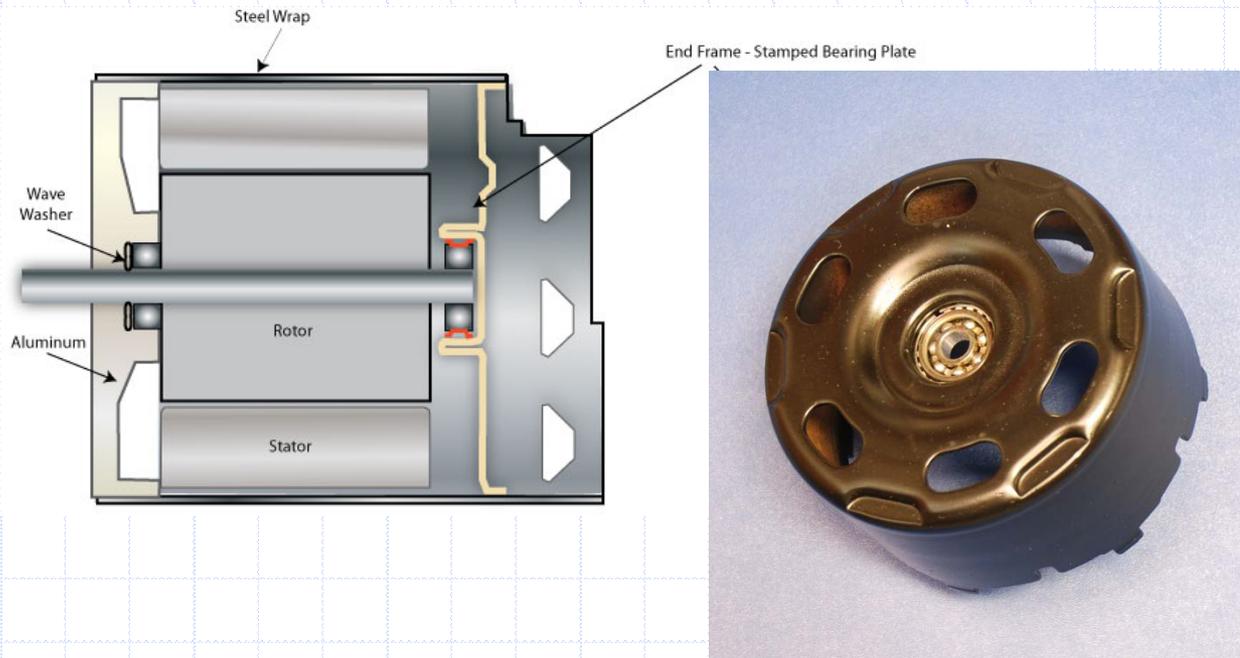


The Most Common Application For Tolerance Rings Is To Mount Ball Bearings In Housings

Why?

A Good Question!



It Solves Bearing Mounting Problems

There are some specific reasons why tolerance rings work in ball bearing mounting applications.

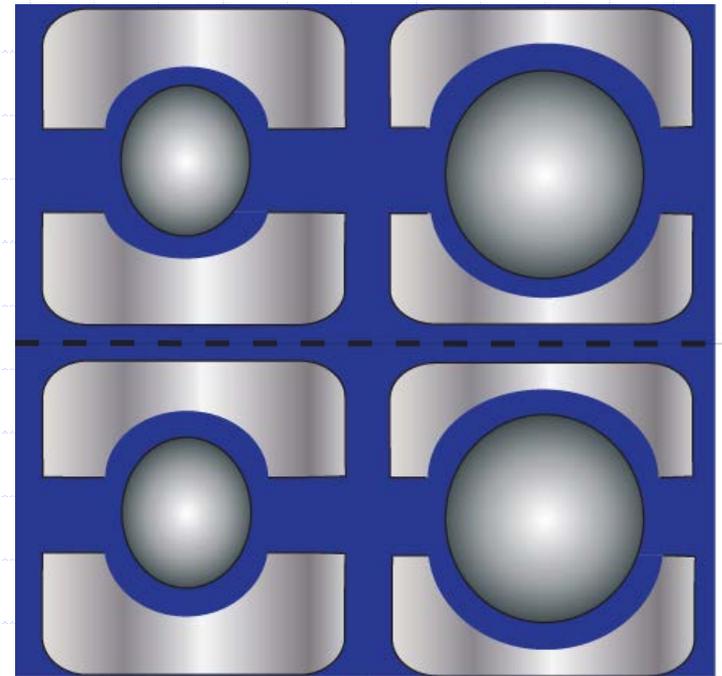


Ball Bearing Design

Ball Bearing manufacturers have increased their theoretical capacities by increasing the ball size and thinning the bearing inner and outer sections.

Using the formula $c = KfcD^{1.8}$, for an increase in ball size of $X\%$ there is approximately a corresponding increase in capacity of $2X\%$ and an increase in life of $6X\%$.

Thin bearing rings place an increasing proportion of application success on good housing design practice and require more exacting tolerances for housing bores.



Housing Design Requirements

Using a 6203 ball bearing as an example...the ball bearing outside diameter tolerance is .011 mm or .00045 in. The internal clearance of this bearing in the free state is .003-.018 mm or .0001-0007 in. The recommended standard steel housing bore tolerance for this popular ball bearing is +.016 mm or +.0006 in. Depending on the complexity of the housing, in most cases a grinding operation will be required to ensure adequate support for the ball bearing outer ring. Any out of roundness or housing wall variations could adversely affect ball bearing performance and life. Without a tolerance ring there is no place for the housing irregularities to go, but into the bearing.



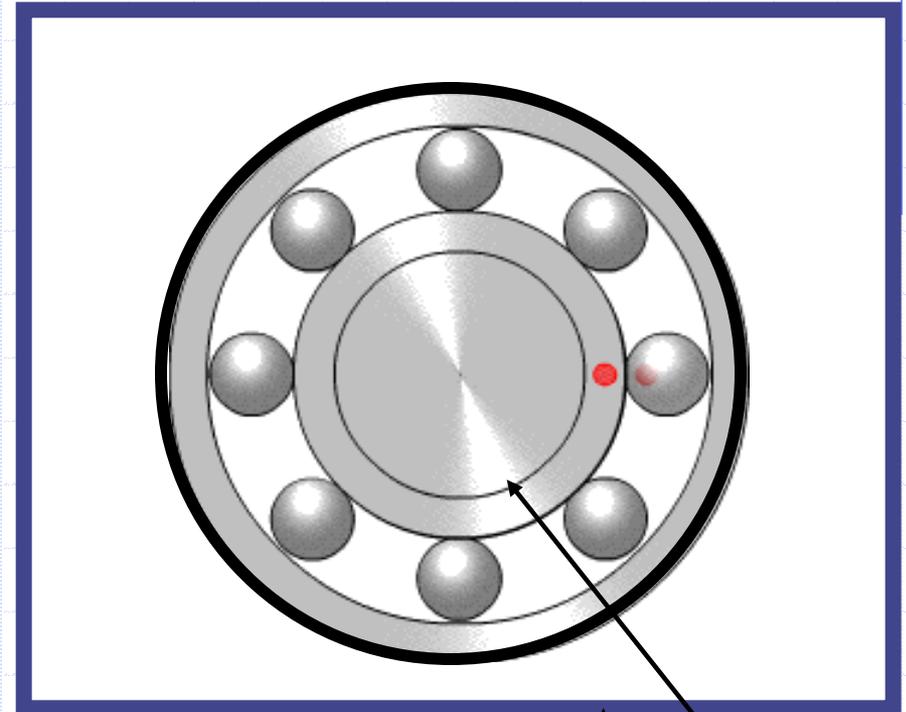
In the worst case, using a tolerance ring would require only a machining operation. The recommended housing bore tolerance with a tolerance ring increases to .010 mm or .004 in.

The Ideal Ball Bearing Mounting

In normal applications with a stationary outer ring load on the ball bearing, the ideal fit up to provide good support for the ball bearing outer ring would be a tight inner ring and a snug outer ring.

The more the clearance between the housing and the ball bearing outer ring, the more problems that will result.

Unless you precision grind the housing you will never achieve a snug fit.

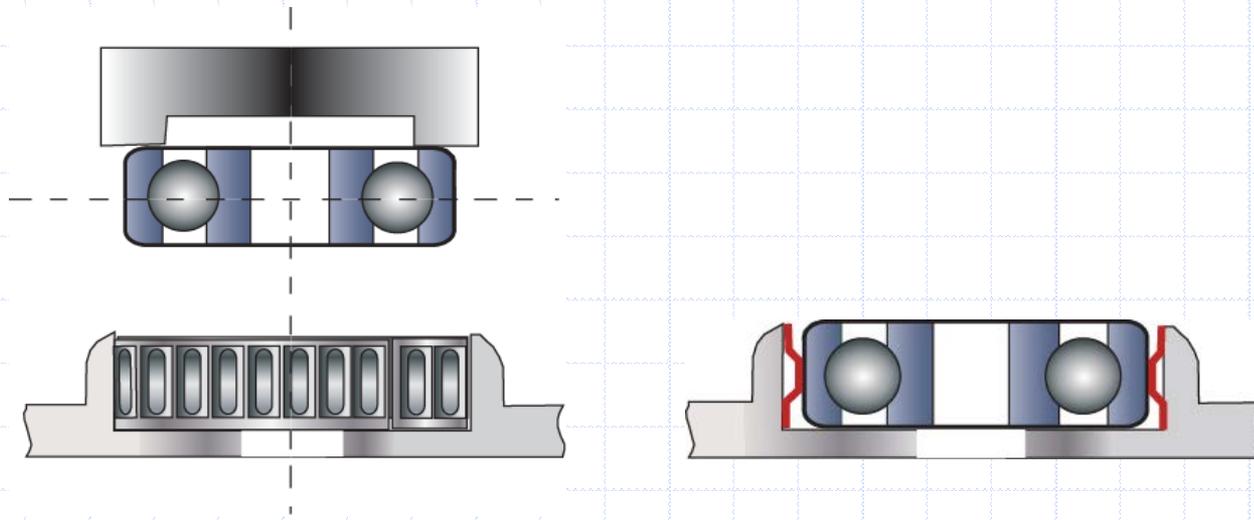


Housing Stationary

Shaft Rotating

The Ideal Fit Up

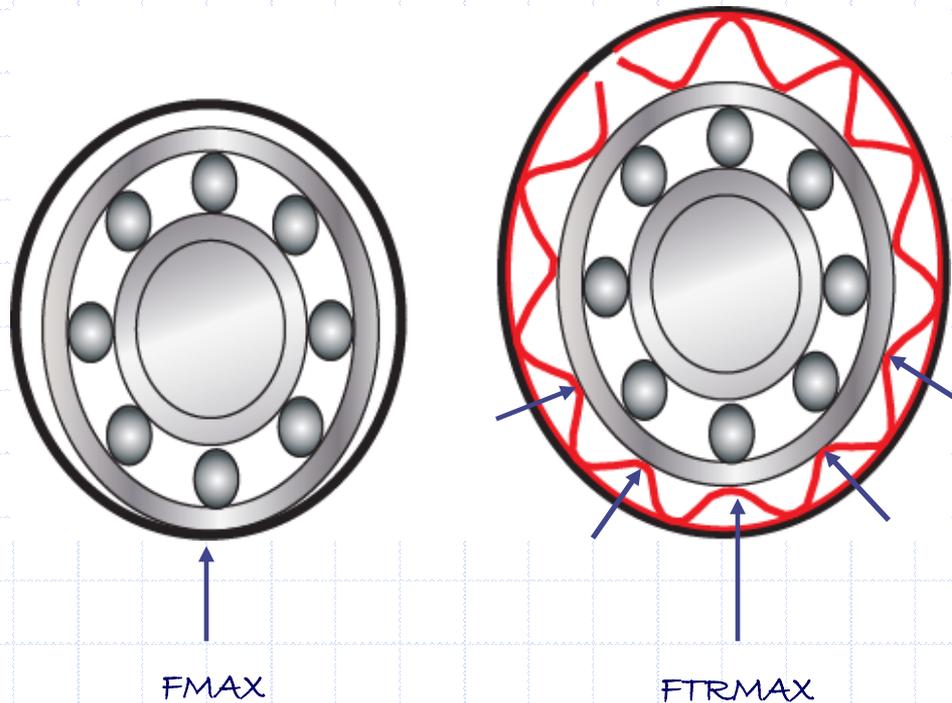
A precision ground housing and a snug fit will only be ideal if there is no bearing misalignments during installation and if there are no thermal expansion requirements for the ball bearing to float in the housing.



A Tolerance Ring provides the ideal fit up between a ball bearing outer ring and its housing bore. Tolerance Rings will compensate for expansion and minor misalignment. The outer ring will fit snugly between the Tolerance Ring and the housing bore.

Some Common Ball Bearing Mounting Problems

Fretting corrosion is a common problem with looseness in the housing bore. The microscopic movement between the outer ring and the housing bore results in this damaging action. In combination with oxidation, tiny hard corrosive particles are generated and the resulting contamination could adversely affect operation. In lightly loaded applications, seal drag and friction created by grease can cause the bearing to spin in the housing causing wear and premature failure.



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