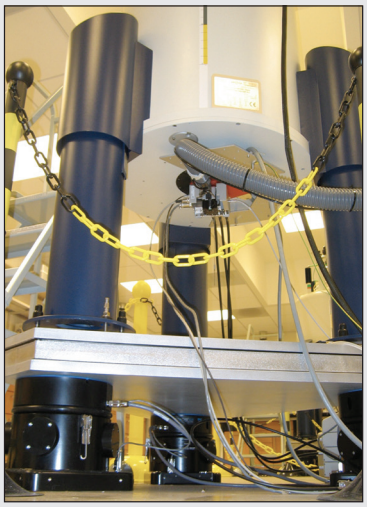
STACIS III is alternatively available with the DC-2020u which has no Ethernet ports, only the single USB port on the front panel. A TMC provided executable file enables the PC-based GUI via this serial USB port. Both options include the front panel display, and monitoring via a PC is optional.

With hundreds of successful installations worldwide, STACIS is the ideal vibration cancellation system for the most vibration-sensitive instruments.

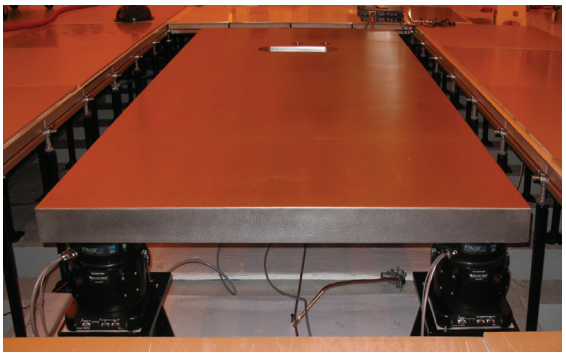
The STACIS® III Advantage

Hundreds of times stiffer than air isolators, STACIS suffers from none of the limitations of air vibration isolation systems. There is no “soft” suspension and, unlike active air systems, STACIS can be placed beneath a tool with an internal active air isolation system with both systems fully optimized.

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, truly active vibration cancellation with 90% reduction starting at 2 Hz.



A STACIS® System, incorporating a non-ferromagnetic, highly damped, aluminum platform, provides a second stage of vibration isolation for a Bruker BioSpin 600 MHz NMR Spectrometer. Photo courtesy of Bruker BioSpin and Memorial Sloan Kettering Cancer Center.



STACIS® System on “risers” installed as a custom designed TMC Quiet Island® subfloor platform to support an eBeam lithography tool in a 36 in. tall raised floor.



STACIS® supporting the end chambers of a prototype LIGO interferometer at the California Institute of Technology. These are the most precise instruments ever made – capable of measuring distances of less than 10-18 m.

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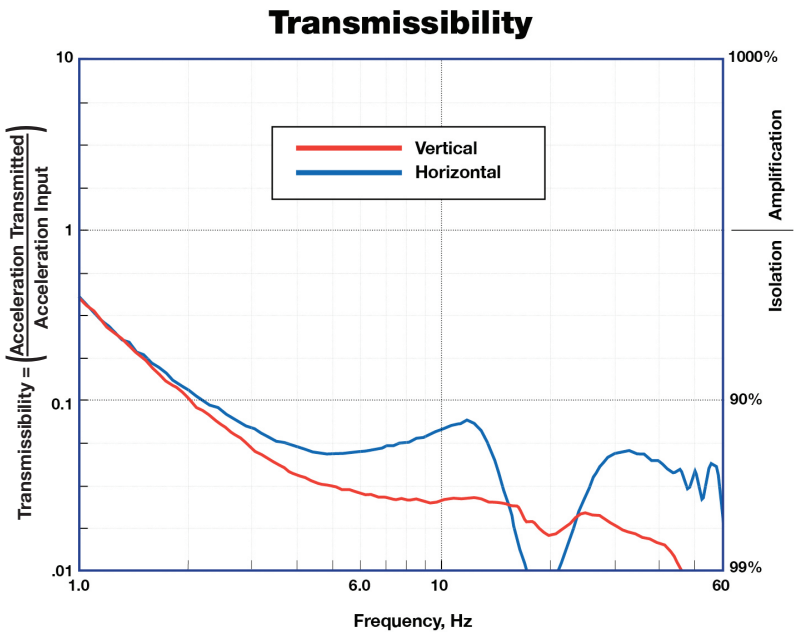
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Features and Performance

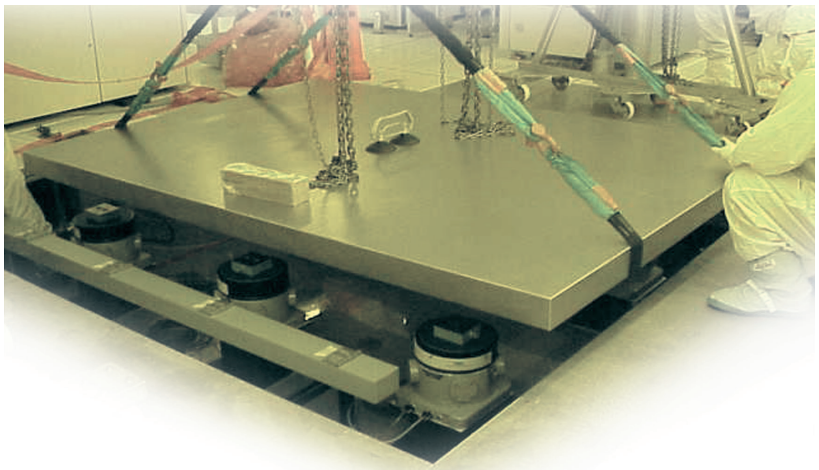
STACIS III®

- Vibration isolation starts at 0.6 Hz, with 40% to 70% isolation at 1 Hz
- Provides greater than 90% isolation at frequencies 2 Hz and higher, vertical and horizontal
- Reduces fab floor construction costs, allows tools to be installed in higher vibration environments
- Active bandwidth, 0.6 Hz to 150 Hz
- Recommended by many tool manufacturers
- 6 degree-of-freedom active hard mount design, no soft air suspension
- Robust control system requires no scheduled re-tuning
- A point-of-use solution that is compatible with all internal tool vibration isolation systems
- Ensures tool vibration criteria will be met as vibration levels increase over time
- Uses TMC's STACIS® technology to cancel vibration using piezoelectric actuators
- Digital Controller with PC-Based Graphical User Interface (GUI)
- Enables older and noisier floors to accommodate state-of-the-art tools
- Compatible with various floor heights and sub-floor geometries in fabs
- Increases throughput, quality and yield
- RoHS Compliant





4500 lbs (2045 kg) payload tested with simulated vibration at VC-C (500 µin./s, 12.5 µm/s RMS)



Installation of a TMC Quiet Island® with a high stiffness, highly damped stainless steel platform on STACIS®. (Photo courtesy of Texas Instruments' Kilby Center)



A Cameca NanoSIMS 50L on a TMC 65 Series Floor Platform supported by STACIS® isolators. This tool is a 5,000-pound secondary ion mass spectrometer with a spatial resolution of 50 nanometers. Photo courtesy of the Planetary and Space Sciences Research Institute (PSSRI) at The Open University, Milton Keynes, U.K.

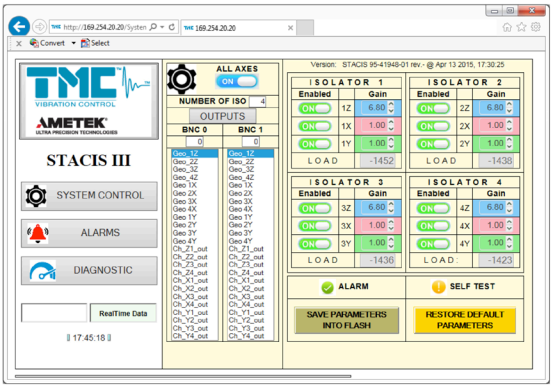
Specifications and Options

STACIS III®

The TMC DC-2020 sets the standard for control of active vibration cancellation, specifically for STACIS III technology. The all new DC-2020 controller offers unmatched processing speed with next-generation capability for system optimization and performance monitoring.



DC-2020e and PC-Based Graphical User Interface



Performance Specifications

Active degrees of freedom	6
Active bandwidth	0.6 - 150 Hz
Passive natural frequency	18 Hz vertical and horizontal
Effective active resonant frequency	0.5 Hz
Isolation at 1 Hz	40 - 70%
Isolation at ≥2 Hz	≥90%
Settling time after 10 lb (4.5 kg) step input (10:1 reduction)	0.3 sec
Internal noise	<0.1 nm RMS
Operating load range per isolator	Low capacity: 400-1100 lbs (181-499 kg) Med capacity: 900-2100 lbs (408-953 kg) Hi capacity: 1900-4500 lbs (862-2041 kg)
Static lift capacity per isolator	9,000 lbs (4090 kg)
Stiffness (1000 lb / 454 kg mass, Med capacity isolator)	40,000 lb/in. (73 x 10^5 N/m)
Magnetic field emitted at maximum 4 in.(102 mm) from the isolator	<0.02 µG broadband RMS

Design, Dimensions, Environmental

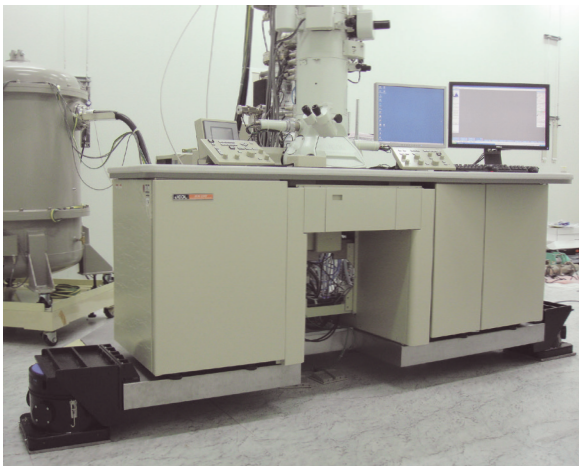
Environmental and safety	CE and RoHS compliant
Active isolation elements	High-force piezoelectric actuators that receive signal from a high-voltage amplifier with an output of up to 800 VDC
Passive isolation element	Single stiff isotropic elastomer (no compressed air supply required)
Vibration sensor 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
Isolator dimensions (WxDxH)	11.75 x 12.5 x 10.8 in. 300 x 320 x 275 mm
Isolator weight	75 lbs (34 kg)
Operating temperature	50° - 90° F | 10° - 32° C
Storage temperature	-40° - 130° F | -40° - 55° C
Humidity (operating)	30 - 60%
System power requirements	100, 120, 230, 240 VAC 50/60 Hz AC; <600 W
Floor displacement	<480 µin. (12 µm) below 10 Hz
Isolator count per system	minimum of 3
Options	laminated stainless steel platforms, frames, risers, leveling devices, earthquake restraints, lifthoods

DC-2020 Controller Specifications

Dimensions (WxDxH)	19 x 8.5 x 1.75 in. 483 x 216 x 45 mm
Weight	6.3 lbs (2.9 kg)
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
Rear panel ports	1x serial USB 2.0 1x Ethernet RJ-45 1x RS-232 DB-9 legacy serial for legacy STACIS 2100 isolators
User interface	Front panel LCD display Character menu on HyperTerminal Extended GUI for Microsoft Windows Embedded Ethernet GUI



65 Series STACIS® Floor Platform supporting an Omicron Multiprobe Scanning Tunneling Microscope (STM) with nanometer scale resolution at the Max Planck Institute in Dresden, Germany.



STACIS® 65 Series Floor Platform supporting a JEOL JEM-2100F Transmission Electron Microscope (TEM).

Room Environmental Surveys

TMC will measure, analyze, and provide reporting on your room environmental data. Our familiarity with your tool's criteria, physical size, shape, mass, enables us to design and manufacture an appropriate solution.



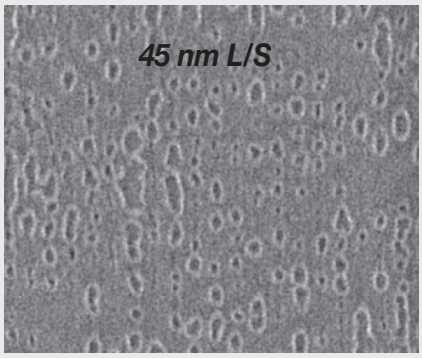
Impact of Vibration on Advanced Immersion Lithography

actual customer supplied data

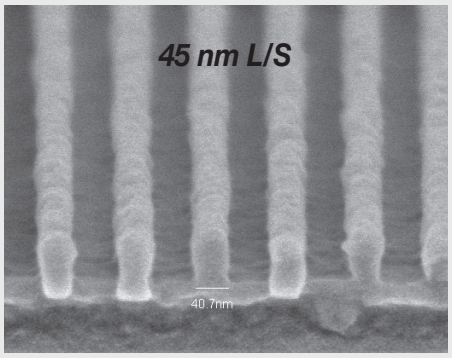




The 45 nanometer line-width test patterns shown were produced with an advanced Immersion Lithography System manufactured by Amphibian Systems and installed at Sematech in Austin, Texas. Variation between the images is due to the effect of seismic vibration on the photolithography process. The images shown were obtained using a scanning electron microscope.



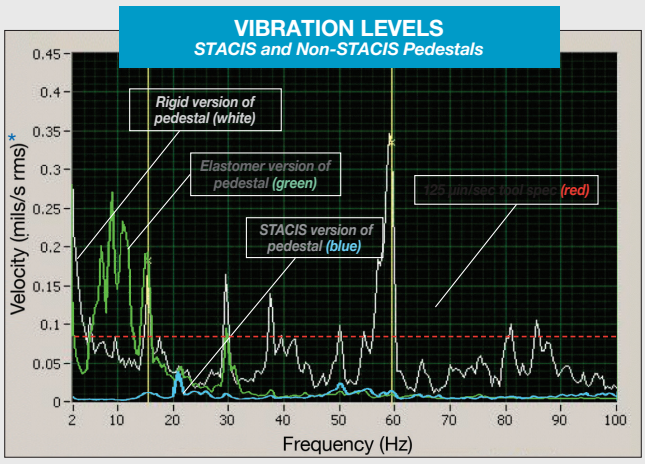
Without STACIS®
Best pattern obtained on either the elastomer or rigid version of original pedestal.



With STACIS®
Pattern achieved with STACIS active vibration isolation.

The tool was initially installed on a steel and concrete plinth with a steel support structure which incorporated commercial elastomer vibration isolation pads. This pedestal did not achieve the tool's specified vibration criteria and pattern quality was poor.

In an attempt to reduce vibration, the elastomer pads were effectively shorted out with metal shims leading to a more rigid, non-resonant structure but this resulted in little improvement. The vibration criteria were not met with either version of the pedestal and pattern quality remained poor.



***Vertical Axis Data shown**

The plinth support structure was removed and retrofitted with a STACIS® Active Piezoelectric Vibration Cancellation System. The STACIS mounts were placed directly beneath the existing plinth. Supporting the tool on STACIS resulted in a dramatic reduction of overall seismic vibration levels and achievement of the manufacturer's floor vibration specification. More importantly, STACIS provided a dramatic improvement in pattern quality.

Photos, images, and vibration data courtesy of Sematech.

TMC VIBRATION CONTROL

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