

## **Procedure For Installing Precision Preloaded Taper Bore Spherical Roller Bearings**

### **Supplementary Notes On Roll Preparation And Bearing Care**

#### GENERAL COMMENTS

##### **IMPORTANT -**

The installation of precision grade taper bore preloaded bearings require careful handling with specific mounting procedures followed to avoid bearing damage and to ensure proper operation. These bearings are manufactured to extremely close tolerances and any shock load from inadvertently dropping or mishandling will destroy the precision characteristics of the bearing requiring replacement. It is important that all handling and mounting procedures be properly observed.

Prior to mounting the bearings, a final check of the shaft for proper taper and bearing mounting dimensions is advisable unless the roll is certified for final installation. The proper taper angle and roundness of the bearing shaft seat are critical since any deviation here will adversely affect the bearing and roll run out or T.I.R. characteristics. Check the shaft by bluing in with a ring gage or, in lieu of a gage, with a spare bearing master inner ring member. To check the roundness and taper angle of the shaft bearing seat, carefully clean the gage bore and bearing shaft seat. To "blue in" the shaft properly, apply a light evenly spread coating of Prussian blue to the gage ring bore and lightly seat the gage with even hand pressure on the shaft seat. While applying light axial hand or thumb pressure to the gage, slowly rotate the gage 90 degrees and rapidly straight pull or snap the gage off using care not to contact the shaft seat again during the pull off operation.

For proper surface contact between the later installed bearing and the shaft there should be at least 80 percent random (with no single total localized or one place open void) registry of bluing on the shaft seat.

#### SUPPLEMENTARY ROLL NOTES

The final grinding of the roll prior to the bearing installation is critical to the performance of the roll itself. It is always best to grind the main roll O.D. and the taper bearing seats off reference land support surfaces at each roll end as versus supporting the roll on centers during the grinding process. This grinding approach eliminates some otherwise potential grinding variables and ensures that the roll O. D. and the taper shaft bearing seats are near perfect concentric with each other. Further roll T.I.R. accuracy can be obtained by follow up final grinding the roll O.D. using the bearing themselves to support the roll. The latter final grinding method is highly recommended to achieve the best possible roll running accuracy.

Proper annealing or stress relieving the roll is also important prior to grinding to eliminate or minimizing residual stresses and creep distortion to retain long term roll precision accuracy.

A one piece total integral roll is superior in design and is recommended, where possible, as opposed to pressed in and bolted on stub shafts. This is especially true for extremely accurate T.I.R. rolls.

It is further advocated that the roll end shafts incorporate a hydraulic removal feature to facilitate ease of bearing removal for periodic bearing inspection and roll servicing. Design data relative to this feature is available upon request.

#### TAKE UP SPACER

A bearing - shaft take up control spacer may or may not be used, although it is advisable that this spacer be utilized to provide for accurate setting of the preload, maximum bearing stability, and roll location control. The spacer must have the flat faces ground with both faces ground parallel with each other to within .0001 parallelisms. The shaft shoulder must also be held square to the bearing seat as close and precise as possible.

#### INSTALLATION OF BEARING MEMBER

1. First clean the shaft thoroughly. Install the spacer against the shaft shoulder making certain there is no interference with the shaft shoulder corner radius.
2. Unwrap bearing and hand wipe off bearing exterior including the taper bore carefully with a lint free cloth. **DO NOT EMERGE THE BEARING IN ANY SOLVENT OR FURTHER ATTEMPT TO CLEAN INTERNALLY.** Lightly re-coat taper bore and shaft seat with a very thin film of light grade oil. Observe the tangential outer ring torque pull and corresponding taper shaft take up etched on the outer ring face. Record this information for later reference.
3. Place bearing on the taper shaft seat. Apply even light hand pressure to just seat or line fit the bearing against the shaft taper seat. Use care to avoid misaligning bearing. (If the bearing inadvertently becomes misaligned a few degrees, slowly oscillate bearing outer ring back and forth while applying light hand pressure to re-align the outer ring member to its original position - **do not force the outer ring during the re-alignment process** ). Forcing the outer ring and rollers into re-alignment may damage the bearing, destroying its precision characteristics.
4. Measure the gap distance remaining between the spacer and inner ring face of the bearing. Remove bearing and spacer and final grind the spacer face to a width that will allow the bearing to be taken up the distance as etched or recorded from the face of the outer ring. This will set the

proper bearing preload. An alternative gap measuring method is to directly measure the distance between the shaft shoulder and the inner ring face. The spacer can then be directly ground to a width which will allow for the proper bearing take up.

5. Install non-split inner housing seal and cover or retainer plate at this time. Position members out of way against the main roll body.
6. Re- install the spacer and orient the bearing inner ring so the high point of run out (etched arrow) is 180 degrees opposite the high point of the shaft bearing seat. This is especially important where no further grinding is performed on the roll using the bearings as supports. Install lock washer. Using either a standard type or hydraulic nut, slowly push the bearing slowly up the shaft taper seat and tightly against the spacer. Check tightness by attempting either to rotate the spacer or through insertion of shim stock between the spacer and inner ring.
7. Lock locknut with lock washer.
8. If desired, the bearing torque can be verified by wrapping a tape around the outer ring O.D. and pulling with a measuring scale. The pull must be constant and even for three or four outer ring revolutions to achieve an accurate torque reading. There is sufficient oil in the shipped bearing for this test. The outer ring must be kept in near perfect alignment position during this test for an accurate torque reading.