

Motus Mechanical

Performance Datasheet

Four-bar Arcuate Translation Stage

The four-bar arcuate translation stage is one of the simplest flexure mechanisms that can be assembled using MechBlocks. This assembly features 1-axis translation of 4 mm that is slightly arcuate but highly repeatable and predictable. We used 0.3 mm thickness springs here, but thinner springs or even longer springs could be used to increase the range. In addition, having a return spring to enable translation in the opposite direction would double the range. This mechanism has many uses and can be put together quickly in less than 15 to 30 minutes.

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 38.1 mm apart and measuring against two gage blocks attached to the side of the translation stage. By measuring the relative change in displacement between the capacitance gages, roll could be calculated. Straightness in y was calculated using only one of the cap gage measurements. Straightness in Z was measured using a Fowler LVDT measuring a gage block mounted to the top moving platform of the translation stage. The theoretical arcuate motion was predicted for comparison, see Figure 7. All measurement gages were set up using custom fixtures produced from MechBlocks, see Figure 2. The results of the tests are shown in Figure 3 through Figure 7.

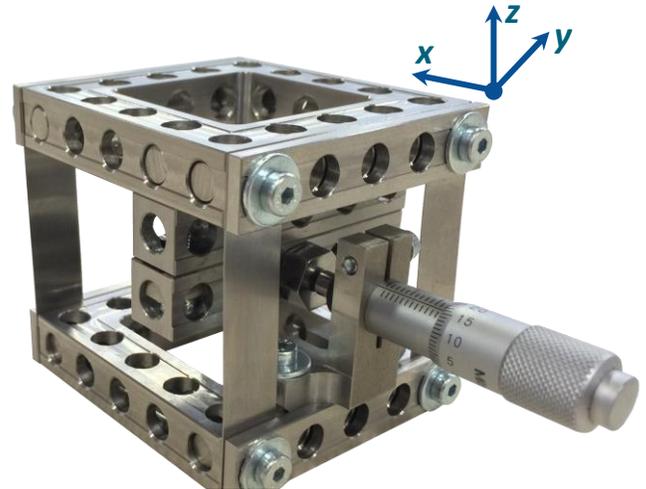


Figure 1: Four-bar arcuate flexure translation stage assembled using MechBlocks from Motus Mechanical.

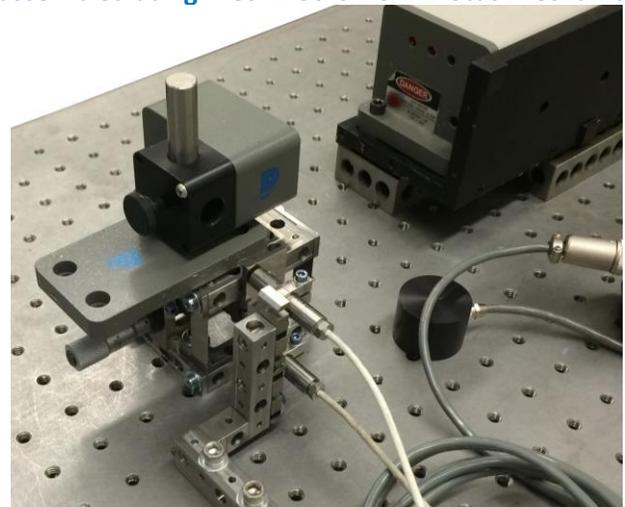


Figure 2: Image showing one of the metrology configurations with custom fixtures produced from MechBlocks. Note that these are our previous generation products which have now been updated.

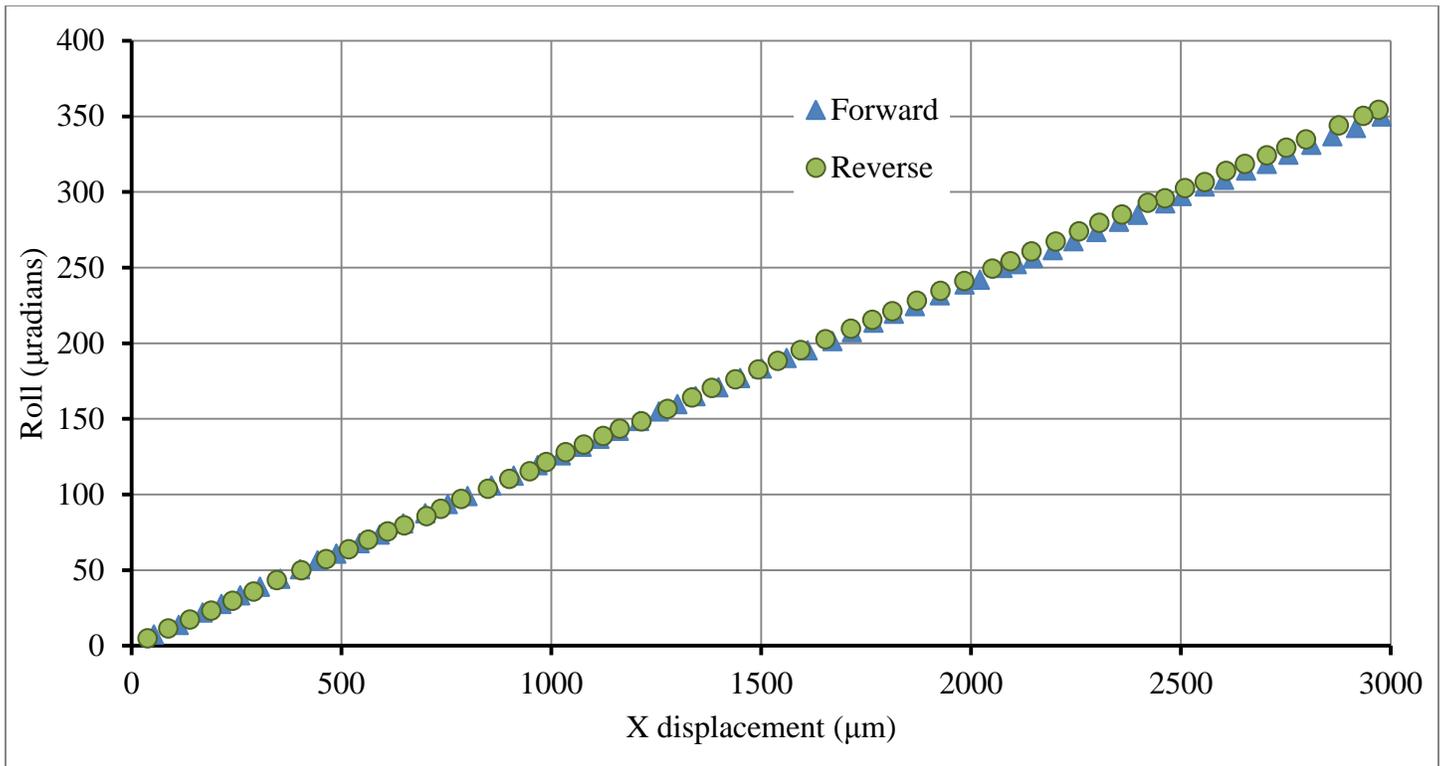


Figure 3: Plot of roll (rotation about the x-axis).

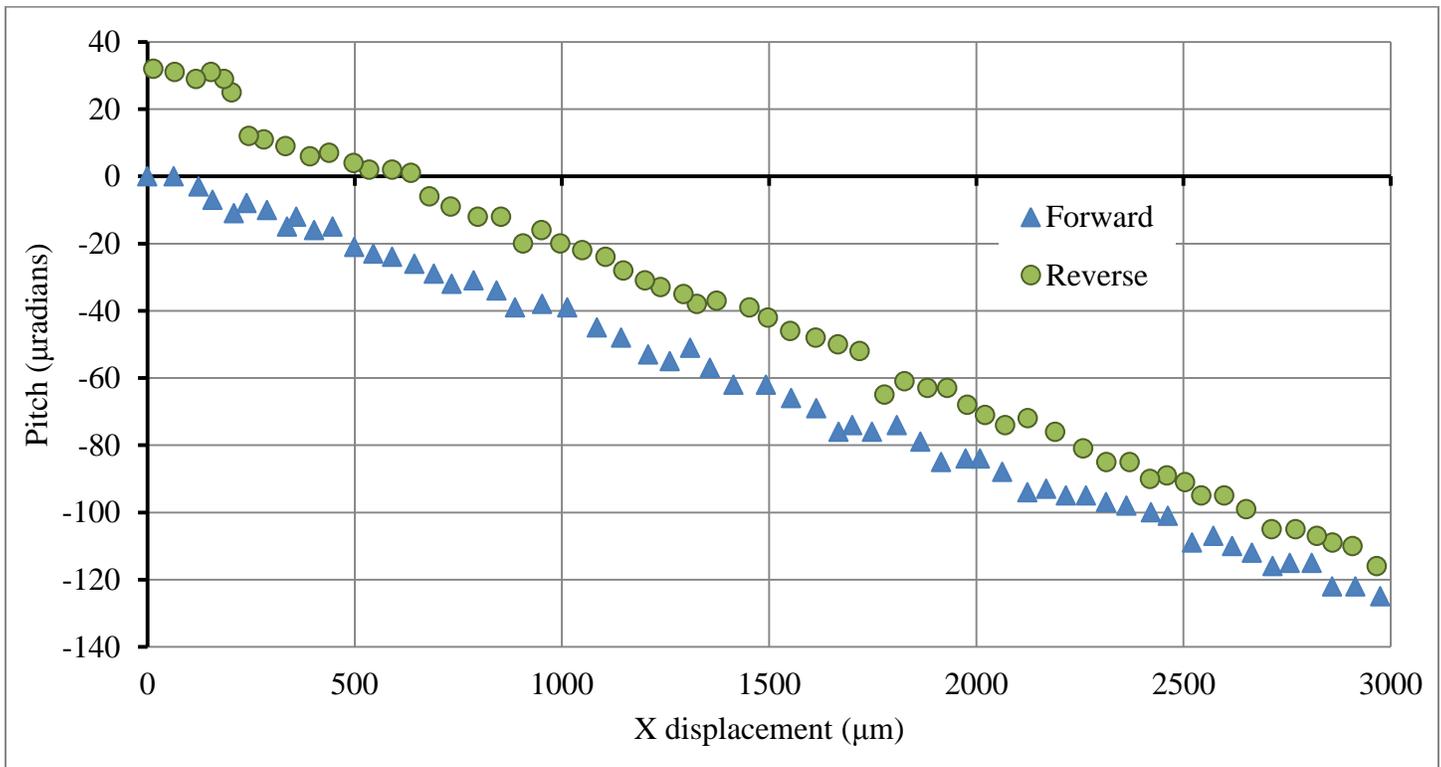


Figure 4: Plot of pitch (rotation about the y-axis).

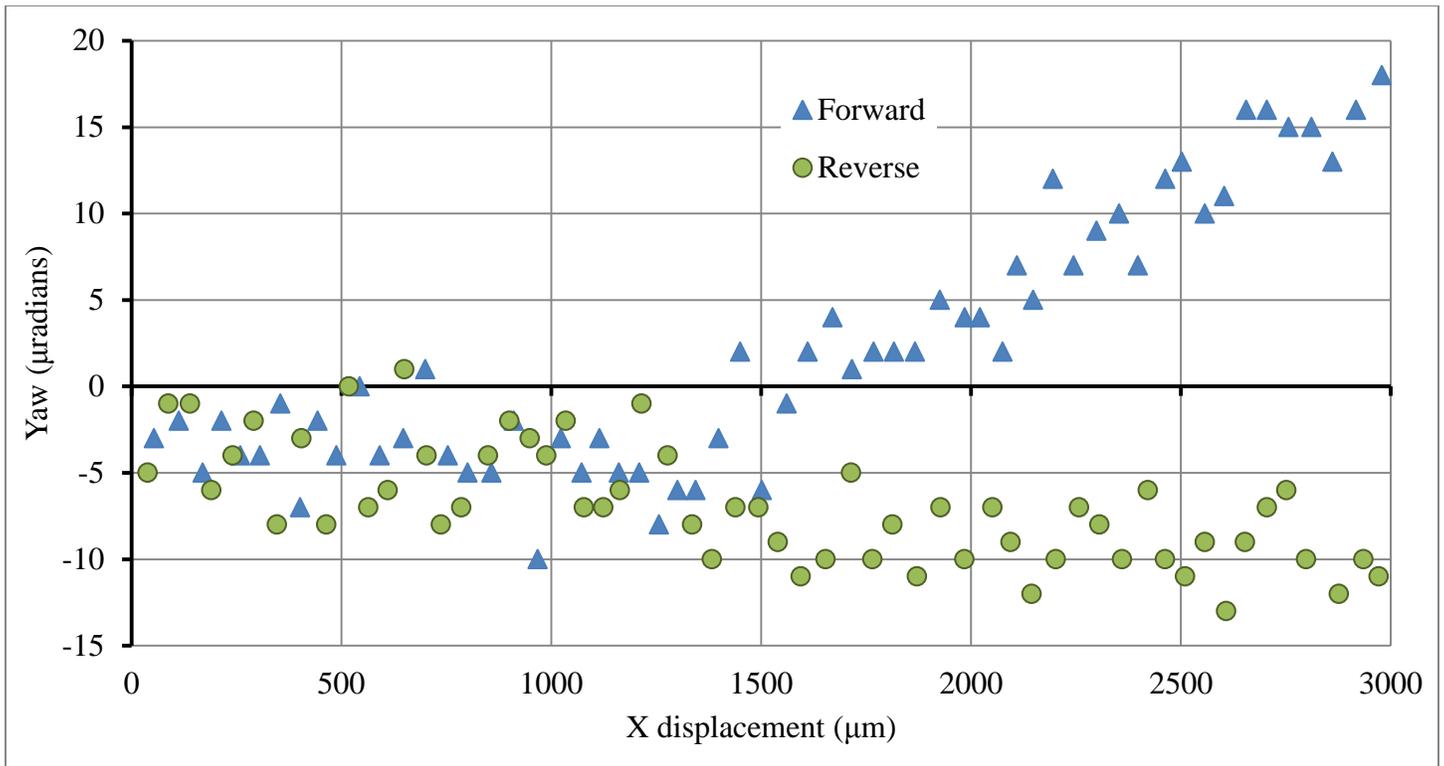


Figure 5: Plot of yaw (rotation about the z-axis).

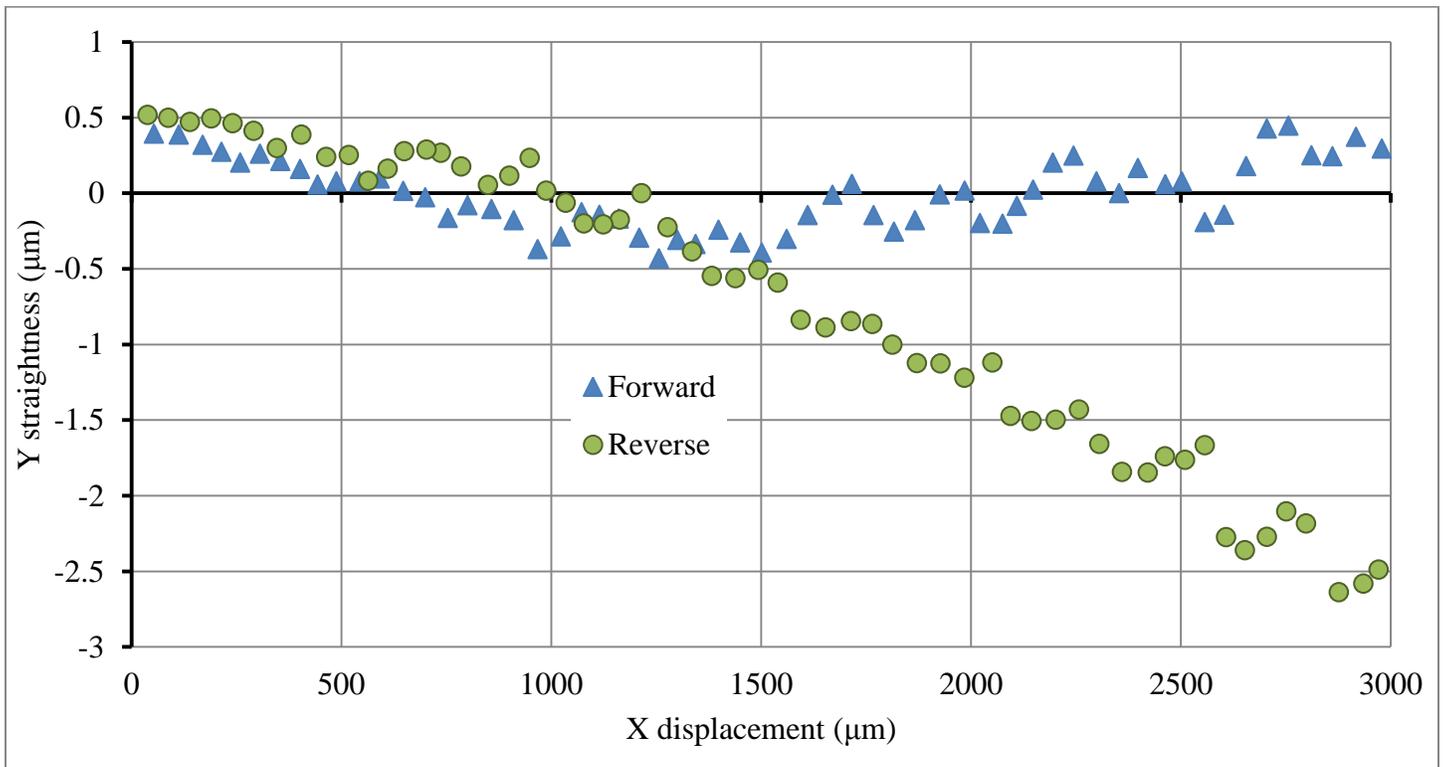


Figure 6: Plot of y-straightness (deviation in the y-axis).

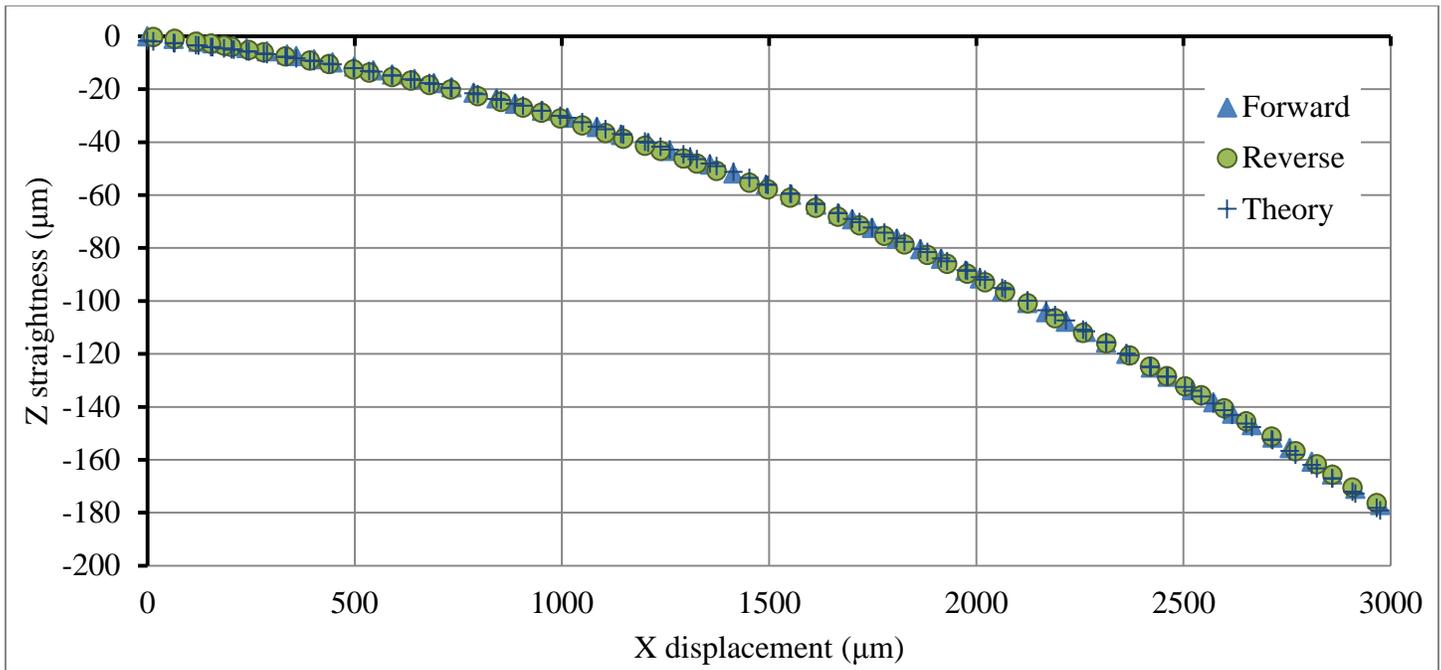


Figure 7: Plot of z-straightness (deviation in the z-axis). This z-straightness error represents half of the arcuate motion of the stage.