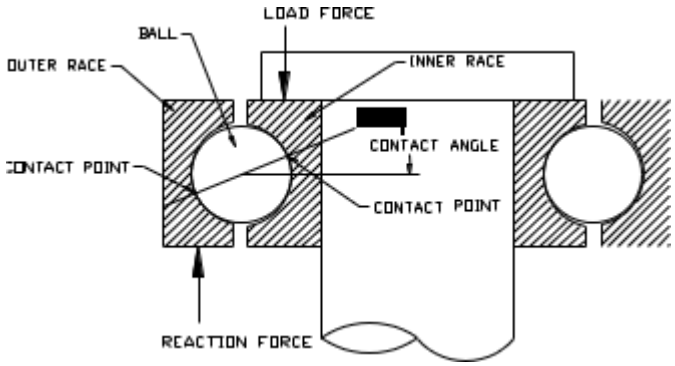
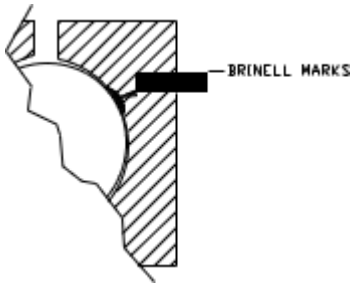
Lincoln Motor Polygon Assembly (MPA) Handling Guidelines

Many Lincoln polygon scanners use ball bearings to achieve smooth, repeatable rotation of the polygon mirror. Their performance directly reflects our product's ability to point the customer's optic beam, achieve speed stability, and meet jitter requirements. As a result we incorporate bearings that have been manufactured to higher standards and reflect higher precision than standard grade bearings. While these bearings are precision components they are fragile during and after assembly. The fragility is caused by the high stress at the point of contact between balls and the raceways.



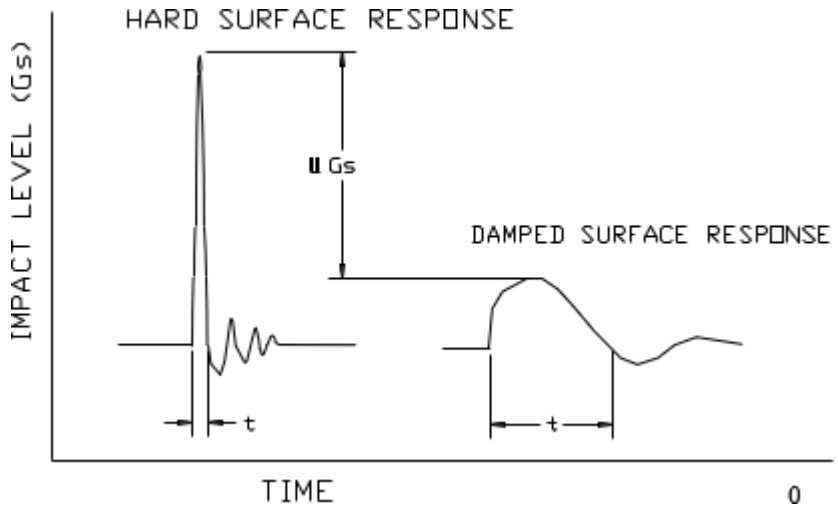
Each bearing type has a unique rating for its load carrying capacity. The load capacity is a function of the bearing geometry at the ball/raceway contact points (number of balls in the bearing, the size of the balls, the contact angle of the balls to the raceway, etc.). If a load that exceeds the rated capacity is applied across the bearing, the raceways and/or balls will permanently deform. This deformation is called brinelling.



Brinelling a scanner's bearings results in unwanted displacement of the polygon, reduced speed stability, audible noise, and repeatable vibrations.

Improper handling of a scanner is a common source of overloading or Brinelling of bearings. During handling, the polygon scanner assembly can be subjected to very high acceleration levels from impact shocks. These shocks impart high forces across the bearing and its ball/raceway contact points. The two factors that determine the effect of the shock impact are the energy of the object before impact and the energy absorption of the surface that is contacted.

The figure below shows two shock impulses (time based response of an impact). Notice the acceleration level is reduced significantly (Gs) when the surface impacted is damped. The duration of the energy dissipation is however increased.



To reduce the potential for brinelling of bearings:

- Handle scanner assemblies delicately and deliberately.
- When a scanner is removed from its packing, place it on a soft surface such as 30 durometer, 2 inch thick, static dissipative foam.
- Ensure the scanner is installed into your assembly with tooling that ensures a smooth and damped transition and contact.
- Ensure the damping between your system and the scanner does not amplify shock events.

If repackaging a scanner for further shipment:

- Ensure the packaging material provides equivalent damping to Cambridge Technology's packaging material.
- Ensure that the scanner will not settle and come into hard contact with the inside of the box.
- Contact Cambridge Technology if repackaging significantly affects shipment such as de-palletizing

Contact Cambridge Technology Sales for further guidelines if high shock levels can be experienced during shipment of your system to your customers.