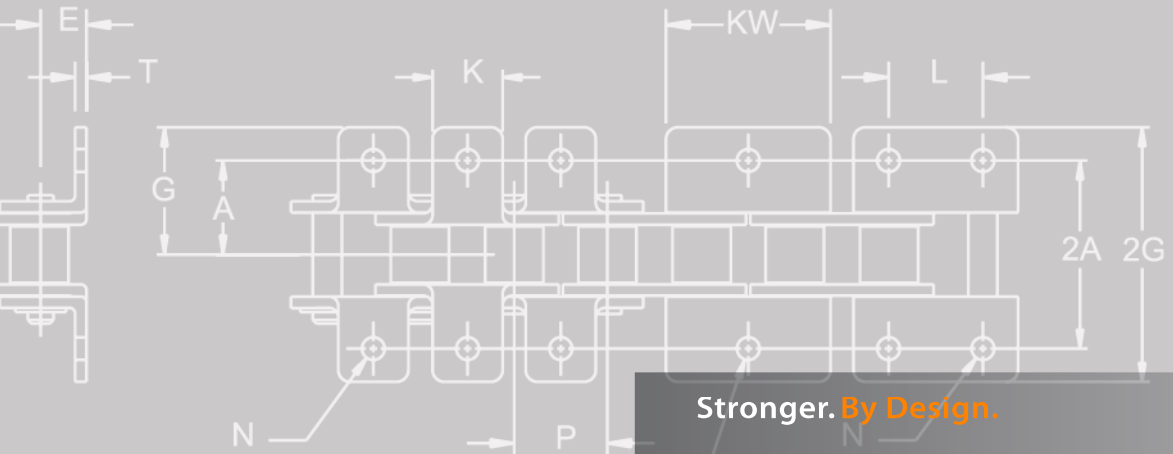
TIMKEN

Rolling Mill Chock and Bearing Maintenance



Stronger. By Design.

Rollneck Bearing Maintenance

Subjects to be Covered:

- Remove the bearing from the chock;
- Inspect bearing components and the chock;
- Install the bearing into the chock;
- Inspect the roll neck; and
- Mount the chock assembly onto the roll neck.

Rollneck Bearing Types

4-Row Cylindrical Roller Bearing

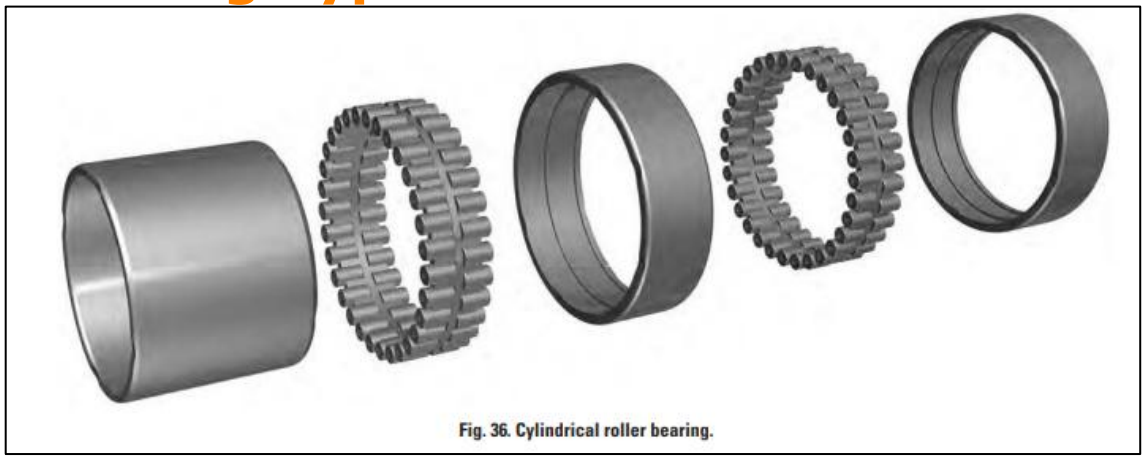
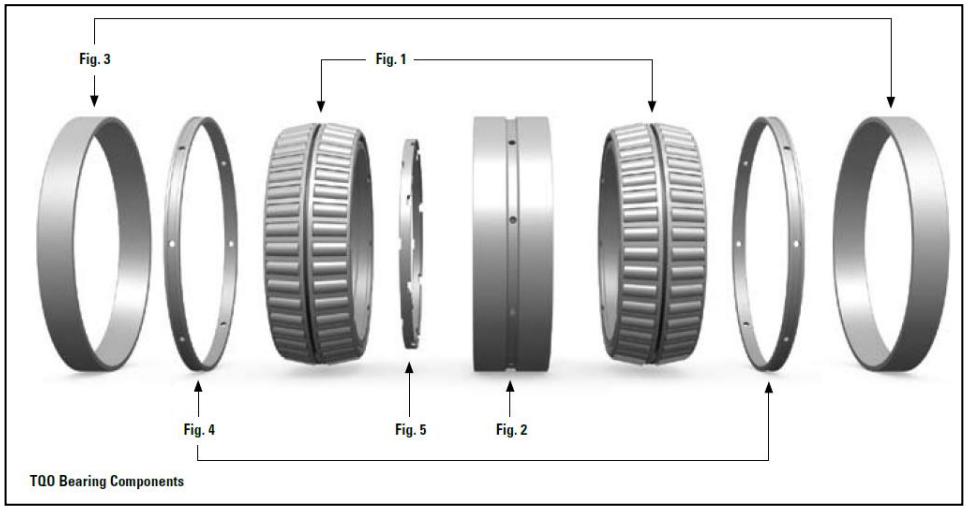


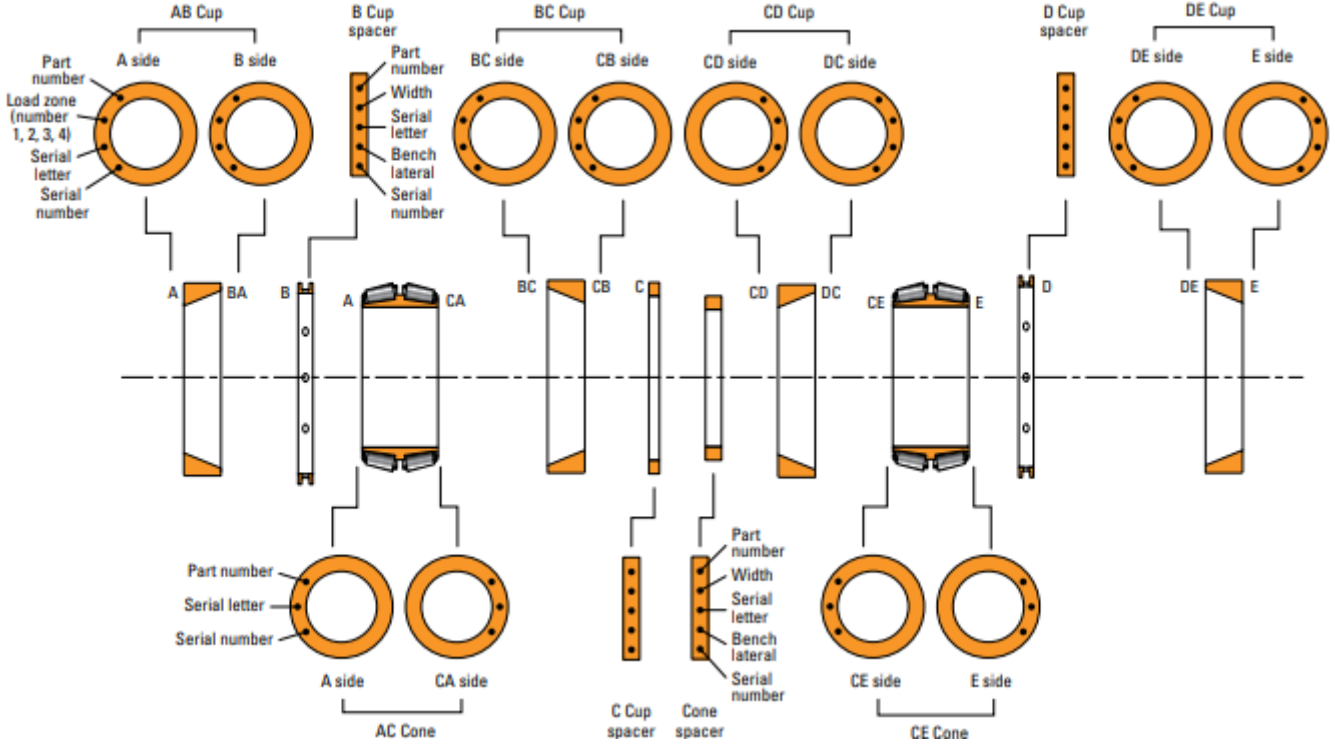
Fig. 36. Cylindrical roller bearing.

4-Row Tapered Roller Bearing



TQO Bearing Components

Stacking Sequence (TRB)



Stacking Sequence (CRB)

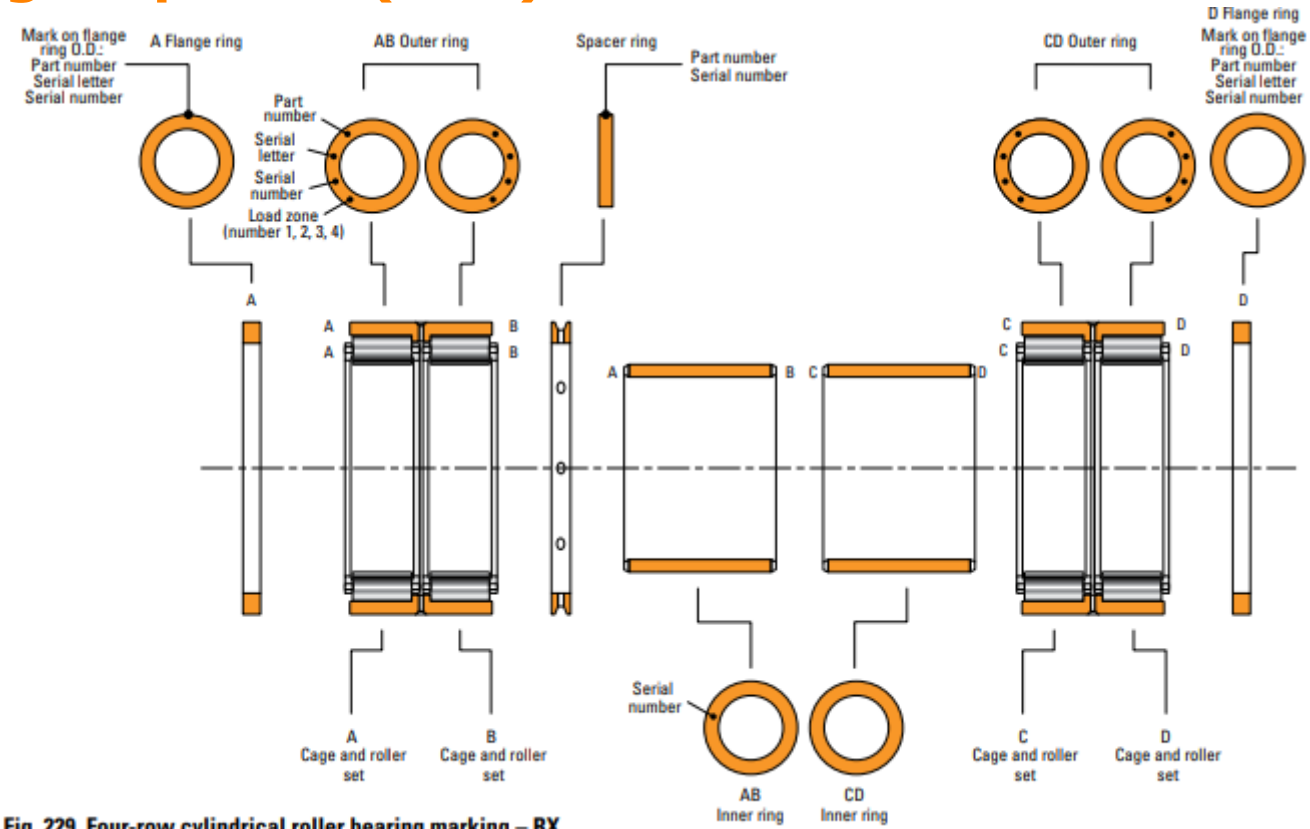


Fig. 229. Four-row cylindrical roller bearing marking – RX.

Spacer Identification

Five Key Markings

- SPACER PART NUMBER
- SEQUENCE
- BENCH END PLAY (TRB)
- SPACER THICKNESS
- SERIAL NUMBER

Rollneck Bearing Maintenance

Roll Neck Bearing Service Record

TIMKEN
Where You Turn

Plant: Mill:

Two-Row: ☐ Four-Row: ☐ Back-up Roll: ☐ Work Roll: ☐ Lubricant:

Serial Number: Part Number/Assembly Number: BEP/RIC:

Times In Service	Date In	Chock No.	Roll No.	Stand No.	Position	Cup Load Zone	A Cup Down	Date Out	Service Hours	Service Tons	Total Hours	Total Tons	Remarks On Nature Of Repairs And Inspections
1					T☐ D☐ B☐ O☐		☐						
2					T☐ D☐ B☐ O☐		☐						
3					T☐ D☐ B☐ O☐		☐						
4					T☐ D☐ B☐ O☐		☐						
5					T☐ D☐ B☐ O☐		☐						
6					T☐ D☐ B☐ O☐		☐						
7					T☐ D☐ B☐ O☐		☐						
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9					T☐ D☐ B☐ O☐		☐						
10					T☐ D☐ B☐ O☐		☐						
11					T☐ D☐ B☐ O☐		☐						
12					T☐ D☐ B☐ O☐		☐						
13					T☐ D☐ B☐ O☐		☐						
14					T☐ D☐ B☐ O☐		☐						

Rollneck Bearing Maintenance

Remove the Bearing from the Chock

Fig. 8 Remove the top single cup and double cone

Fig. 9 Remove the double cup, bottom double cone, cone spacer and top cup spacer

Rollneck Bearing Maintenance

Remove the Bearing from the Chock

Fig. 10 Remove the bottom single cup and cup spacer

Rollneck Bearing Maintenance

Clean the Bearing Components

- Small bearings or small quantities of bearing may be cleaned in a commercially available parts cleaner that circulates a cleaning solution.
- Large bearings may be cleaned in a wash tank that circulates a cleaning solution.
- Cleaning Solutions
  - Alkali Cleaners
    - 2-3 ounces per gallon of heated water
  - Kerosene
  - Other commercial cleaners/solvents
  - If you use a water-based cleaner, blow the bearing out after cleaning and coat with a preservative.

Rollneck Bearing Maintenance

Inspection of Bearing Components

Fig. 11 Remove the pin locking wire

Rollneck Bearing Maintenance

Inspection of Bearing Components

Fig. 12 Remove the roller to inspect the bearing raceway for damage

Rollneck Bearing Maintenance

Check the Bearing for Wear

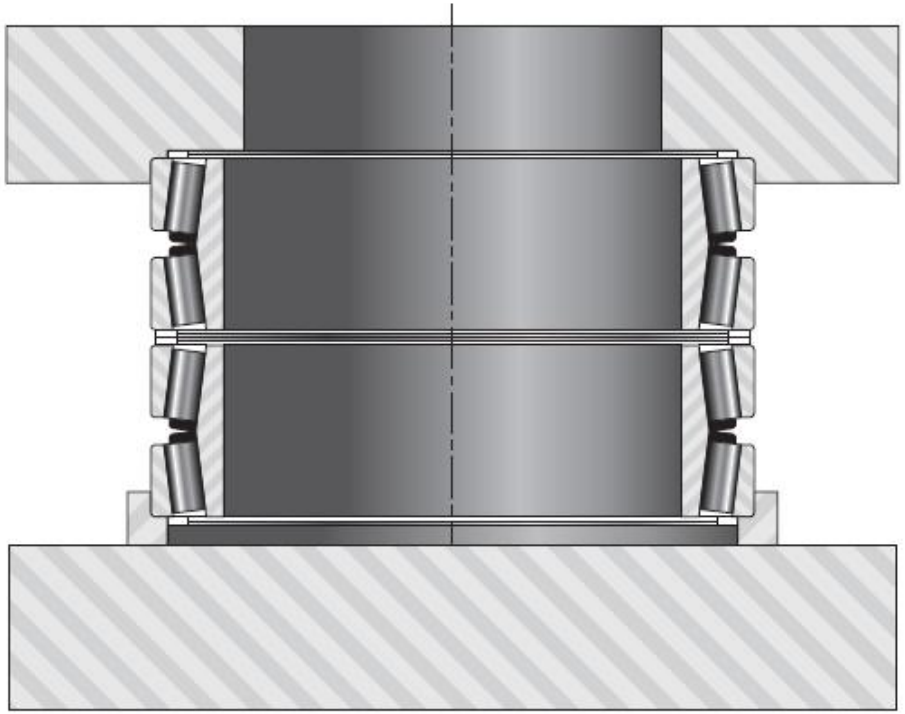


Fig. 13 Weighted bearing

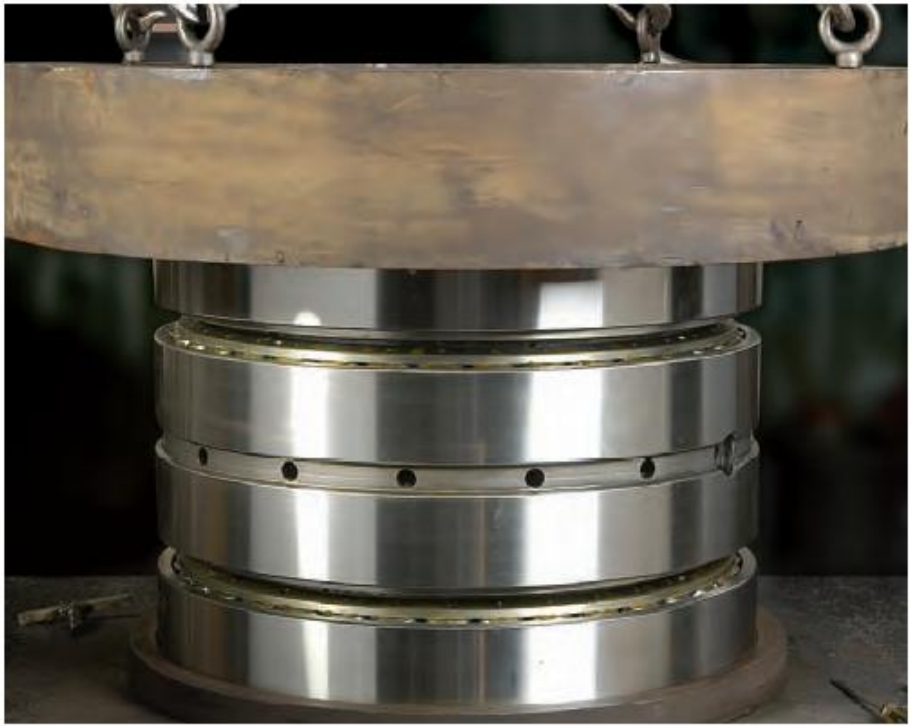


Fig. 14 Weight the bearing to properly seat components

Rollneck Bearing Maintenance

Check the Bearing for Wear

Fig. 15 Follow the Timken lettering system to enure proper stacking order

Rollneck Bearing Maintenance

Check the Bearing for Wear

Fig. 17 Apply a light coating of oil to protect the bearing

Fig. 18 Use a feeler gage to check for proper bearing seating

Rollneck Bearing Maintenance

Check the Bearing for Wear

Fig. 19 Measure the B, D and C gap for wear

Fig. 20 Measure the B, D and C spacer width

Rollneck Bearing Maintenance

Check the Bearing for Wear

Fig. 21 With the proper bearing end play, the spacer width is greater than the spacer gap

Rollneck Bearing Maintenance

Check the Bearing for Wear

Bearing End Play Readjustment		
When To Readjust End Play		
Original end play in bearing (new)		**0.31 mm** 0.012 in.
Regrind spacers when end play doubles to		**0.61 mm** 0.024 in.
Regrind spacers to provide 1.5 times original end play		**0.46 mm** 0.018 in.
Spacer Width Calculation		
Space measurement		**26.01 mm** 1.024 in.
End play desired	+	**0.46 mm** 0.018 in.
Regrind spacer to		**26.47 mm** 1.042 in.
All three spacers, B, C and D, are calculated using the actual values of space measurement.		

Fig. 22 Sample end play readjustment calculation

Rollneck Bearing Maintenance

Inspect the Chock

Fig. 23 Remove any heavy corrosion or fretting in the chock

Fig. 24 Check for chock bore size and out-of-roundness

Rollneck Bearing Maintenance

Inspect the Chock

Cup Fitting Practice				
Outside Diameter Cup		Chock Bore Variance from Nominal Cup O.D.		Fit.
Over	Incl.	Min.	Max.	
mm in.	mm in.	mm in.	mm in.	mm in.
0 0	**304.8** 12	**+0.05** +0.002	**+0.08** +0.003	**0.02 L** **0.08 L** 0.001 L 0.003 L
304.8 12	**609.6** 24	**+0.10** +0.004	**+0.15** +0.006	**0.05 L** **0.45 L** 0.002 L 0.006 L
609.6 24	**914.4** 36	**+0.15** +0.006	**+0.23** +0.009	**0.08 L** **0.23 L** 0.003 L 0.009 L
914.4 36	**1219.2** 48	**+0.20** +0.008	**+0.31** +0.012	**0.10 L** **0.31 L** 0.004 L 0.012 L
1219.2 48	**1524** 60	**+0.25** +0.010	**+0.38** +0.015	**0.13 L** **0.38 L** 0.005 L 0.014 L

Fig. 25 Cup fitting practice

Rollneck Bearing Maintenance

Inspect the Chock

Chock Bore Rework Limits						
Chock Bore - Metric *(Note: for tapered bore bearings in mills running at **1200 mpm** (4000 fpm) or higher consult with your Timken representative)*						
Size Range Bearing O.D.		Chock Bore - Variance from Nominal Cup O.D.		Max. Out of Round	Max. Oversize Variance from Nominal Cup O.D.	Max. Taper
Over	Incl.	Min.	Max.			
mm in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.	**mm** in.
0 0	**304.8** 12	**+0.05** +0.002	**+0.08** +0.003	**0.08** 0.003	**+0.20** +0.008	**0.04** 0.0015
304.8 12	**609.6** 24	**+0.10** +0.004	**+0.15** +0v.006	**0.15** 0.006	**+0.38** +0.015	**0.05** 0.002
609.6 24	**914.4** 36	**+0.15** +0.006	**+0.23** +0.009	**0.23** 0.009	**+0.58** +0.023	**0.08** 0.003
914.4 36	**1219.2** 48	**+0.20** +0.008	**+0.31** +0.012	**0.31** 0.012	**+0.76** +0.030	**0.10** 0.004
1219.2 48	**1524** 60	**+0.25** +0.010	**+0.38** +0.015	**0.38** 0.015	**+1.01** +0.040	**0.13** 0.005

Fig. 26 Chock bore rework limits

Rollneck Bearing Maintenance

Inspect the Chock

Fig. 27 Remove any nicks or burrs from the chock backing shoulder

Fig. 28 The chock cover plate should also be free of damage

Rollneck Bearing Maintenance

Inspect the Chock

Fig. 29 Seals should be inspected and replaced if necessary

Rollneck Bearing Maintenance

Bearing Installation

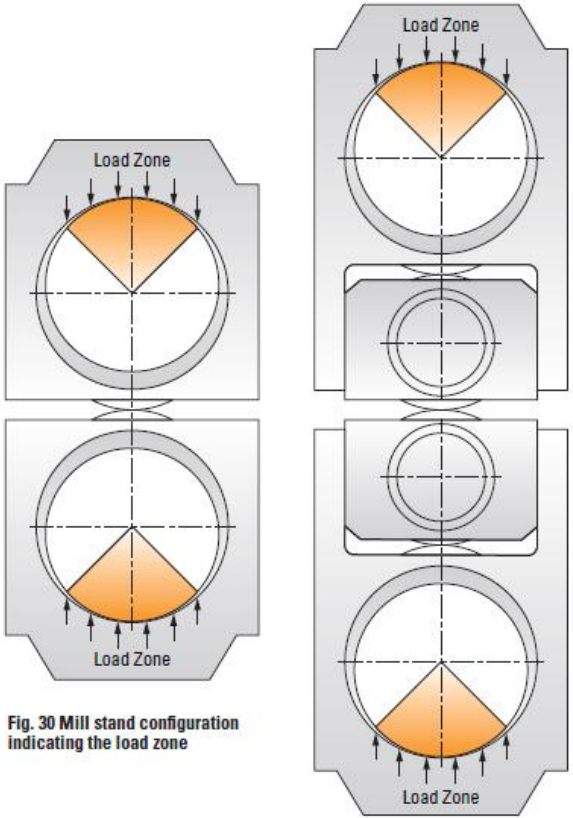


Fig. 30 Mill stand configuration indicating the load zone

Fig. 31 Each cup quadrant is specified on the bearing

Fig. 32 The load zone in a back-up roll chock

Rollneck Bearing Maintenance

Bearing Installation

Since the bearing cups are stationary in the chocks, only one cup load zone of the cup carries the rolling load. The suggested load zone is 90 degrees inside diameter (I.D.) or raceway (Fig. 30). If you find that the cup load zone is greater or less than 90 degrees, contact your Timken representative for further instruction.

The bearing inspection period is an ideal time to rotate the cups to bring a new cup load zone into position in the chock. Make sure you record this activity. Rotating the cups at every inspection will extend the useful life of the bearing by gradually distributing the load over the entire cup working raceway surface. After the cup has been rotated four times, it is suggested that you invert the bearing assembly A side down to E side down (Fig. 16) while maintaining the proper component sequence. This allows for equal distribution of the load zones across alternate roller sets, helping to extend bearing life.

Rollneck Bearing Maintenance

Bearing Installation

Fig. 33 Install the bottom cup into the chock

Fig. 34 Install the cup spacer

Rollneck Bearing Maintenance

Bearing Installation

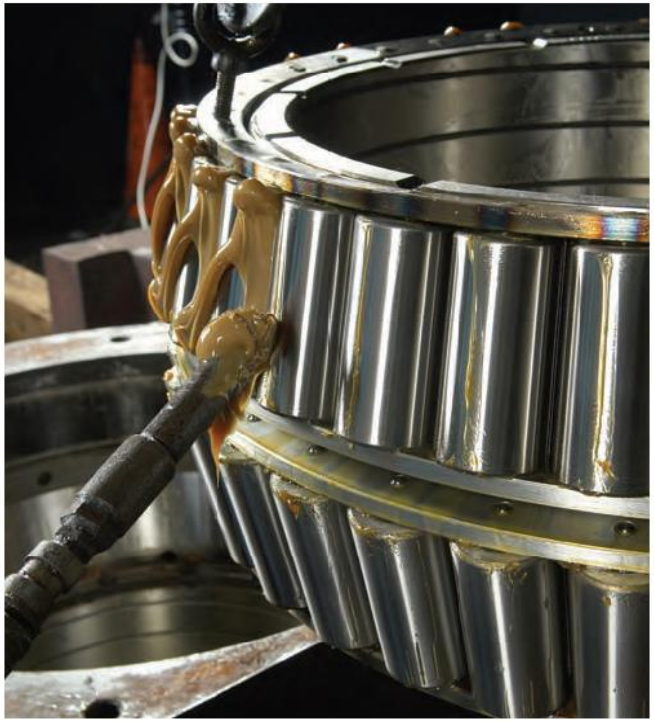


Fig. 35 Lubricate the bearing with grease

Fig. 36 Install the bottom double cone and double cup into the chock

Rollneck Bearing Maintenance

Bearing Installation

Fig. 37 Place the cone spacer and top cup spacer into position

Fig. 38 The top double cone and cup are the last components to be installed into the chock

Rollneck Bearing Maintenance

Cover Plate Installation

Fig. 39 Notch the gasket

Fig. 40 Use a feeler gage to make sure the cups are properly clamped

Rollneck Bearing Maintenance

Roll Neck Inspection

Fig. 41 Before mounting the bearing, check the roll neck for size

Fig. 42 Remove any nicks or gouges on the roll neck

Rollneck Bearing Maintenance

Roll Neck Inspection

Roll Neck Wear Limits - Diameter					
Size Range Bearing Bore		Neck Diameter - New Variance from Bearing Nominal		Minimum Undersize Variance from Bearing Nominal	Max. Taper
Over	Incl.	Min.	Max.		
mm in.	mm in.	mm in.	mm in.	mm in.	mm in.
101.6 4	127.0 5	-0.13 -0.005	-0.10 -0.004	-0.28 -0.011	0.04 0.0015
127.0 5	152.4 6	-0.15 -0.006	-0.13 -0.005	-0.36 -0.014	0.04 0.0015
152.4 6	203.2 8	-0.18 -0.007	-0.15 -0.006	-0.43 -0.017	0.05 0.002
203.2 8	304.8 12	-0.20 -0.008	-0.18 -0.007	-0.51 -0.020	0.05 0.002
304.8 12	609.6 24	-0.25 -0.010	-0.20 -0.008	-0.61 -0.024	0.08 0.003
609.6 24	914.4 36	-0.33 -0.013	-0.25 -0.010	-0.84 -0.033	0.10 0.004
914.4 36	1219.2 48	-0.40 -0.016	-0.33 -0.013	-1.12 -0.044	0.13 0.005

Fig. 43 Roll neck wear limits

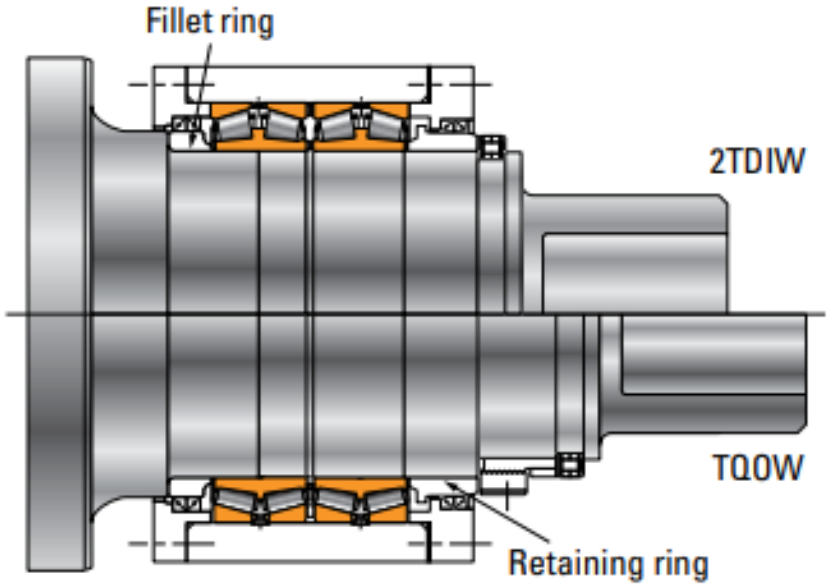
Rollneck Bearing Maintenance

Roll Neck Inspection

Fig. 44 Remove any burrs or sharp edges from the seal riding surface of the roll neck

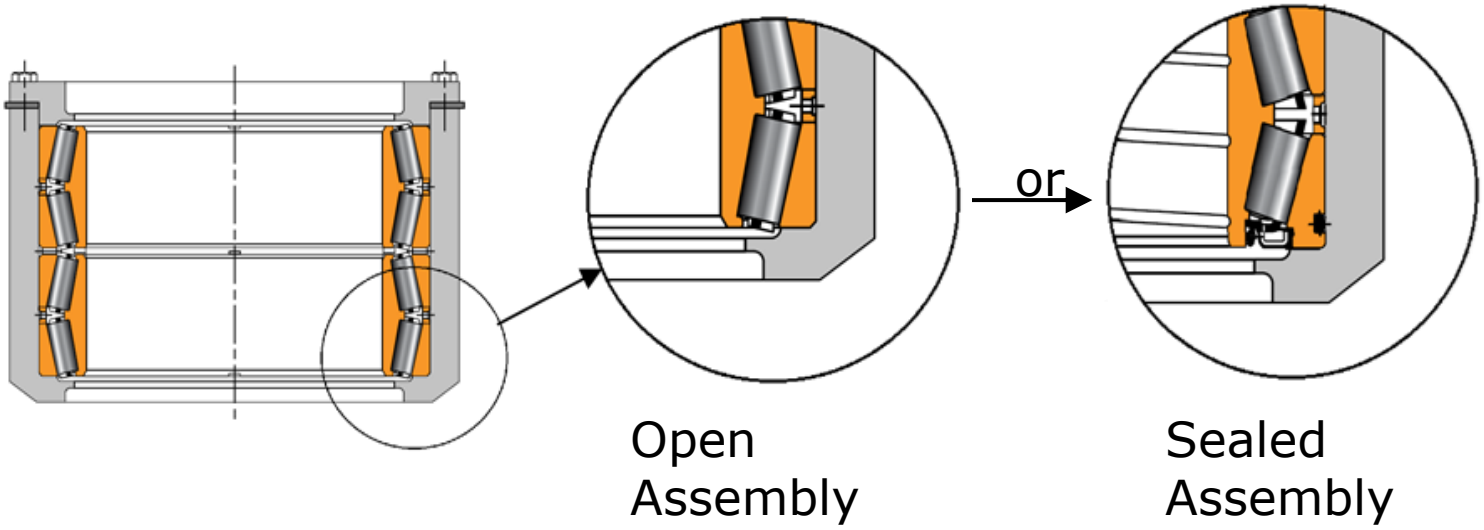
Rollneck Bearing Maintenance

- **Mount the Chock Assembly onto the Roll Neck**
- **Use care to not damage bearing/seals during mounting**
- **Secure bearing/chock assembly to rollneck**
  - Depending on assembly type, threaded take up ring may be necessary
  - Axial clearance through inner rings of .010” -.040” suggested, even more for large bearings (cylindrical bore TRB only)



Handling

Typical Bearing Mounting Configuration



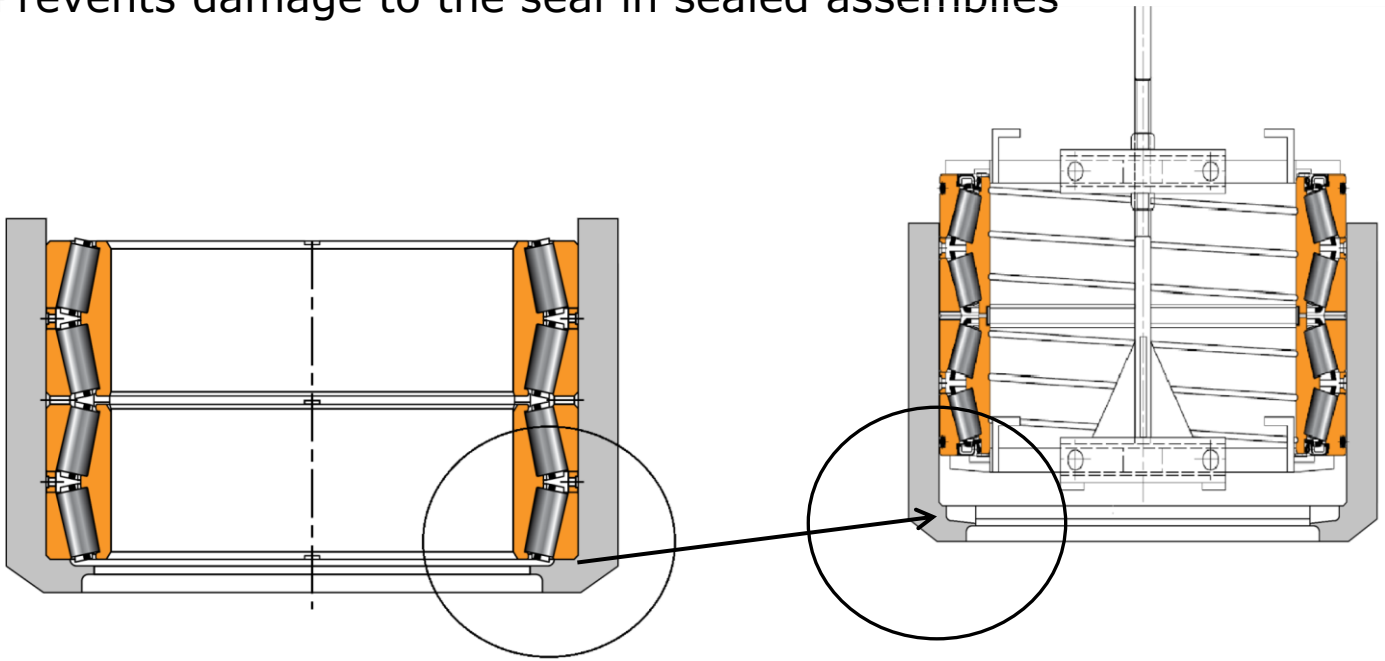
- What's missing from the chock to help with disassembly?

Typical Removal of bearing assembly

- Without chock modifications, the bottom cup is left in the chock and often requires manual removal

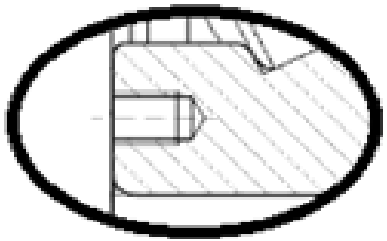
Chock Design Needs to Improve Lifting

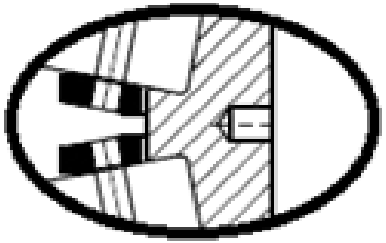
- Relief in chock shoulders for feet of lifting tool
  - Allows engagement with bottom of lowest cup
  - Prevents damage to the seal in sealed assemblies

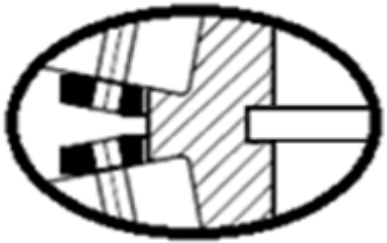


Bearing Features to Improve Lifting

- Bearing features
  - Tapped holes in faces
  - Blind holes in bore of inner ring
  - Groove in bore
- Allows for positive retention of bearing race by tool

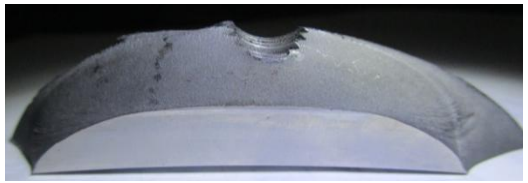






Lifting Caution using bearing features: Eyebolts

- Use all tapped holes in cage rings to lift the bearing
  - Smaller pin-type cages use single holes spaced out around ring
  - Large product uses paired eyebolts (2-side by side) where a cross-bar is used through the eyebolts for the lifting chain
- Always lift when the bearing is horizontal, a bearing leaning on a bench or while at an angle will lead to eyebolt or bearing damage



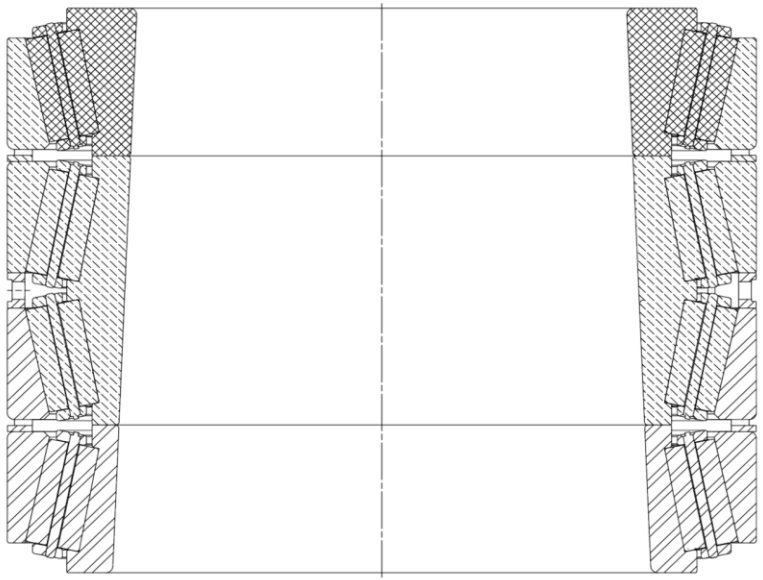
Lifting TQITS

- Assembly is removed from the chock in stages utilizing eyebolts threaded into bearing cage and lifting chains

1st Lift

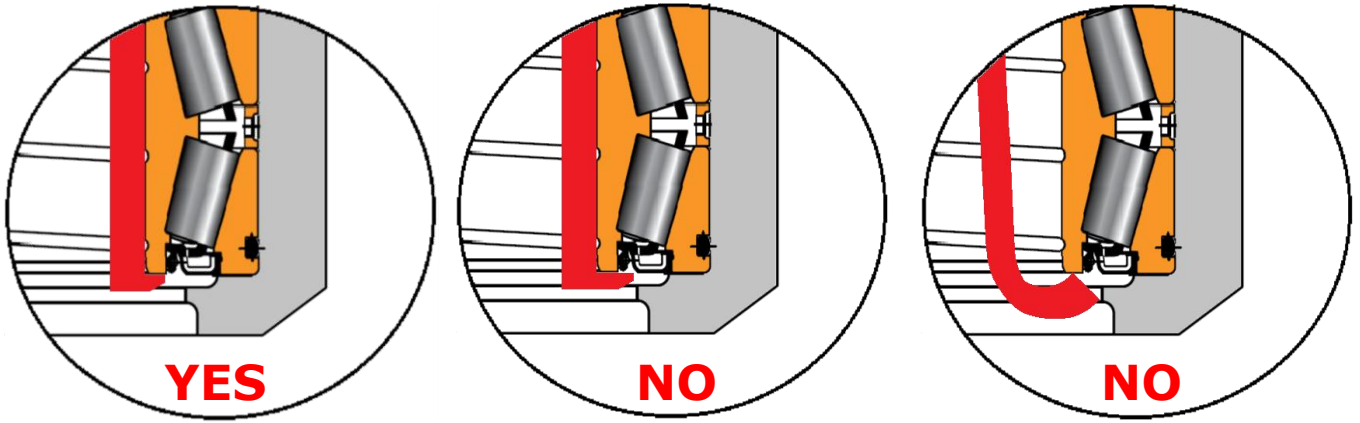
2nd Lift

3rd Lift

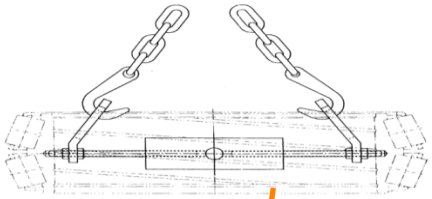


Bearing Lifting: Sealed Bearings

- Integral seal with lack of relief in chocks: **CAUTION**
  - Cannot lift as an assembly, feet of lifting tool cannot engage the backface of the cup
  - Feet must be short as to only engage inner ring face
  - Do not lift through the seal



Current Design Configurations



Moving safety Forward

- Lifting tools/handling should be evaluated during the design review phase of a mill upgrade

- Provisions for clearance of lifting tools are not typically incorporated at OE design level
  - Features for bearing handling can be added when chock modifications are already in the plan for mill upgrades, reducing cost of implementation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