

Project Learning Pre-Loading Bearings

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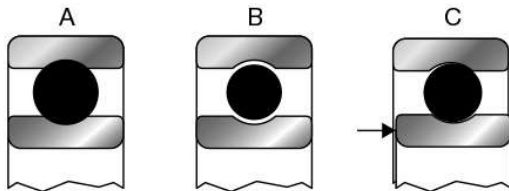
An easy way to reduce play in a bearing system and to increase its rigidity is to pre load the bearings themselves.

Preloading is the act of applying an axial load to the bearing to reduce the excess play. Preloading eliminates the clearance between the balls of a ball bearing and the inner and outer races. Without preloading, the rolling elements have the freedom to slide instead of rolling which can cause misalignment.

From National Precision Bearing there is a correct amount of preloading that you want to do as seen below:

How Much Preload?

The best preload for a system should be individually determined based on a bearings size and the system's required stiffness, starting torque, running torque, life, and loading parameters. Excessive preload can cause increased heat, fatigue, and torque. Insufficient preload can allow resonant vibration causing fretting of the raceways.



Left image: A bearing with no play, or an interference fit has all rolling elements loaded, wears and heats up excessively.

Center image: A bearing with standard play in the free state has low rigidity, and rolling elements can slide or skid instead of rotating.

Right image: A standard bearing with proper preload applied will provide system rigidity, reduced vibration, and optimal bearing life.

A preload is easily applied in a few different methods:

- 1) Solid Preload
 - a. Achieved by holding the inner and outer rings of the bearing in place with spacers or a locking mechanism while applying an axial load
- 2) Spring preload
 - a. Created by using a coil spring or a spring wave washer to apply a constant axial load on the inner or outer ring of the bearing

Spring preloading is most commonly used because of how easy it is to install.

On the inner links of our robot we will be preloading the bearings using spring wave washers in conjunction to retaining rings in order to preload each bearing.