Motus Mechanical

Performance Datasheet

Hard-spring, Soft-spring Attenuator

The hard-spring, soft-spring attenuator features a soft-spring stage, consisting of two springs, and hard-spring stage, consisting of 18 springs, creating an attenuator analogous to a voltage divider where a large and small resistance is placed in series. In this configuration, the device has an attenuation ratio of 9-to-1 (all springs are same stiffness). With a high-quality micrometer, this assembly can be used to control nanometer level translations. By adding additional series stages, using softer (thinner) springs in the soft-spring stage, or adding stiffer springs to the hard-spring stage, the attenuation ratio can be increased significantly. This device can be assembled in less than one hour.

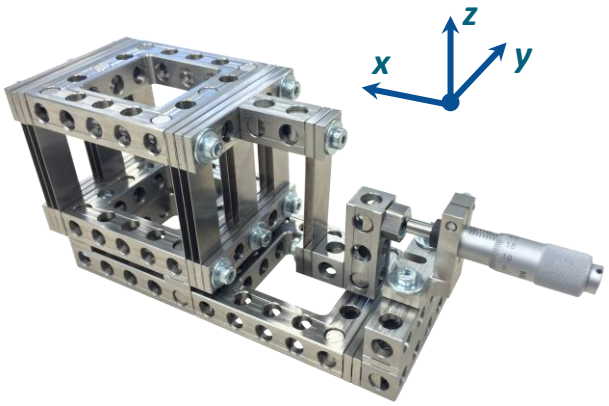

Figure 1: Hard-spring, soft-spring attenuator assembled using MechBlocks from Motus Mechanical.

Defining the x-axis as the primary direction of motion, as shown in Figure 1, the roll, pitch, yaw, straightness in y, and straightness in z were measured. The pitch and yaw were measured using an Optodyne LDDM laser interferometer. The roll was measured by spacing two DTM22 Lion precision capacitance gages 50.8 mm apart and measuring against two gage blocks attached to the side of the translator. By measuring the relative change in displacement between the capacitance gages, roll was calculated. Straightness in y and z was each calculated using only one cap gage measurement. The theoretical arcuate motion in the z direction was predicted for comparison, see Figure 7. All measurement gages were set up using custom fixtures produced from MechBlocks. The results of the tests are shown in Figure 2 through Figure 6.

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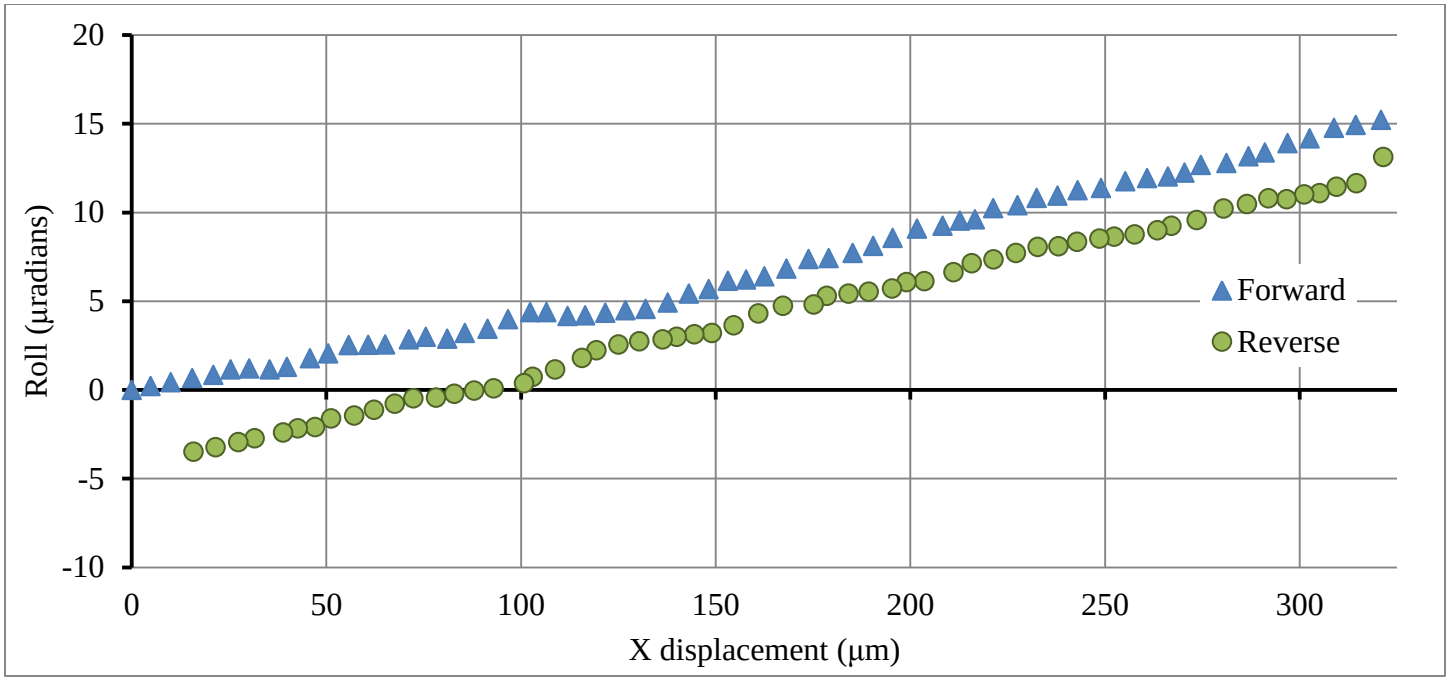

Figure 2: Plot of roll (rotation about the x-axis).

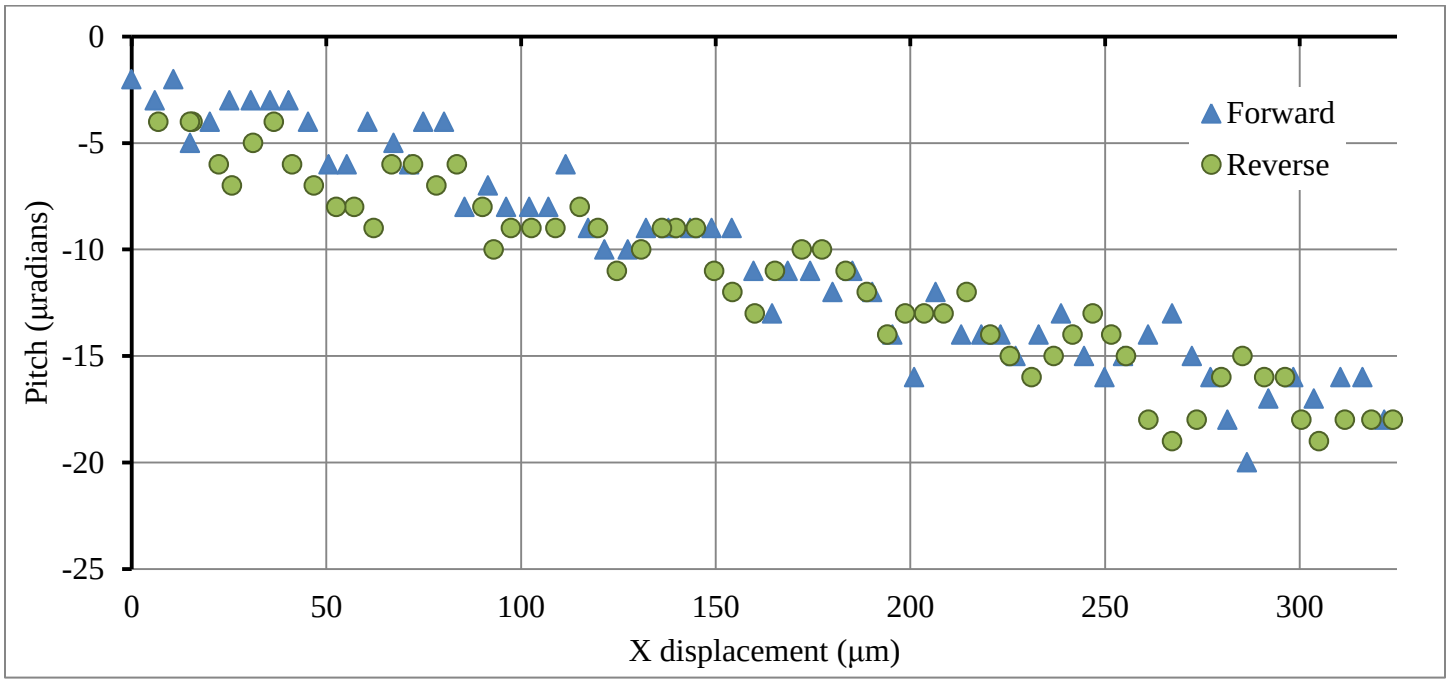

Figure 3: Plot of pitch (rotation about the y-axis).

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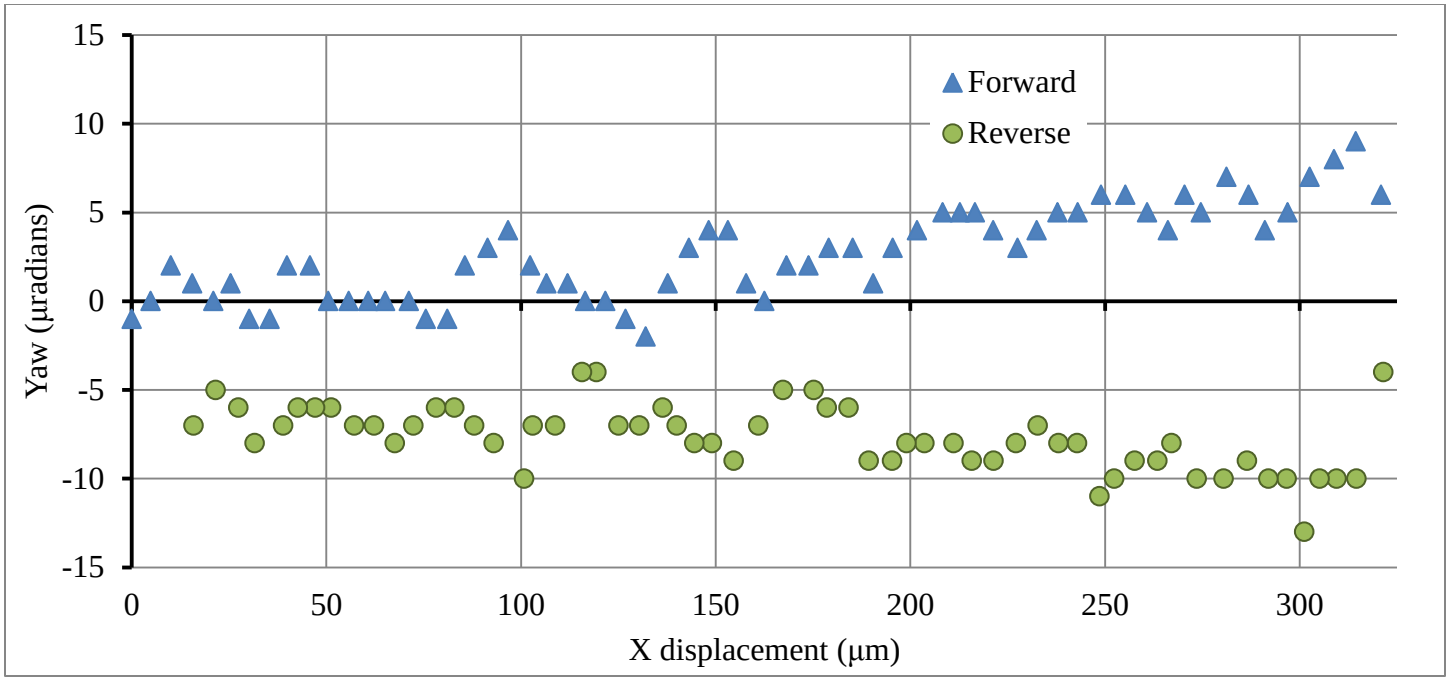

Figure 4: Plot of yaw (rotation about the z-axis).

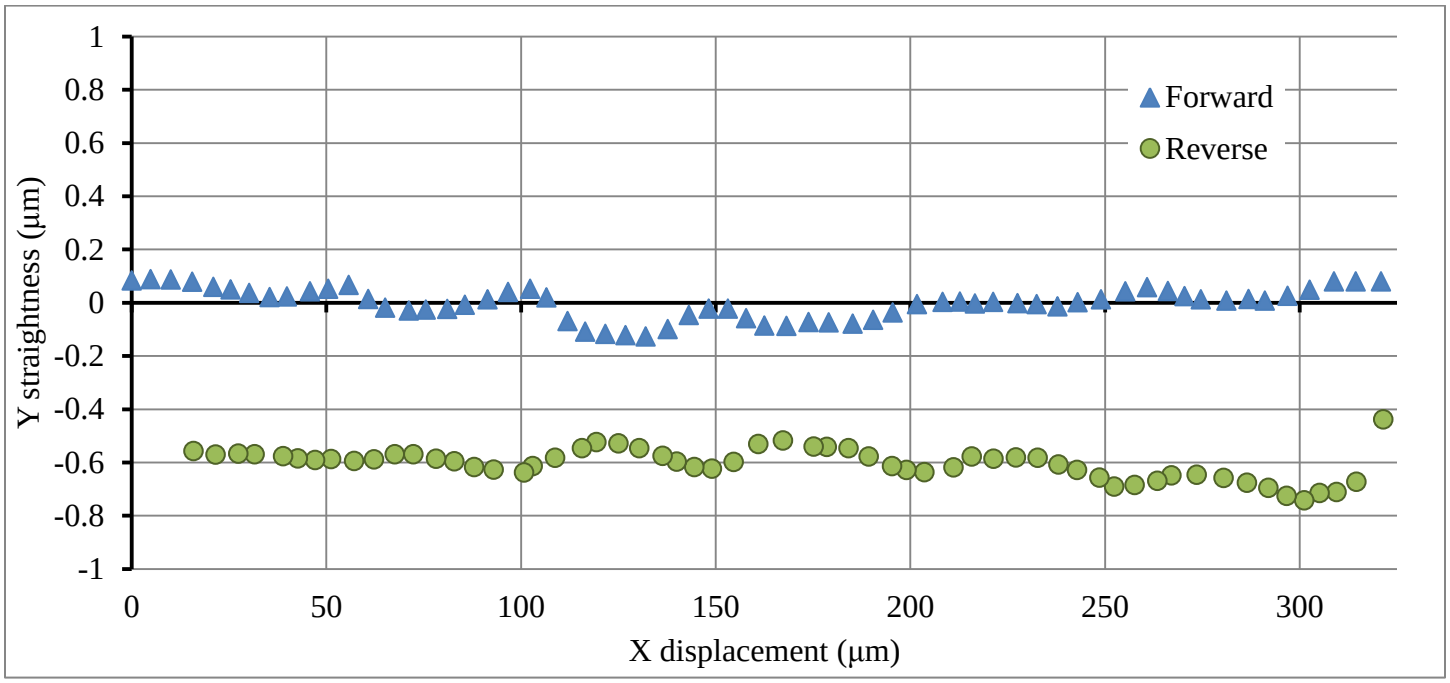

Figure 5: Plot of y-straightness (deviation in the y-axis).

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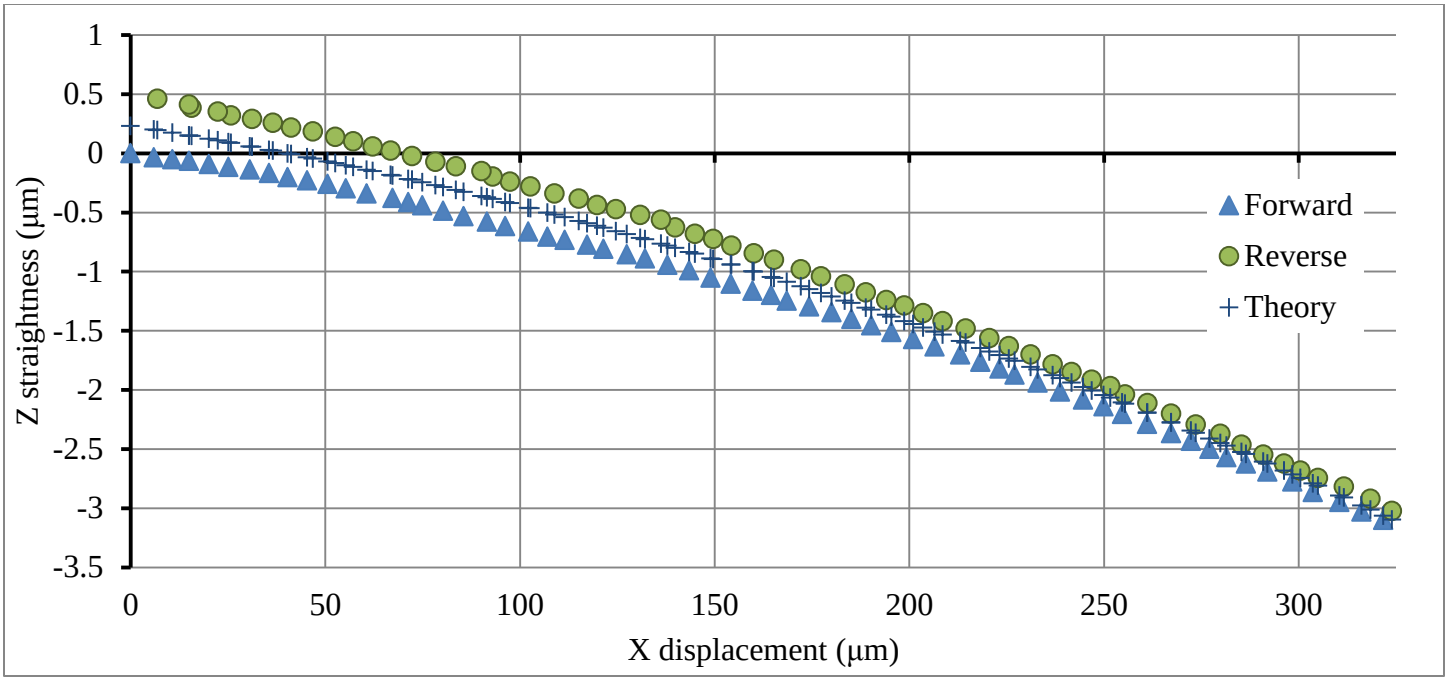

Figure 6: Plot of z-straightness (deviation in the z-axis).

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