



Minus K Technology BM-8

Vibration Isolation Platform

Gary Reber

I have been a long-time proponent of vibration isolation materials and systems used in *Widescreen Review* reference systems. For years I have used isolation platforms engineered by Monster Cable and even air-type vacuum units to reduce the sonic degradation caused by minute vibration.

Minus K Technology has developed and patented a passive negative-stiffness vibration isolation tabletop platform that significantly improves sonic performance over traditional air tables and active vibration isolation methods. Dr. David L. Platus is the inventor of negative-stiffness isolators, and President and Founder of Minus K Technology, Inc.

This review encompasses the 25BM-8 with payload range from 10 to 30 pounds. The dimensions of the unit are 18 wide x 20 deep x 4.6 high (in inches), with an approximate weight of 40 pounds. The BM-8 series is also available in payload pound weight ranges of 25 to 55, 50 to 105, 90 to 130, 125 to 155, and greater.

The design of the 25BM-8 is to support high-end turntables, tube amplifiers, and optical disc players. Such internal electronic components such as capacitors, resistors, and transistors used in many audio systems are likewise sensitive to vibration.

Vibration isolation in the playback process is crucial to experiencing high-quality sound. Any external vibration, no matter how slight, even someone walking near the turntable or vibration from floor-mounted loudspeakers, is sensed by the turntable's stylus movement. The sound waveforms captured in the grooves with microscopic undulations affect the sound being played back from the record. The turntable's cartridge and stylus trace these minute waveforms, play them back with very sensitive low voltages, and convert them into an audio signal. This is how the sound captured

in the record grooves is reproduced. But this process is extremely sensitive to movement and vibration. And the human ear can detect movements of the stylus as small as 0.25 microns (250 nanometers, or 1/100,000 of an inch).

Why Vibration Isolation?

In an optical disc system, playback of the audio or video from an optical disc can be interrupted by external vibrations causing the data-reading operation to mis-read on the optical disc due to defocusing and mistracking of the laser pickup head of the optical disc player system, whether a CD, DVD, DVD-Audio, SA-CD, or Blu-ray Disc™ player. The optical player system has a laser pickup head for reading data from an optical disc; servo circuit for controlling the laser pickup head; data processor for decoding the data from the laser pickup head; memory circuit for temporary storage of the output data from the data processor; microcontroller for controlling operations of the servo circuit and the data processor; and audio and, in the case of optical video player, video reproduction components for reproducing the output data from said data processing.

Vibrations that influence the sound reproduction in a home theatre or stereo/surround system can occur in the range of 2 Hz to 20 kHz. Vibration within this range can be caused by a multitude of factors. Every structure is transmitting noise. Within the home or building itself, the heating and ventilation system, fans, pumps, and elevators are just some of the mechanical devices that create vibration. Depending on how far away the system is from these vibration sources, and where in the structure the system is located—whether on the third floor or in the basement, for example—will determine how strongly the sound quality will be influenced.

External to the building, audio equipment can be influenced by vibrations from adjacent road traffic, nearby construction, loud noise from aircraft, and even wind and other weather conditions that can cause movement and vibrations of the structure.

These internal and external influences primarily cause lower frequency vibrations, which are transmitted through the structure, creating strong disturbances in sensitive, high-end audio systems, making vibration isolation a necessity.

While sound quality is subjective, serious enthusiasts tend to want to experience the full listening experience without further coloration.

Turntable designers have long recognized the sonic quality attributes of vibration and accordingly try to minimize it in their turntable designs. Some premium turntables are built with superb platter bearings to minimize rumble and incorporate high-mass platters that are designed to increase speed stability and reduce flutter. Designers will use exotic materials to dampen vibrations without deadening the sound. Tone arm geometry and vibration and damping isolation also is important in turntable design. Quality turntables are often factory-equipped with built-in vibration isolation supporting the entire turntable. In such cases, additional vibration isolation should not be used because two isolation systems will interact, creating random resonances that actually harm the audio quality.

But for the majority of high-end turntables that are manufactured without factory-installed vibration isolation, the BM-8 vibration isolation platform is ideal. While there are air systems and mechanical vibration isolation devices on the market, they usually provide limited isolation performance, especially in terms of horizontal isolation. The BM-8 platform is designed to dissipate very low-resonance frequencies.

According to Jim McMahon, a technology writer for Minus K Technology, several years ago, aware of the limitations in even the best audiophile vibration isolators, The Audio Archive began an extensive search for better vibration isolation systems to facilitate the world-class sound reproduction services that it provides to its clients, including some of the world's leading archives, libraries, and record labels.

"Having thoroughly tested systems available to the audio market and generally been unsatisfied, we then looked outside of the audio world and conducted an in-depth search of industrial vibration isolation systems," says Eric Jacobs, President of The Audio Archive. "We learned about negative-stiffness vibration isolation, which was being used to eliminate vibrations in ultra-sensitive atomic force microscopes, and in nanotechnology labs where objects are literally built one molecule at a time. As we learned more about negative-stiffness isolators, the more interesting it seemed for audio vibration isolation."

"After extensive testing in our own audio laboratory, which is outfitted with extremely sensitive and accurate audio reproduction systems and measurement equipment, we confirmed that negative-stiffness isolators are unrivaled in vibration isolation for high-end audio reproduction," continues Jacobs. "Negative-stiffness isolators were not just a little bit better, they were significantly better. Whether with turntables, tube electronics, CD transports or other audio equipment, negative-stiffness isolators provided an unheard of 0.7 Hz isolation performance vertical, and 1.5 Hz horizontal, using a totally passive mechanical system—no air or electricity required. We were not really expecting to find a passive vibration isolation system that outperformed an active system—that was a big, and very pleasant surprise for us."

While we do not have the technical measurement equipment to verify the findings of The Audio Archive, our experience with the BM-8 is affirmative as to the sonic benefit of this completely mechanical low-frequency vibration isolation platform.

The BM-8 negative-stiffness isolators have the flexibility to custom tailor resonant frequencies vertically to 0.7 Hz, and horizontally to 1.5 Hz (with some product models as low as 0.7 Hz horizontally).

According to the company, vertical-motion isolation is provided by a stiff spring that supports a weight load, combined with a negative-stiffness mechanism. The net vertical stiffness is made very low without


SPECIFICATIONS

Minus K BM-8 Vibration Isolation Platform

Features
25BM-8P Passive vibration isolation
Payload Range — 10 - 30 pounds

Specifications
Dimensions (WxDxH) — 18 x 20 x 4.6 (inch)
Weight — 40 pounds
MSRP — \$2,640

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affecting the static load-supporting capability of the spring. Beam-columns connected in series with the vertical-motion isolator provide horizontal-motion isolation. A beam-column behaves as a spring combined with a negative-stiffness mechanism. The result is a compact passive isolator capable of very low vertical and horizontal natural frequencies and very high internal structural frequencies.

According to McMahon, vibration transmissibility with negative-stiffness isolators is substantially improved over air systems, which can make vibration isolation problems worse since they have a resonant frequency that can match that of floor vibrations. Transmissibility is a measure of the vibrations that are transmitted through the isolator relative to the input vibrations. The negative-stiffness isolators, when adjusted to 0.5 Hz, achieve 93 percent isolation efficiency at 2 Hz; 99 percent at 5 Hz; and 99.7 percent at 10 Hz.

"Negative-stiffness isolators work with audio systems in two ways," continues Jacobs. "One, they cancel out large vibrations, what we refer to as footfall. If a turntable is set up on anything other than a concrete slab floor or other large inert mass, then every time someone walks in the vicinity of the turntable, the vibrations from their footsteps are transmitted through the floor to the support stand and into the turntable, and finally show up in the recording. People will literally tip-toe around their audio playback systems, but the playback process is so sensitive that it will still pick up footsteps in the hallways or rooms some distance away. And two, the negative-stiffness isolators block out building vibrations in the higher audible frequencies."

McMahon states, "transmissibility of negative-stiffness isolators is also improved compared to active vibration isolation systems. Also known as electronic force cancellation, active isolation uses electronics to sense the motion, and then adds forces electronically to effectively cancel out or prevent it. Some active isolation systems can start isolating as low as 0.7 Hz. But active systems have a limited dynamic range that is easy to exceed, causing the isolator to go into positive feedback and generate noise. Although active isolation systems have fundamentally no resonance, their transmissibility does not roll off as fast as negative-stiffness isolators."

McMahon says that "air tables will actually amplify, instead of reduce vibrations in a typical range of 2 Hz to 7 Hz because of the natural frequencies at which air tables resonate. All isolators will amplify at their resonant frequency, and then they will start isolating. So with air tables, any vibration in that resonant frequency range could not only fail to be attenuated, it could be amplified. In this case, the low cycle perturbations will come straight through to the audio system."

BM-8 negative-stiffness isolators resonate at 0.5 Hz. At this frequency there is almost no energy present. McMahon says that it would be very unusual to find a significant vibration at 0.5 Hz. Vibrations with frequencies above 0.7 Hz (where negative-stiffness isolators begin isolating) are rapidly attenuated with increase in frequency.

Another aspect that the BM-8 platform provides is the simplicity of setup. One does not have to deal with compressed air or electricity, which makes for a system that is simpler to install, easier to set up, and more reliable to operate and maintain over the long-term.

BM-8 negative-stiffness isolators do not require electricity or compressed air. There are no motors, pumps, or chambers and no maintenance because there is nothing to wear out. They operate purely in a passive mechanical mode.

Of course, what really matters most is the sound-quality performance that the BM-8 negative-stiffness isolator produces. There is a sense of harmonic rightness. Instruments sound much more like real instruments, and voices sound like they are in a real acoustic space, with real air around them. The ability to "see" clearly into the entire three-dimensional soundstage is greatly enhanced. Improvements in rhythm and pace are captivating. BM-8 negative-stiffness isolators truly represent a significant advance in sound quality for high-end audio.

Performance

Wow! This is a phenomenal product that works as claimed! Our worst-case challenge is to isolate external vibrations from interfering with our turntable systems. Presently, we use three reference turntables: the Linn Sondek LP12 with Linn Radikal DC motor, motor control

unit and power supply and Ekos SE tonearm with an Akiva moving-coil cartridge, and the Thorens TD 350 and Thorens TD 2035. The Linn setup is in *Widescreen Review's* reference system and the Thorens in a secondary, Class A system. Both setups are prone to vibration within a frame wood structure and concrete slab foundation. In fact, one must walk with extreme care to not cause the stylus to jump grooves. Thus, this was a perfect test for the BM-8.

In both locations, with the Linn and Thorens supported by the BM-8, the stylus jump condition was completely eliminated! But the real benefit was the immediate sense of openness to the sound that was obviously previously masked by vibration and the seemingly complete absence of rumble and acoustic feedback. The BM-8 has no competition in this regard and is a MUST HAVE component in an enthusiast's system.

We also positioned the OPPO BDP-95 Universal 3D Blu-ray Disc Player on the BM-8. While the sonic improvement was not as dramatic an improvement compared to the turntable performance, still a detectable nuanced clarity in the sound resulted.

The BM-8 is simply an amazing vibration platform product that provides an impressive degree of isolation from vibration distortions, resulting in definitive sonic refinement. Recommended! [WSR](#)

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