Koyo

INSTALLATION AND MAINTENANCE MANUAL FOR ROLLING MILL BEARINGS (1)

FOUR-ROW TAPERED ROLLER BEARINGS (Cylindrical Bore) FOR ROLL NECKS

CAT.NO. B3002E

JTEKT | JTEKT CORPORATION

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However, we cannot assume responsibility for any errors or omissions.

INTRODUCTION

JTEKT manufacture and supply various types of roll neck bearings world widely. Among these bearings, straight bore four row tapered roller bearings have been mostly utilized.

As the roll neck bearing is manufactured to a very high degree of precision, it must be handled with a corresponding degree of carefulness. Other wise, even an ideally designed and most accurately manufactured bearing cannot function as designed and in extreme cases, unexpected operating problems might be resulted. Therefore, the personnel in charge of bearing maintenance are required to have sufficient kowledge about bearing handling to exercise utmost care in the mounting and dismounting of the bearings.

This manual, which is intended for those who are being trained to handle the roll neck bearings, presents a simplified guide to the handling of four row tapered roller bearing from preparation, mounting, inspection and disassembly, to maintenance.

When damage is found in a bearing, a decision must be made whether to rework the bearing for further service or discard it. This decision depends on the severity of damage as well as on the operating conditions and type of mill. If the damage is boarderline, JTEKT should be consulted.

Table of Contents

1. PREPARATION AND INSPECTION

1-1 Preparation and Inspection of Bearings

Fig. 1-1 Roll neck bearing arrangement

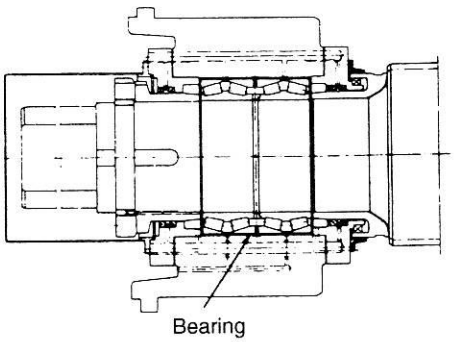


Photo. 1-1 Nomenclature

	Nomenclature
①	Single cup
②	Cup spacer
③	Double cone, roller-cage assembly
④	Double cup
⑤	Cone spacer

- Grease lubricated new bearings should never be unpackaged until just prior to installation.
- Oil mist lubricated bearings must be washed prior to installation to remove the rust preventive. Particularly careful washing is required on such parts as the cage, lubrication holes on the cup and cone spacers and cone ribs.
- Note : Grease lubricated bearings can be used with the rust preventive unremoved. Although the grease is discoloured due to mixture with the rust preventive, it does not have any influence on bearing performance.

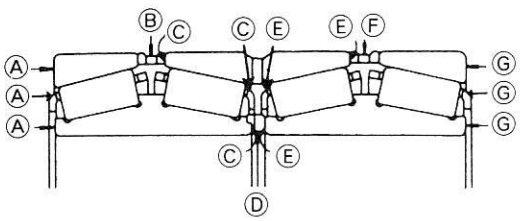
	Inspection required	Description	
1	Make sure that the bearing components have the same serial number, and that they are properly assembled in accordance with the row numbers	Bearing assembly with mixed serial numbers or assembly not in accordance with the row numbers may lead to undesired failures such as overheating, premature fatigue, spalling, etc.	
2	Check the working surfaces (cup and cone raceways and roller rolling surfaces) for fatigue phenomenon	Incipient flaking can propagate rapidly in the further operation, unless properly reworked. Incipient spalling, if found, should be repaired by rounding the edge with No. 500 oil stone or microgrinder. Flaking on the cup raceway should be located at the non-load[*1)] position after rework.	

Example of serial number and row number

VG-10-1

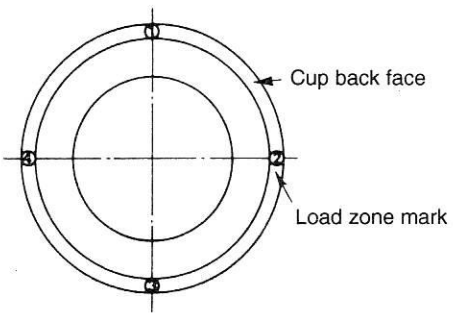
Serial Number — Row Number

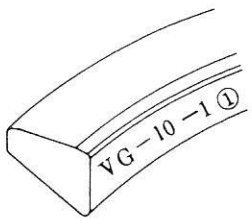
Fig. 1-2 Serial number and row number



Ⓐ	VG-10-1
Ⓑ	VG-10-1~2
Ⓒ	VG-10-2
Ⓓ	VG-10-2~3
Ⓔ	VG-10-3
Ⓕ	VG-10-3~4
Ⓖ	VG-10-4

Fig. 1-3 Load zone marking on the cup





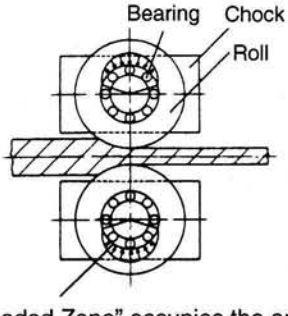
	Tools for inspection and rework	Remarks
		See Fig. 1-2 for serial number and row number.
	• Oil stone • Sand paper • Microgrinder	 Photo. 1-2 Rework cup raceway  Photo. 1-3 Checking cone raceway (pin-type cage)

	Inspection required	Description
3	Check the cup and cone spacers' width surface for wear	Appreciable reduction of cup and cone spacer width due to wear may cause excessive increase or decrease in the end play, which may result in overheating or premature failure of the bearing. (Checked width result should be compared with width record at brandnew)
4	Check cup O.D. dimension and out-of-round	Improper cup O.D. or cone bore, especially excessive out-of-round, may result in catastrophic bearing failure.
5	Check cone bore dimension and out-of-round	
6	Check cone bore and side faces for smearing crack	Remove superficial smearing crack, if found, with No. 500 oil stone. A carburized cone with deep smearing crack extending down to the core can lead to cracking, so such a cone must be scrapped.
7	Check the roller large end face for scuffing or other defects	Scuffing, melting or nick or cracks on the roller large end may be generated under excessive thrust load due to irregular mill operation. If the damage is slight, the bearing can be used further. But heavy damage should be the cause of rejection, as it can lead to bearing seizure or other failure.
8	Check the cage for excessive pocket wear and deformation (Pressed steel cage type)	Excessive cage looseness may permit the cage O.D. to rub on the cup raceway or cup spacer, and leads to bearing seizure.
9	Check pin type cage for loose pins	Loose pins can lead to catastrophic failure, if used without tightening.
10	Check cup, cone, rollers and cage for sludge occurrence (In case of oil mist lubrication)	If sludge is found on the cup, cone, rollers and cage, wash off thoroughly and blow holes with compressed air to remove, since sludge may clog nozzles resulting in poor lubrication.
11	Check pin holes in rollers of the pin type cage for foreign matter contamination	Foreign matter in the pin-hole of rollers may cause irregular roller movement. Since this can lead to smearing, the pins and pin-holes should be thoroughly washed to remove the foreign matter by compressed air and kerosene.

	Tools for inspection and rework	Remarks
	• Micrometer	 Photo. 1-4 Check cup spacer width for wear
	• Micrometer	
	• Inside micrometer	
	• Oil stone • Sand paper	

*1) Non-loaded zone

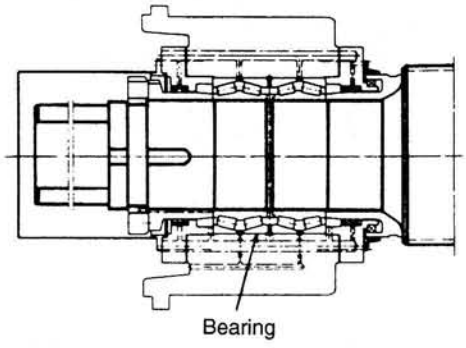
*2) This inspection does not apply to grease lubricated bearing



The "Loaded Zone" occupies the arrowed portion of the bearing circumference, while the remaining portion is called "Non-loaded Zone".

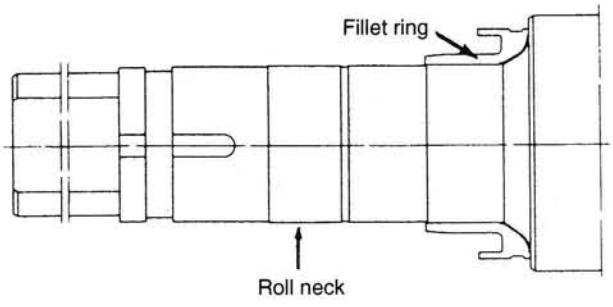
1-2 Preparation and Inspection of Roll Neck

Fig. 1-4 Roll neck assembly



	Inspection required	Description
1	Check roll neck cylindricity	If the roll neck is out-of-round or tapered is excess of the design limits, the bearing will be subjected to stress concentration and resulting in premature failure.
2	Check roll neck out-of-round	
3	Check roll neck squareness	
4	Check roll neck surface finish	Rough roll neck surface or damage thereon disrupts the oil film between the roll neck and bearing. This not only causes overheating and scuffing but also accelerates roll neck wear. Moreover, damage on the roll neck makes bearing mounting difficulty.
5	Check roll neck damage such as nicks, rust, etc.	
6	Check sharp edges on the lubrication slots of the fillet ring	Sharp edged lubrication slots of the fillet ring disturbs the formation of oil film between the fillet ring and the cone face. This will accelerate the wear on these mating faces and cause friction cracks under relative rotation.

Fig. 1-5 Roll neck



	Tools for inspection and rework	Remarks
	• Micrometer • Square gage	 Photo. 1-5 Check cylindricity and out-of-round of the roll neck
	• Oil stone • Sand paper	 Photo. 1-6 Rework roll neck surface (using No.500 oil stone)

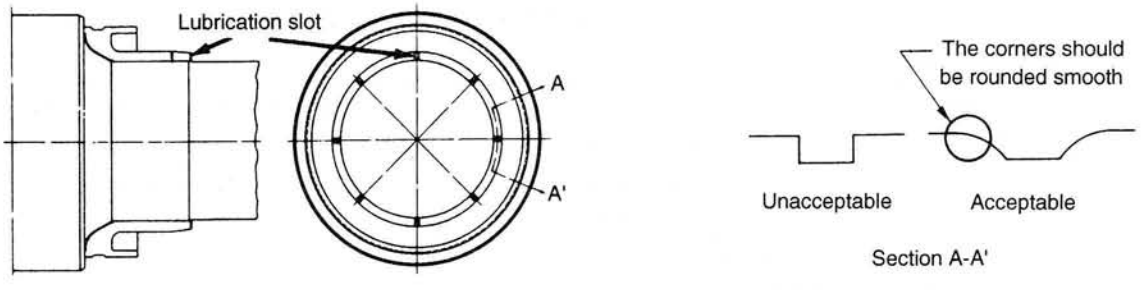


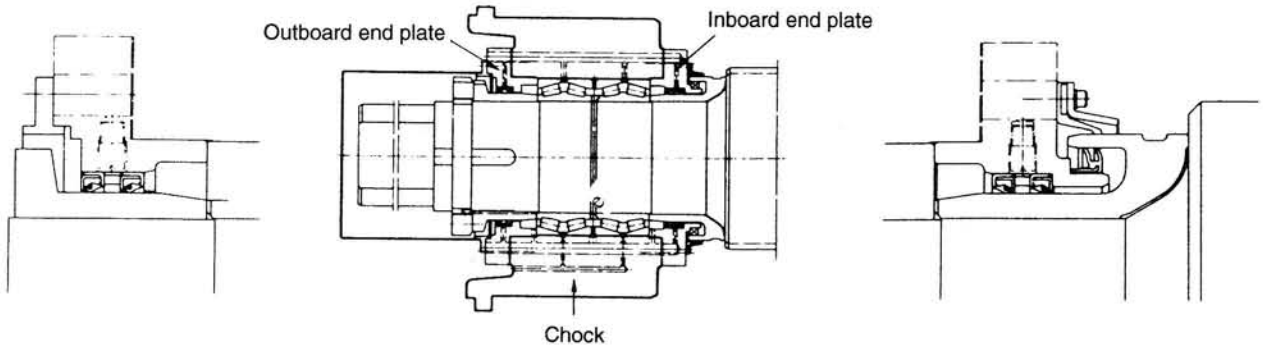
Fig. 1-6 The lubrication slots on the fillet ring

1-3 Preparation and Inspection of Chock

Outboard end plate

Fig. 1-7 Roll and chock general assembly

Inboard end plate



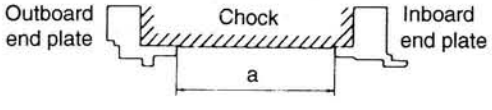
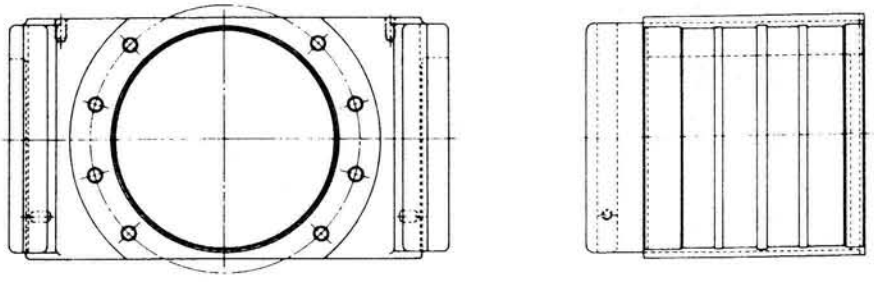
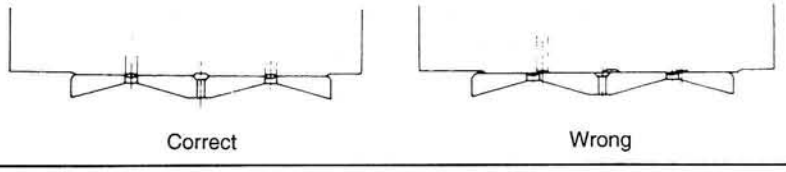
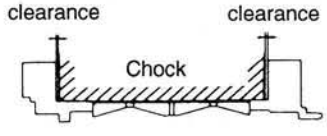
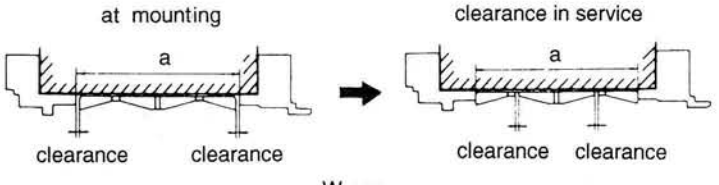
	Inspection required	Description
1	Check chock bore cylindricity	If the chock bore is tapered or out-of-round in excess of the design limit, the bearing will be subjected to stress concentration, which will result in premature failure.
2	Check chock bore out-of-round	
3	Check the chock bore surface for damage and rust	If the chock bore contains damage or rust, bearing mounting may be difficult. Also, rust, if left to develop, can accelerate fretting corrosion.
4	Check the location of the oil groove in the axial direction on the chock bore	Incorrect oil groove location will result in misalignment between the groove and cup spacer grooves as shown. This apparently causes inadequate lubrication. The alignment of these grooves is particularly essential for oil mist lubrication.
5	Check the chock length and plate length 	Too long a chock length or too short an extension on the end plate may result in the condition sketched right. If the minimum end plate distance "a" is longer than the bearing overall-cup width, as shown, the cup can not be properly clamped. This eventually causes the load to be supported by the central two rows only and causing premature bearing failure.
6	Check the lubrication holes for clogging	If the lubrication holes, mist nozzles or threads are contaminated with foreign matter, lubricant passage can become clogged in operation, causing inadequate lubrication. The small mist oriifices, in particular, should be carefully checked.
7	Check the oil mist nozzle holes for clogging* (This is not applicable to grease lubrication)	
8	Check the lubrication grooves for sharp edges or dirt	

Fig. 1-8 Roll chock



	Tools for inspection and rework	Remarks
	• Inside micrometer	
	• Oil stone • Sand paper	 Photo. 1-7 Check chock bore for damage, rust, etc.
	• Slide calipers	 Correct Wrong
	• Slide calipers  Correct	 at mounting clearance in service clearance clearance clearance clearance Wrong
		 Photo. 1-8 Check lubrication holes for foreign matter

1-4 Preparation and Inspection of Seals and End Plates

Fig. 1-9 General assembly

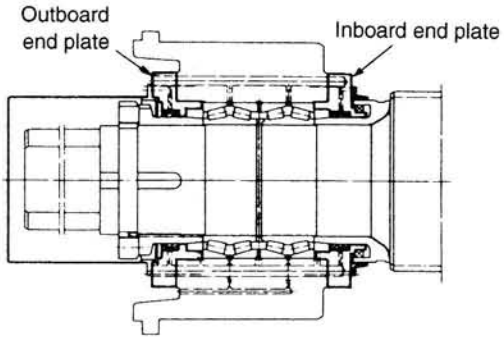
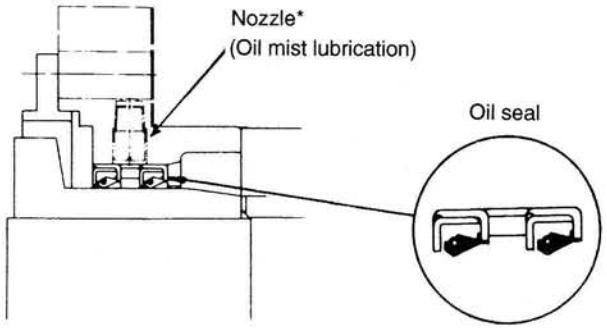
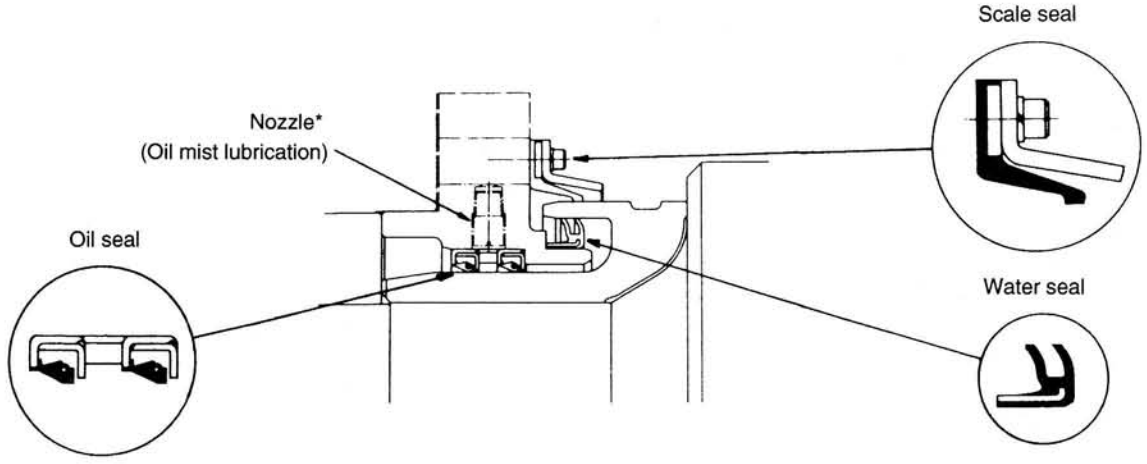


Fig. 1-10 End plate (Outboard) assembly



	Inspection required	Description
1	Check the seal lip for defects	Seals are relatively sensitive to deformation or damage during transportation. Always check to make sure that they have not been deformed or warped. The seal lips should also be checked for damage.
2	Check the seal case for deformation and defects	
3	Check the seal counterbore of the end plates for dirt, damage or burrs	If the seal counter bore on an end plate is damaged, or contains burrs or foreign matter, seal performance may be affected. Remove them thoroughly.
4	Check the finish of the seal lip contact surfaces on fillet rings, etc.	Rough seal lip contact surface may accelerate seal lip wear, and will eventually cause lubricant leakage. These surfaces should desirably be finished to 0.2～0.63 μmRa. Also, if the surface is spiral cut, or shows tool marks, the lubricant may be pumped out in operation.
5	Check the nozzle holes on end plates (of oil-mist lubricated bearing) for contamination*	Foreign matter trapped in the nozzle holes may cause inadequate lubrication.
6	Make sure that seals are mounted facing in the correct direction	The mounting direction of the seals should correspond with their purposes. The wrong mounting direction, as it is sometimes overlooked, can lead to unsatisfactory seal performance. See Section 2-1.
7	Check the oil holes and nozzle holes on the end plates for burrs	Burrs on the oil holes or nozzle holes of the end plates may damage the seals.
8	Make sure that the oil seals are equipped with garter springs, and that the springs are free from foreign matter trapped between the coils	If the oil seal is not provided with the garter spring as designed, the seal lip will not have surficient fit on the shaft, and hence will not provide an effective seal. If the garter spring traps foreign matter, the sealing effect will be reduced due to lowered spring tensing. As the used seal is more likely to contain sludge and metallic debris between the coils, the spring should be removed for careful washing.

Fig. 1-11 End plate (inboard) assembly



	Tools for inspection and rework	Remarks
	• Oil stone	
	• Oil stone	
		* Checking on grease lubricated bearing is not required.
	• Stand paper • Oil stone	

2. MOUNTING AND DISMOUNTING

2-1 Mounting Seals

Fig. 2-1 General assembly

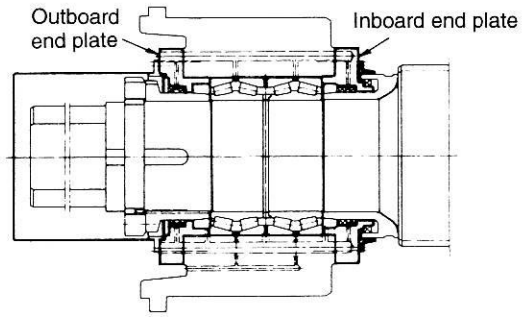
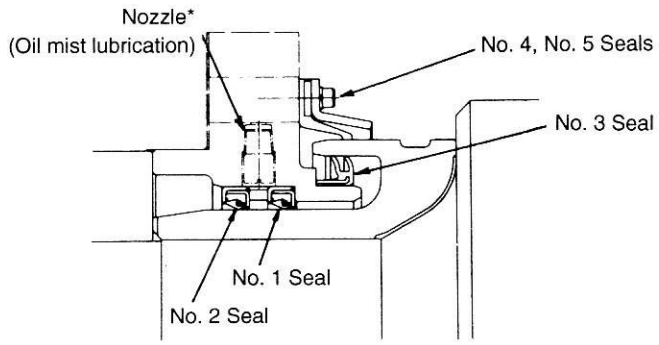


Fig. 2-2 Inboard end plate



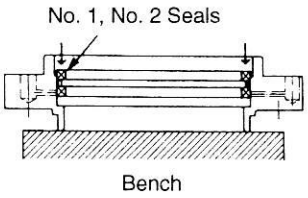
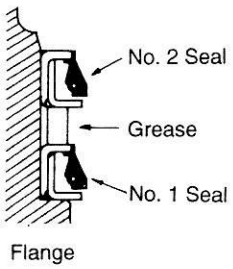
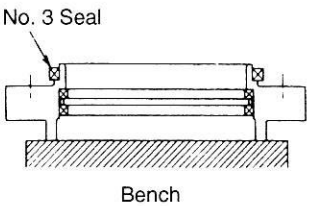
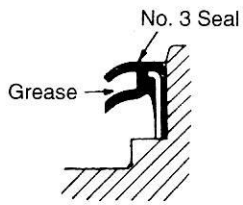
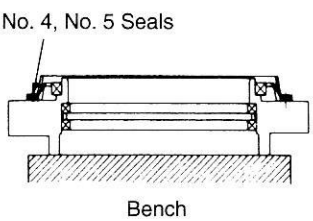
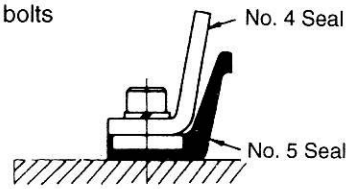
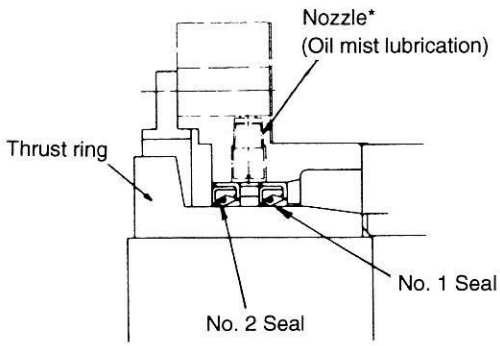
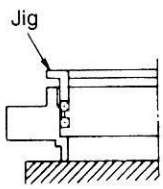
	Mounting procedure	Procedure diagram	Mounted parts
1	Mount No. 1 seal (oil seal)		Oil seal Seal mounting layout (example)  Seal main lips should face to outside water or particles
2	Mount No. 2 seal (oil seal)		
3	Mount No. 3 seal (water seal)		Water seal Pack with extreme pressure type grease. 
4	Mount No. 4 and No.5 seals (scale seal)		Scale seal Two seals fitted together by means of hex. socket bolts  Prior to mounting the seals, apply a thin coat of grease on seal rubbing surfaces (coat grease also in case of oil mist lubrication)

Fig. 2-3 Outboard end plate



Mount No. 1 and No. 2 oil seals on the outboard end plate with the same procedures as set out below.

	Procedure details and cautions	Tools for mounting and dismounting
	• Lubricate the seal lip and seal case O.D. with oil or grease. • Do not hammer the seal directly. Use a proper jig as shown or tap through a wooden plate around the seal case. • After mounting the No. 1 seal, make sure that it is well in contact with the flange by using a feeler gage. • Then, mount No. 2 seal. • Check to make sure the seals are facing correctly. • Fill grease in the space between the two seals. (Fill grease also in case of oil mist lubrication)	• Wooden or plastic hammer • Jig or wooden plate • Feeler gage 
	• Turn the inboard end plate up side down, and mount No. 3 seal. • Fill grease in the space between two lips. (Fill grease also in case of oil mist lubrication)	• Wooden hammer • Jig or wooden plate • Feeler gage
	• Bolt the No. 4 and No.5 seals together. But do not tighten up the bolts at this stage, so that the seals can be positioned later. • Scale seals may be fitted after the bearing is mounted into the chock to guard against seal damage and expedite installation. (i.e. after operation No. 14 in page 19)	• Allen wrench

* Not required for grease lubricated bearings.

2-2 Mounting Bearing

Fig. 2-4 Roll neck bearing arrangement

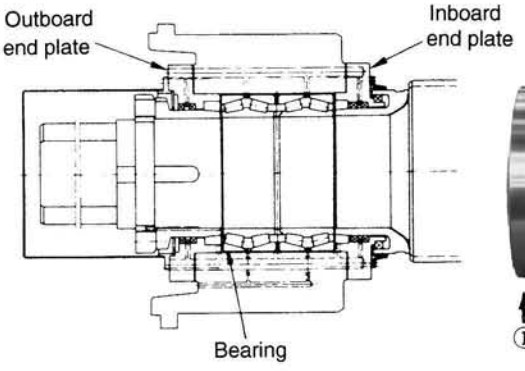
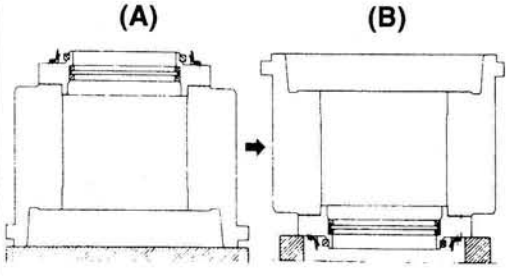
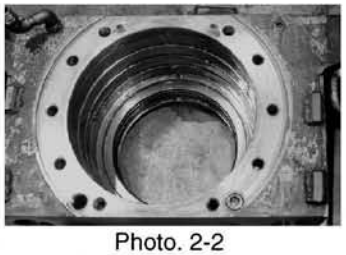
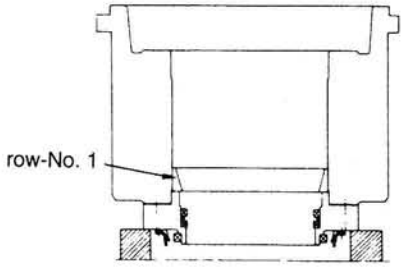


Photo. 2-1 Nomenclature

	Nomenclature
①	Single cup
②	Cup spacer
③	Double cone, roller-cage assembly
④	Double cup
⑤	Cone spacer

	Mounting procedure	Procedure diagram	Photo
1	Attach inboard end plate to chock		 Photo. 2-2
2	Install single cup (Row No. 1)		 Photo. 2-3  Photo. 2-4

Example of serial number and row number

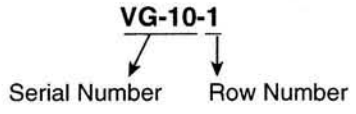
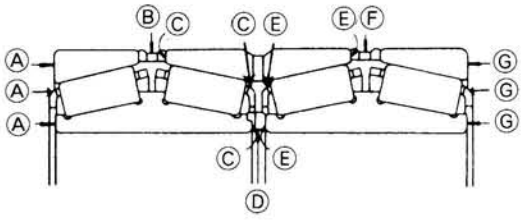
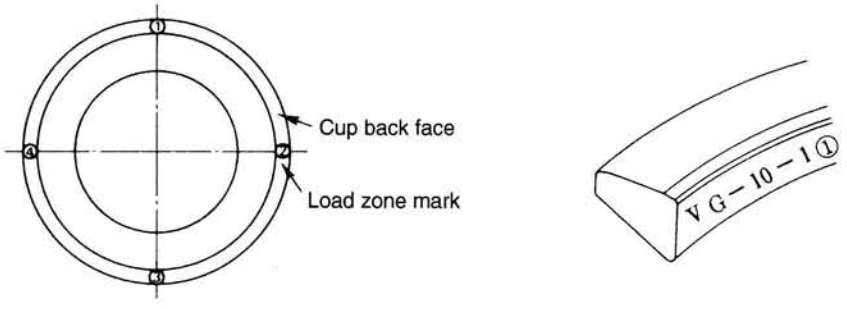


Fig. 2-5 Serial number and row number

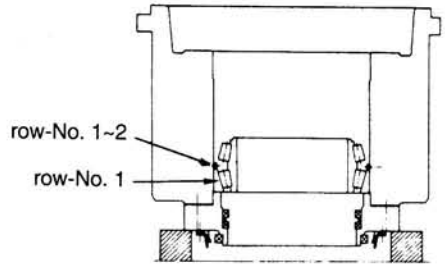
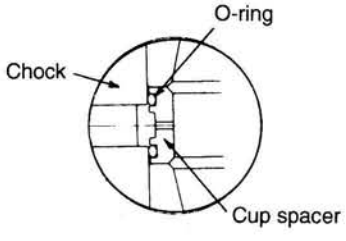
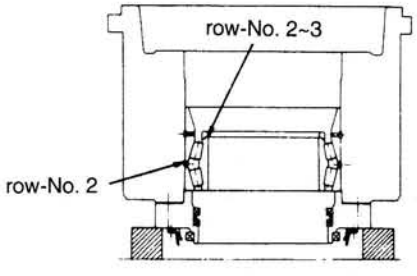
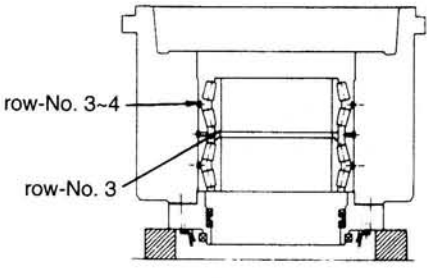


Ⓐ	VG-10-1
Ⓑ	VG-10-1~2
Ⓒ	VG-10-2
Ⓓ	VG-10-2~3
Ⓔ	VG-10-3
Ⓕ	VG-10-3~4
Ⓖ	VG-10-4

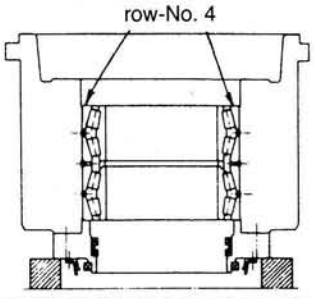
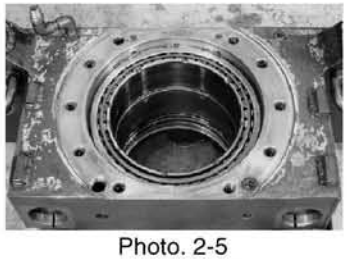
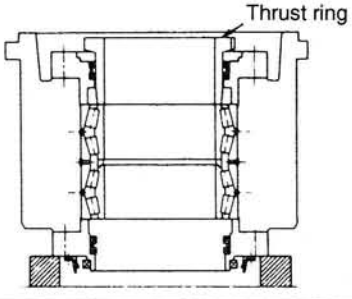
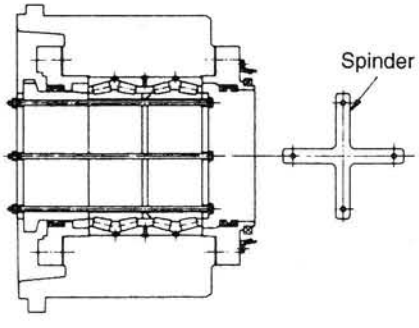
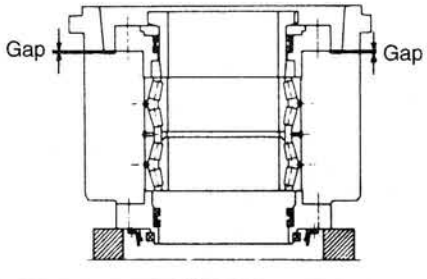
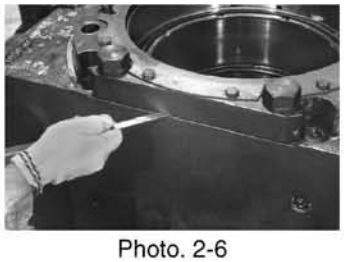
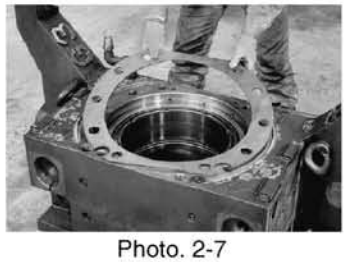
Fig. 2-6 Load zone marking on the cup

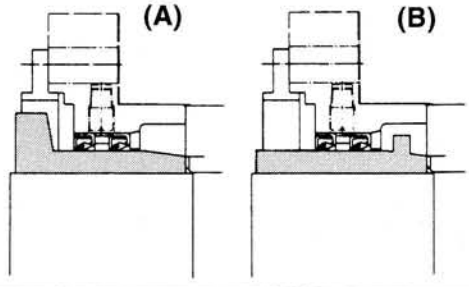


	Procedure details and cautions	Remarks
	a. Place a shim pack (approx. 1mm thick) on the chock inboard face. b. Fit the inboard end plate on the chock as shown in Fig. (A). c. Turn and Place the chock vertically on the bench with the inboard end plate down as shown in Fig. (B). d. Coat grease or mist oil on the chock bore to prevent fretting corrosion.	
	a. Hoist the cup marked row No. 1 over the chock using hook and crane (or by hands). Then, lower the cup into the chock positioning the load zone mark ① at the loaded position. (Do the same for all cups. At subsequent regular inspections, change the load zone to ①→③→②→④ and so on) Caution : Be careful to maintain the cup horizontal while mounting. Do not hammer the cup directly but use a brass drift. b. After mounting the cup, try to insert a feeler gage between the end plate or chock shoulder and the cup to make sure that the cup is properly seated. (Photo. 2-4)	

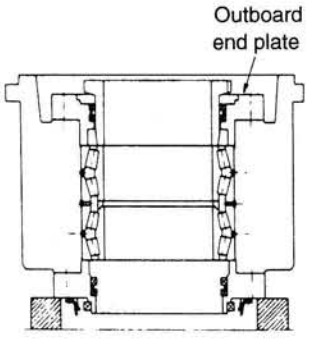
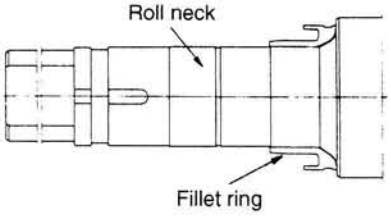
Mounting procedure		Procedure diagram	Photo
3	Install inboard cup spacer		
4	Install inboard double cone	 (In case of oil mist lubrication)	
5	Install double cup		
6	Install cone spacer		
7	Install outboard cup spacer		
8	Install outboard double cone		

Procedure details and cautions	Remarks
a. <table><tr><th>Grease lubricated bearings</th><th>Oil mist lubricated bearings</th></tr><tr><td>Fill the cage and roller assembly with grease. (For pin type cage, the pin holes should also be greased.)</td><td>Coat the cage and rollers with oil. (For pin type cage, the pin holes should also be oiled.)</td></tr></table> b. Install the inboard cup spacer marked row-No. 1~2. c. Lift the cone with the side showing row No. 1 down. Lower it into the chock on the cup already mounted. For oil mist lub. bearing : The cup spacer provided mist nozzle holes is equipped with two O-rings. Utmost care should be used in mounting the spacer not to damage or cut the O-rings. Make sure that the O-rings have proper interference with the chock bore. If the O-rings are too loose, the spacer will slide down the chock bore without effort. If, on the other hand, the O-ring is too tight to drive down, cut one end to reduce the fit, then bond the ends.	
a. Lift the double cup marked row-No. 2 side down and install it over the cup spacer aligning to mate the same load zone mark as that of the single cup. b. Place the cone spacer on the double cone so that the spacer rib fits over the cone shoulder.	
a. <table><tr><th>Grease lubricated bearings</th><th>Oil mist lubricated bearings</th></tr><tr><td>Fill the cage and roller assembly with grease. (For pin type cage, the pin holes should also be greased.)</td><td>Coat the cage and rollers with oil. (For pin type cage, the pin holes should also be oiled.)</td></tr></table> b. Install the outboard cup spacer marked row-No. 3~4 side down. c. Lift outboard double cone marked row-No. 3 side down, and install it on the cone spacer. (See page 16, No. 4 in case of oil mist lubrication)	

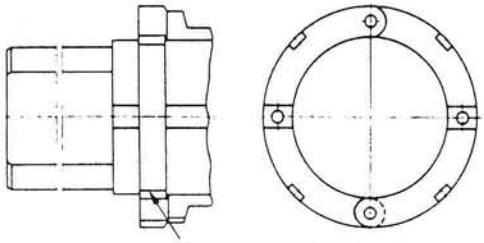
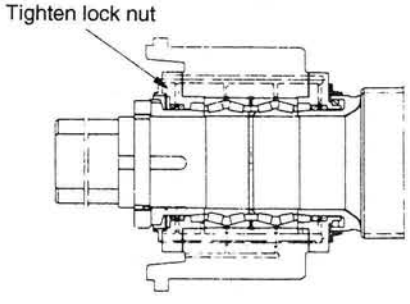
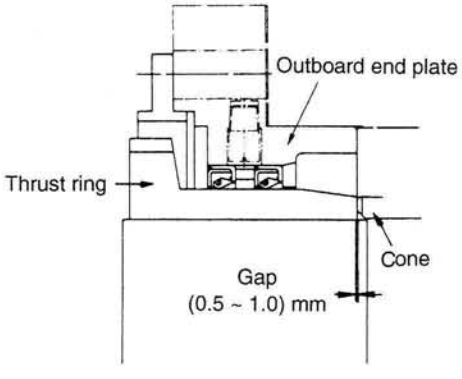
	Mounting procedure	Procedure diagram	Photo
9	Install the outboard single cup		 Photo. 2-5
10	Attach the outboard end plate temporarily to chock		
11	Attach the spider		
12	Determine the axial gap between the outboard end plate and chock		 Photo. 2-6
13	Install the shim pack		 Photo. 2-7

	Procedure details and cautions	Remarks
	Install the single cup marked row No. 4 with aligning the same load zone mark with the previously mounted cups.	
	a. Place the thrust ring on the cone face, then place the outboard end plate on the chock. (For reference, thrust ring is of either (A) or (B) design) b. Temporarily fit the outboard end plate on the chock with four bolts.	
	a. Turn the chock 90° to lay the chock horizontally then fit a spider as shown. b. Tighten up the bolts on the end plate, while rotating the spider back and forth. Note : As the cups and cones have been installed vertically, first and third rows of rollers could have not been seated against the cone back face ribs. Since this can lead to false end play reading. c. Push and pull the spider axially to determine the bench end play. d. Remove spider.	
	a. Determine the axial gap between the outboard end plate and chock with a feeler gage. b. Loosen the four bolts and remove the end plate.	
	Select the shim pack according to the gap as determined above referring to the Table 2-1. Install the shim pack on the chock face. Be careful not to install the shim pack up side down.	Table 2-1 unit : mm

Gap	Total shim thickness	Shim combination
< 0.95	1.0	1.0
1.0 1.25	1.5	1.5
1.35 1.65	2.0	2.0
1.75 2.0	2.5	1.0+1.5
2.1 2.4	3.0	1.0+2.0
2.5 2.8	3.5	1.5+2.0
2.9 3.2	4.0	2.0+2.0
3.3 3.6	4.5	1.0+1.5+2.0
3.7 4.0	5.0	1.0+2.0+2.0
4.3 4.5	5.5	1.5+2.0+2.0

	Mounting procedure	Procedure diagram	Photo
14	Attach outboard end plate to chock		 Photo. 2-8  Photo. 2-9
15	Mount fillet ring		 Photo. 2-10  Photo. 2-11
16	Coat grease or oil on the roll neck		 Photo. 2-12

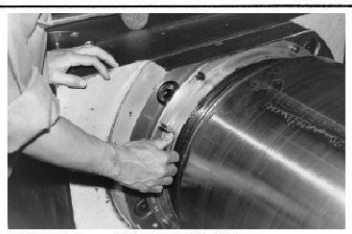
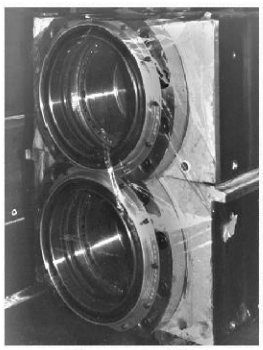
	Procedure details and cautions	Remarks
	Install the thrust ring and mount the outboard end plate again.	
	Tighten up all bolts. Note : Tighten the bolts evenly. Tighten two diametrally opposite bolts in sequence.	
	Press fit the fillet ring by the heat expansion method. Make sure that the fillet ring is in full contact with the roll barrel side face by inserting a feeler gage between them. (Photo. 2-10) Note : Before mounting, don't forget to install the O-ring on the fillet ring, if so designed. (Photo. 2-11)	
	Coat some extreme pressure and high heat type grease or oil on the roll neck.	

	Mounting procedure	Procedure diagram	Photo
17	Mount the chock with bearing on roll neck		 Photo. 2-13  Photo. 2-14
18	(1) Mount the thrust ring with lock nut (2) Then assemble half ring	 Split ring (Half ring)	 Photo. 2-15
19	Tighten lock nut	 Tighten lock nut  Outboard end plate Thrust ring Cone Gap (0.5 ~ 1.0) mm	 Photo. 2-16 Nut tightening tool

	Procedure details and cautions	Remarks
	Lift the chock complete with the bearing horizontally, and slide it onto the roll neck. (An automatic installation fixture may be used for quick mounting)	
	a. Mount the thrust ring with the lock nut on roll neck at first. b. Assemble both halves of the half ring and align the slots thereon with the keyways on the roll neck. c. After inserting the key, bolt them together with a spring washer.	
	a. Tighten the lock nut over the thrust ring until the bearing is clamped up against the fillet ring. (Use a tightening tool as shown in Photo. 2-16) b. Make sure that the chock swings easily. c. Back the nut off as tabulated below to provide a gap of 0.5 to 1.0 mm between the bearing cone face and thrust ring and fix lock nut by nut fixing bolts.	

Table 2-2

Pitch of nut thread	Turn back angle of nut corresponding to 0.5-1.0 mm axial movement
3 mm	60 ~ 120°
4	45 ~ 90°
5	36 ~ 70°
6	30 ~ 60°

Mounting procedure		Procedure diagram	Photo
20	Fix up the scale seals		 Photo. 2-17
21	Storage of chock assembly		 Photo. 2-18

2-3 Dismounting Bearing

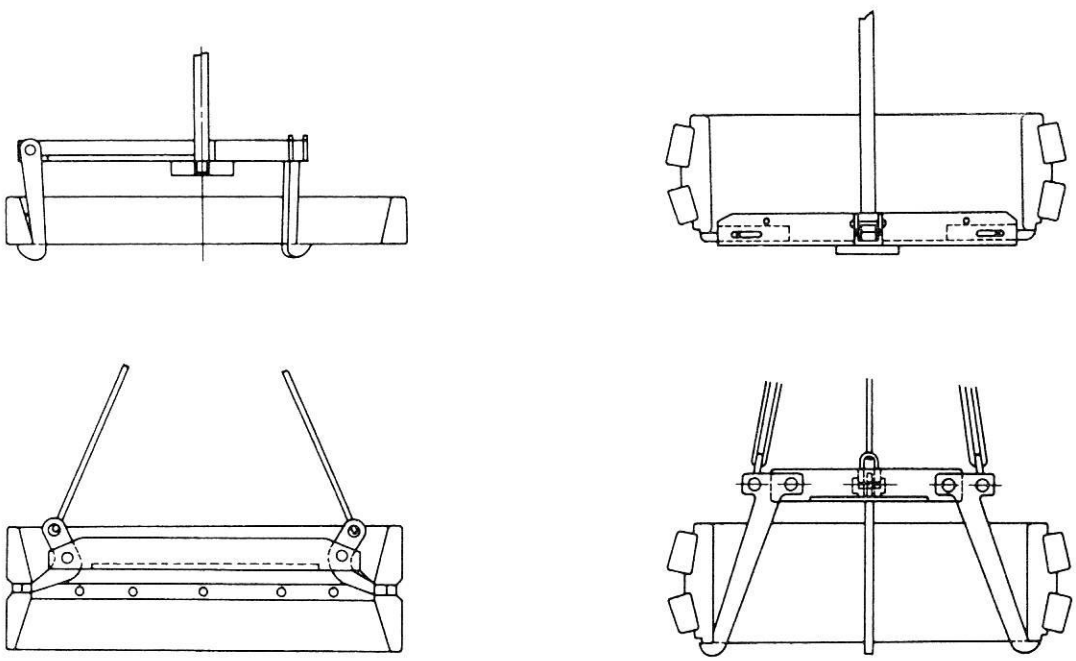
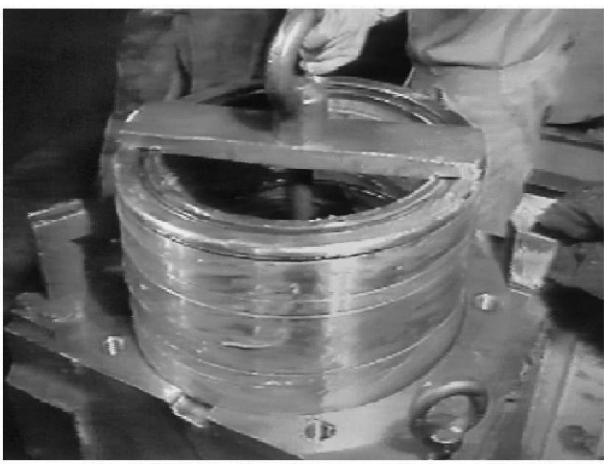


Fig. 2-7 (1) Bearing lifting tools

	Procedure details and cautions	Remarks
	After assembling the chock onto the roll neck, position the scale seal (No. 4 and No. 5) properly and tighten the bolts up.	
	The chock assembly complete with the bearing and end plates is sometimes stored as a spare until a later roll change. In these cases, the chock assembly should be covered with plastic sheet or other suitable material to protect from dust contamination. During the storage, the scale seals (No. 4 and No. 5) should not been tightened firmly. So that procedure No. 20 should not be skipped.	

The procedures for bearing removal are the reverse of the mounting procedures. As in mounting, the removal operation should be done in a clean environment. Also, the chock should be cleaned of scale, etc. before removing the bearing. Bearing removal requires lifting tools as shown, or other fixtures such as a floor press for convenience at disassembly.



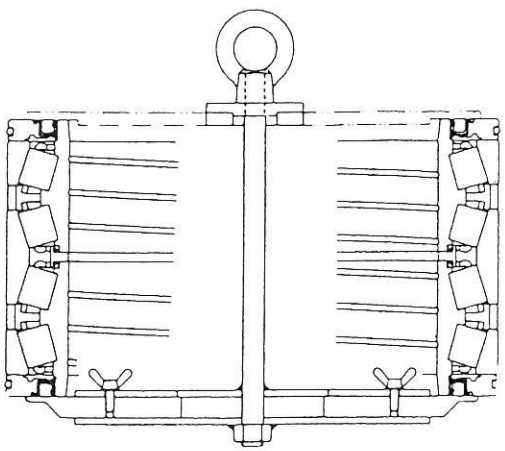


Fig. 2-7 (2)

3. MAINTENANCE AND INSPECTION

A bearing that has been operated for an extended period of time will inevitably terminate its life due to material fatigue on its working surfaces. In order to prolong this normal fatigue life as well as to protect the bearing from failure during operation, it is necessary to utilize proper inspection and maintenance techniques.

Any irregularity occurring in the bearing can be detected by checking noise, temperature and vibration. The maintenance personnel, therefore, should be familiar with these characteristics under normal operating conditions, and check them during operation as frequently as possible.
It is recommended that regular inspection interval be setup. For noise inspection, a metallic bar can be utilized as a stethoscope.

3-1 Routine Maintenance and Inspection (without disassembly)

(1) Relubrication :

Grease : The bearing should be regreased when the roll is removed from the stand and brought to the roll shop. Replenish with new grease until the new grease purges from the outlet.

Oil mist : Remove the drain cock and replenish the oil sump (or initial oil). The oil level should be maintained at the center of the roller at the lowest position.

(2) Used Lubricant Check :

Grease : Collect the used grease at the time of regreasing and check it for deterioration or contamination. When iron debris has contaminated the grease, the bearing should be disassembled for detailed inspection. The used grease also indicates the intrusion of water through the extent of emulsification of the grease. If the grease emulsification has advanced rapidly, disassemble the seals and check for defects that could permit the entrance of water.

Oil mist : Likewise, collect the used oil for inspection.
If the oil is contaminated with iron debris, disassemble the bearing for inspection.

(3) Seal Inspection :

Check the seal lip for foreign matter collection or damage.

(4) Seal Lip Contact Surface Inspection :

Check the seal lip contact surfaces on the thrust ring and fillet ring for abnormal wear or other defects, and rework as required.

3-2 Regular Overhaul

In addition to routine inspection, whether or not the bearings show signs of abnormality, they should be dismount from the chock for inspection at regular intervals. The frequency depends upon the operation of the rolling mill, however it is desirable to conduct the inspection at least every three months after within one years operation. The frequency may decrease depending upon the condition of the bearings, i.e., if the bearing condition is good, inspection at every 6 months may be acceptable.

(1) Remove foreign material adhering to the chock such as scale prior to removing the chock from the roll.
(2) Remove the bearings in accordance with dismounting procedures. At this time confirm the bearing was correctly mounted such as load zone position, row No. inspection No. etc.
(3) Wash the bearings by either of the following two methods.

Ⓐ Method

No. 1 washing (Solvent washing)	→	No. 2 washing (Hot water washing)	→	Final washing (Kerosene washing)
Water (90%) + alkaline detergent (10%) Solvent temperature 80 ~ 90°C		Water temperature 80 ~ 90°C		Kerosene at room temperature

Ⓑ Method

Rough washing	→	Finishing washing
Kerosene		Kerosene

Washing can be improved if the liquid is blown away by compressed air and bearings components should be rotated by hand while washing.

(4) Check the cage, outer ring and inner ring for irregularities. Rework irregularities if found.
(5) After washing, the components with the same serial No. should be kept together for strage or reassembling to avoid mixture of components with different serial Nos.
(6) Inspection and repair of bearing components.
(in accordance with Section 1-1)

(a) If the cup O.D. is badly affected by fretting corrosion, repair the surface with No. 500 grit sand paper or oil stone.

(b) If smearing or local flaking appears on the cup raceway, polish the corners smooth with No. 500 grit oil stone. It may be rounded by a microgrinder prior to polishing.

(c) Smearing or local flaking on the roller O.D. should be repaired similarly.

(d) Check the cone raceway as follows.

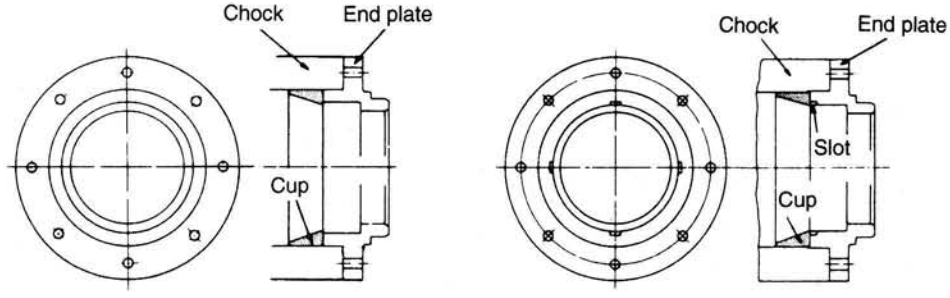
Pin type cage — Remove the removable pin (threaded) and the roller, and check the raceway by rotating the cage and roller assembly.

Pressed cage — Judge from the condition of the roller and cup raceways.

3-3 General Cautions

(1) Readjustment of the end play by means of spacer regrinding should be unnecessary. If the end play has increased to an extent that requires readjustment, the increase in itself is a problem, because the bearings manufactured currently are wear-resistant enough to factor out the necessity for readjustment. Cup deformation generally occurs before wear. Unless cup deformation is minimized, the adjustment of end play by spacer regrinding would be meaningless.

(2) The inboard end plate should be so designed as to facilitate the removal of the adjacent single cup. The end plate inside diameter should be larger than the cup small inside diameter as shown in Fig. 3(a) below, or, if smaller, the end plate should be slotted as shown in Fig. 3(b).



(a) (b)

Fig. 3 End plate design for Cup easy dismounting

(3) Vibration during unloaded running has an influence on the bearing life. To eliminate this influence, the clearance between stand and chock should be kept to a minimum and within the limits recommended below. Also, for the driveline, a universal coupling (KOYO Driveshaft) rather than a gear coupling or slipper coupling is preferred.

Table 3-1 Recommended limits for clearance between chock and stand

Unit : mm

Roll barrel Diameter	Clearance between Chock and Stand	
	Minimum	Maximum
250 ~ 340	0.30	0.40
360 ~ 380	0.35	0.45
400 ~ 450	0.40	0.60
550 ~ 650	0.55	0.75
700 ~ 800	0.70	0.90

These are recommended limits for merchant mills, wire & rod mills and tandem strip mills.

4. WEAR LIMITS OF CHOCKS AND ROLL NECKS

The following dimensions are recommended, in order to keep a good bearing performance.

Table 4-1 Recommended chock bore dimensions

a) For metric series bearings

Unit : 0.001mm

Brg. O.D. (mm)		Chock Bore Standard Tolerance		Fitting Clearance		Max. Chock Bore Out-of-Roundness	Allowable Max. Chock Bore
over	incl.	over	incl.	over	incl.		
120	150	+25	+57	25	75	75	+150
150	180	+50	+100	50	125	100	+250
180	250	+50	+120	50	150	150	+300
250	315	+50	+115	50	150	150	+300
315	400	+50	+110	50	150	150	+300
400	500	+50	+105	50	150	150	+300
500	630	+50	+100	50	150	150	+300
630	800	+75	+150	75	225	200	+450
800	1000	+75	+150	75	250	250	+500
1000	1250	+100	+175	100	300	300	+600
1250	1600	+125	+215	125	375	350	+750
1600	2000	+150	+250	150	450	400	+900

b) For inch series bearings

Unit : 0.001mm

Brg. O.D. (mm)		Chock Bore Standard Tolerance		Fitting Clearance		Max. Chock Bore Out-of-Roundness	Allowable Max. Chock Bore
over	incl.	over	incl.	over	incl.		
---	304.8	50	75	25	75	150	+150
304.8	609.6	100	150	49	150	150	+300
609.6	914.4	150	225	74	225	250	+450
914.4	1219.2	200	300	98	300	300	+600
1219.2	1524.0	250	375	123	375	350	+750

Table 4-2 Recommended roll neck O.D.

a) For metric series bearings

Unit : 0.001mm

Brg. Bore (mm)		Standard Roll Neck Dia. Tolerance		Fitting Clearance between Bearing Bore and Roll Neck (loose fit)		Allowable Min. Roll Neck Dia.
over	incl.	over	incl.	over	incl.	
80	120	-150	-120	100	150	-300
120	180	-175	-150	125	175	-350
180	250	-200	-175	145	200	-400
250	315	-250	-210	175	250	-500
315	400	-300	-240	200	300	-600
400	500	-300	-245	200	300	-600
500	630	-300	-250	200	300	-600
630	800	-400	-325	250	400	-800
800	1000	-425	-350	250	425	-900

b) For inch series bearings

Unit : 0.001mm

Brg. Bore (mm)		Standard Roll Neck Dia. Tolerance		Fitting Clearance between Bearing Bore and Roll Neck (loose fit)		Allowable Min. Roll Neck Dia.
over	incl.	over	incl.	over	incl.	
101.6	127	-125	-100	100	150	-300
127	152.4	-150	-125	125	175	-350
152.4	203.2	-175	-150	150	200	-400
203.2	304.8	-200	-175	175	225	-450
304.8	609.6	-250	-200	200	301	-600
609.6	914.4	-325	-250	250	401	-800

Value & Technology

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CAT.NO. B3002E
Issue Date 2007. 2