**Power screw/ Worm gear Calculations:**

The following calculation was preformed to obtain an understanding of the feasibility of implementing a power screw and worm gear system for hard constraint control in a linear displacement joint prototype. The main intended purpose of this calculation was to quantify the minimum motor speed needed to be able to adjust the hard surface constraint in sufficient time.

Main system parameters such as stroke, worm and worm gear pitches, and power screw pitch diameter, were chosen based on the anticipated size of the linear displacement joint. The mass of the load was chosen to be 10 kg, based on the functional requirement of the device which states that it must resist a pushing force of 10 kg minimum. The speed of the load (the pushing force in this case is assumed to be constant) was roughly calculated to be 0.5 m/s, based on a distance of 0.5 mm (from functional requirements also) to be pushed in 990 microseconds (leaving the remaining time for sensing, transmission, and computation).

The torque requirements of the gears and worm involved in the design were calculated, in order to properly spec out these components if needed. In general, the torque/force values were quite low, so most of the gears and worms found in the market would meet the limit. The required speed of the motor was also found to be approximately 3000 rpm, assuming a triple thread (gain) worm. Although this value is within the realms of physical and mechanical possibility, it is a tough performance to achieve, especially in our high precision and immediate response application.