HybrYX® - HD with Soft Isolation

HybrYX® High Dynamic, Hybrid Air Bearing XY Stage with Soft Isolation System

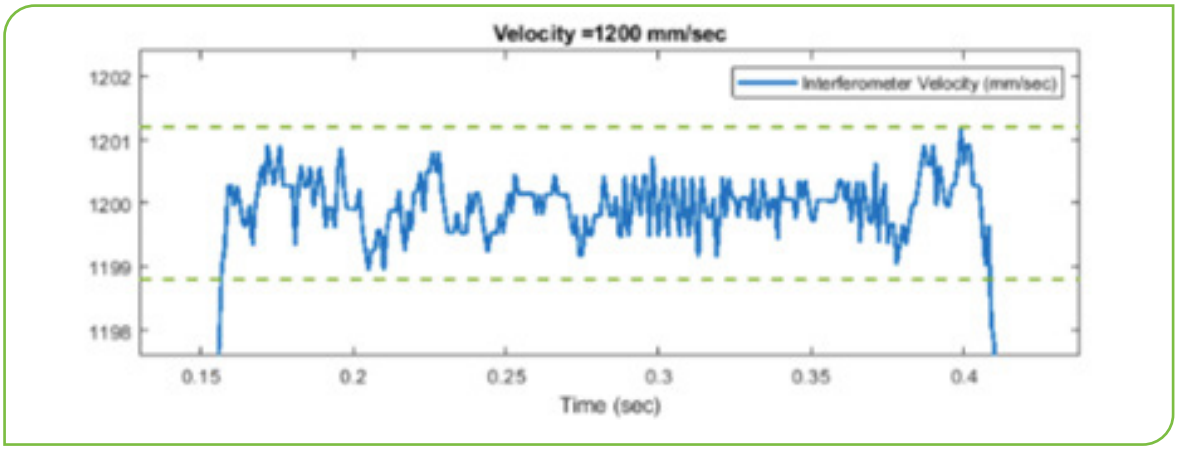
The HybrYX single plane XY hybrid stages are the latest addition to our air bearing products offering the advantages of a single plane air bearing stage with exceptional price-performance. HybrYX-HD with Soft Isolation System is well suited for semiconductor wafer processing systems, as well as being an excellent choice for use in large substrate inspection and processing tools. The Soft Isolation System option allows the system to operate at higher speed & acceleration (High Dynamic) without sacrificing stability at the point of interest or inducing vibrations into the floor.

Product Features

HybrYX stages blend the cost-effectiveness of mechanical bearings with the precision of a single plane air bearing carriage to deliver a powerful combination of throughput, precision and value. During motion, a ceramic/aluminum carriage freely slides in X and Y on a precision lapped granite reference plane using a proprietary pressure-vacuum air bearing design. This XY carriage is pressure-pressure guided on the beam and guided along the Y-axis by a rigid and lightweight SiC ceramic beam. The beam is supported (and guided) at each end by recirculating ball bearing carriages resulting in a low-profile design that is extremely rigid, well-damped, and capable of quick & precise point-to-point moves and exceptional high-speed scanning performance. This design also provides exceptionally high Z stiffness/stability for critical applications. Comparable to the density of aluminum and granite, SiC has the added advantage of higher stiffness compared to any other material used in precision motion applications, including steel and aluminum. The thermal conductivity of SiC is 6 X lower than aluminum. While its thermal expansion coefficient is lower than granite. The benefits of using SiC are the ability to move and stop at higher accelerations coming from its light weight and high stiffness and better accuracy and repeatability due to less susceptibility to thermal changes. Another measurable benefit from SiC's desirable characteristics is in position stability.

Features

- Excellent price-to-performance value for demanding industrial OEM applications
- Ideal for scanning applications requiring ultra-low velocity ripple & minimal dynamic following error
- True single plane XY architecture with optional theta and Z-Tip-Tilt solutions
- Reliable, long-life operation well suited for high duty cycle environments
- Large (>1 meter) XY Travel range
- Scanning velocities up to 2 m/sec and 5 g acceleration on Y Axis



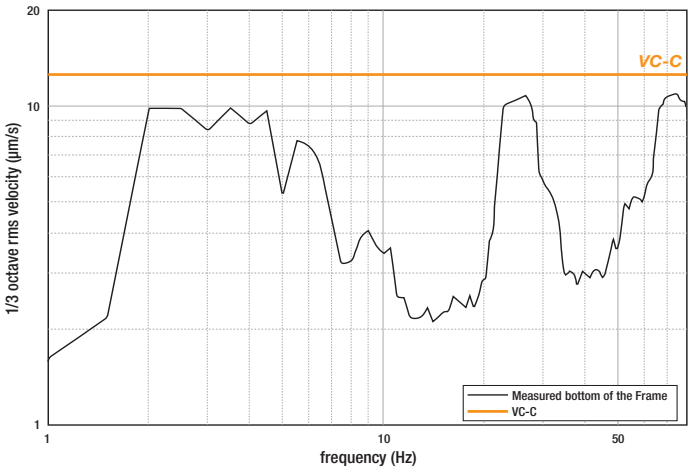
Ultra-low velocity ripple

Material Properties of SiC, Granite, and Other "Traditional" Stage Material

	Granite	Steel	Aluminum	SiC
Density: d	3	7.8	2.7	2.7
Young's Modulus: E, (GPa)	70	210	70	250
Stiffness (E/d)	23	27	26	93
Thermal Conductivity: TC (W/m*K)	2	50	180	30
Thermal Expansion: TE (10-6/K)	5	11	22	3.5

Soft Isolation System: Active motion compensation and vibration isolation

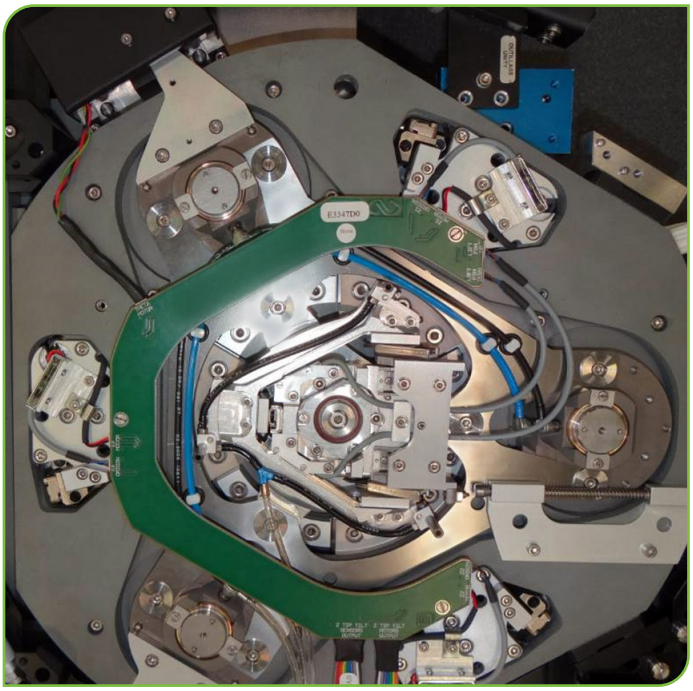
The patented Soft Isolation System is designed for applications such as optical lithography or wafer inspection that require fast movement from point-of-interest to point-of-interest, with minimal settle time while reducing vibration introduced to the production floor. The system includes 4 Soft Isolation modules, one for each corner of the granite base. The soft elastomer mounts isolate the granite from the frame and allow the granite to move in reaction to stage acceleration. One Soft Isolation module is equipped with "absolute encoders" in both X and Y to measure movement between the granite and the frame. The stage has an encoder in Y and two encoders in X (one for each end of the gantry). Using a Position Control Loop, the stage can actively compensate for movement by the granite and maintain a stable position at the "point-of-interest". The Soft Isolation System dramatically reduces any stage acceleration vibration (VC-C) transmitted to the production floor. The system allows for high acceleration and throughput without inducing vibrations into the subfloor.



Vibration induced at bottom of frame is below VC-C level.

Optional: ZT3 (Z-Tip-Tilt-Theta) with active plane technology

The patented ZT3 (Z-Tip-Tilt-Theta) module is designed for applications such as optical lithography or wafer inspection that require active alignments of a wafer/chuck in vertical, tip, tilt, and theta. The Active Plane drive technology provides high-bandwidth repeatable and stable positioning without compromising the dynamic performance of the XY stage. The ZT3 integrates cleanly within the SiC carriage of HybrYX and HybrYX-HD stages. The compact design includes an air bearing coarse theta which clamps for ultimate stability, and a lift-pin mechanism for simplified wafer loading and unloading. An optional piezo driven fine-theta axis with 0.1 µrad sensitivity may be added to allow for active yaw control/compensation.



- Travel Range: 4 mm Z; ±2 mrad (tip/tilt); ±2° (Θz)
- High resolution linear encoders directly measure movement of all voice coil driven axes
- Minimum incremental motion: 10 nm
- Step & Settle: 5 µm displacement in 50 ms settled to ±50 nm
- Load capacity: < 2.5 kg including chuck

Applications:

- Wafer Inspection
- Laser Annealing
- Laser Wafer Dicing
- Laser Direct Imaging
- Advanced Packaging Lithography
- PCB Patterning
- PCB Drilling
- Wafer Bump Inspection
- Automated Optical Inspection

SPECIFICATIONS

Travel Range X/Y	500 mm / 320 mm
Speed X/Y	1500 mm/sec / 2000 mm/sec
Peak Acceleration X/Y	1.5 g / 5 g
Repeatability X/Y	± 75 nm / ± 45 nm
Accuracy X/Y (mapped)	0.450 µm / 0.150 µm
Pitch and Yaw	< 15 µradian
Step & Settle (10 µm) ±100 nm X/Y	90 ms / 30 ms
Step & Settle (25 mm) ±100 nm X/Y	540 ms / 335 ms
Step & Settle (80 mm) ±100 nm X/Y	760 ms / 425 ms
Speed Stability	± 0.1%
RMS Acceleration with standard payload of 5 kg X/Y	6 m/s^2 / 20 m/s^2
Payload	5 kg
MTBF (25% load, 30% duty cycle)	>20,000 hrs
Other Features	Z-Tip-Tilt-Θ option for wafer chuck

Low vibration emission enabled by our Soft Isolation System

Ordering Information

All models are customized to meet customer requirements:

a) HybrYX-HD with Soft-Isolation System

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