Koyo

Handling Manual of Bearings for Back Up Roll Assembly of CR-mill

JTEKT | JTEKT CORPORATION

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1. Back up roll assembly: Overview

There are two kinds of back up roll (named BUR here after) assemblies in CR-mill: large-diameter BUR and small-diameter BUR assemblies.

A large-diameter BUR assembly consists of three kinds of components: bearings, shaft and spacers.

A small-diameter BUR assembly consists of two kinds of components: bearings and shaft. This handling manual presents how to handle, maintain, and inspect the bearings, shafts, and spacers of representative BUR assemblies. Other BUR assemblies should also be handled according to the instructions in this manual.

1.1 Nomenclature and construction of back up roll assembly

(1) Nomenclature of BUR assembly

One side of a mill toward to the operator is called as work side (W.S.), and the other side is called as drive side (D.S.). The mill stand has an upper side large-diameter left-hand BUR assembly, upper side large-diameter right-hand BUR assembly, lower side large-diameter left-hand BUR assembly, lower side large-diameter right-hand BUR assembly, upper side small-diameter BUR assembly, and lower side small-diameter BUR assembly, as viewed from the work side (Refer to Fig. 1.1).

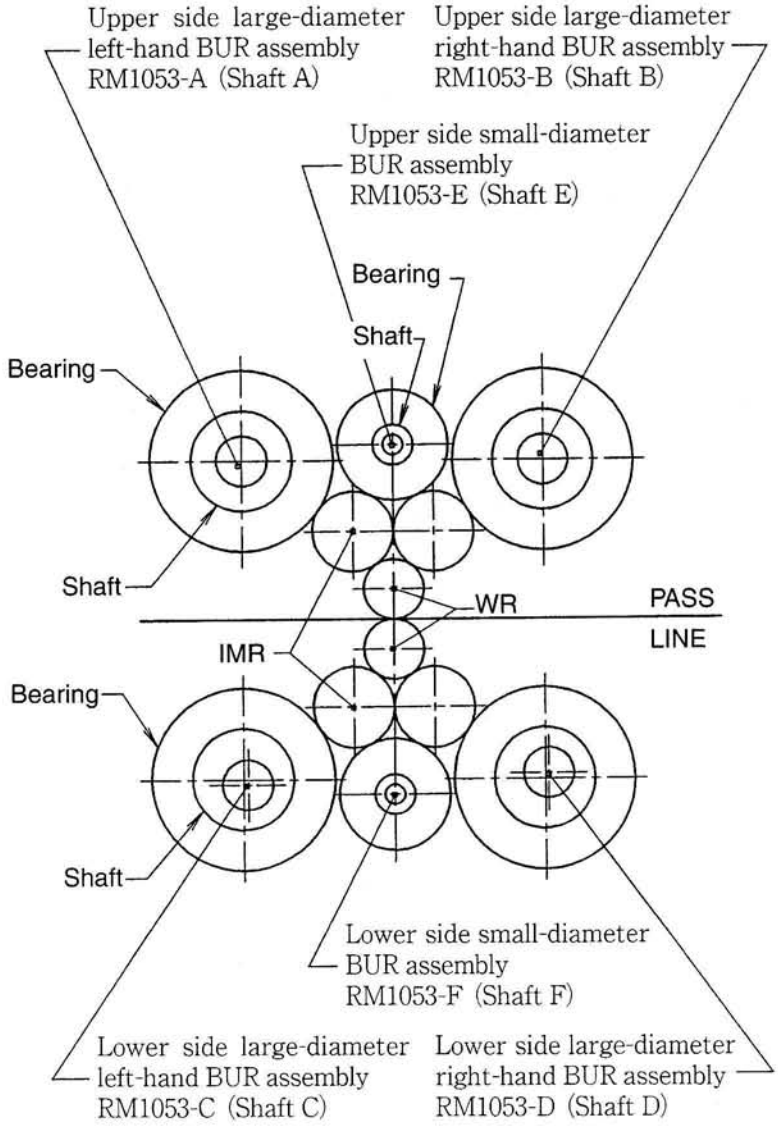


Fig. 1.1 Nomenclature of back up roll assembly

(2) Construction of BUR assembly

The four types of BUR assembly are constructed as shown in Figs. 1.2 to 1.5 below:

① Upper side large-diameter BUR assembly (left-hand/right-hand)

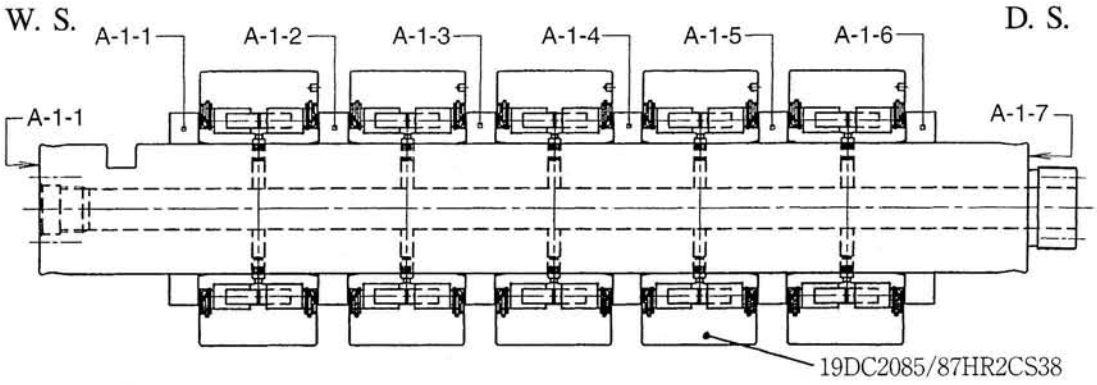


Fig. 1.2 Construction of upper side large-diameter BUR assembly

② Lower side large-diameter BUR assembly (left-hand/right-hand)

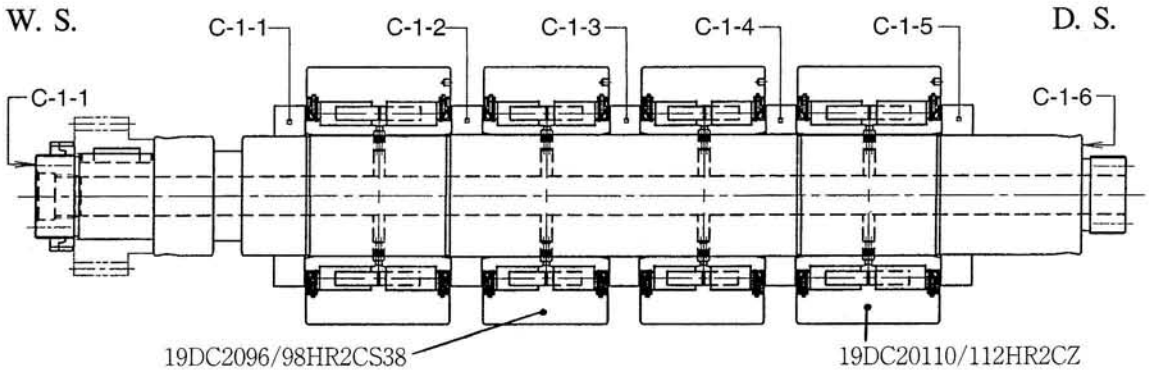


Fig. 1.3 Construction of lower side large-diameter BUR assembly

③ Upper side small-diameter BUR assembly

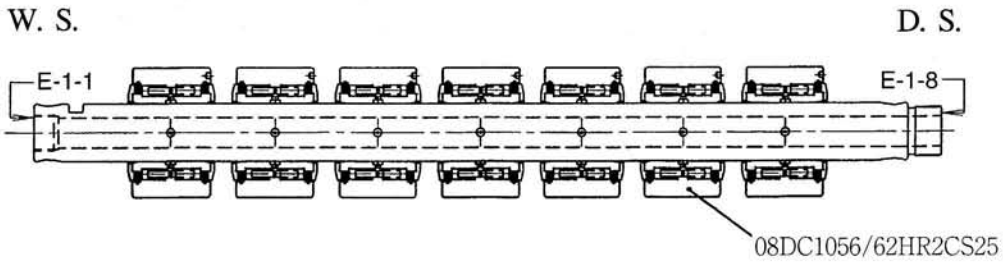


Fig. 1.4 Construction of upper side small-diameter BUR assembly

④ Lower side small-diameter BUR assembly

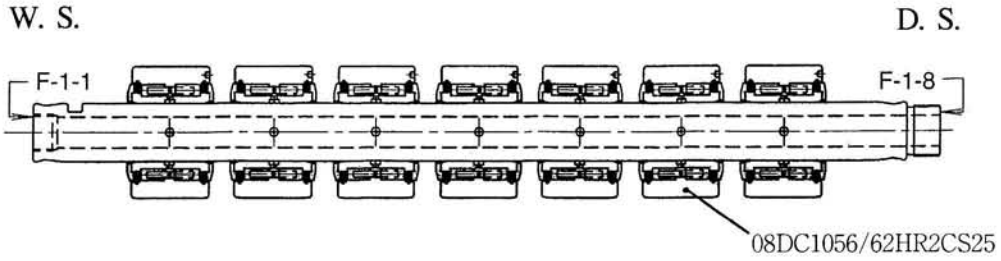


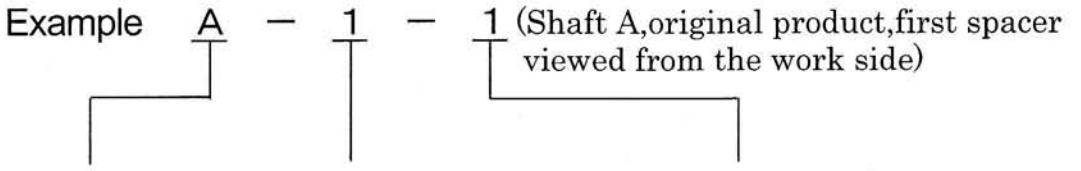
Fig. 1.5 Construction of lower side small-diameter BUR assembly

1.2 Numbering system on spacers and shafts

The numbers marked on spacers (provided for large-diameter BUR assembly only) and shafts are important for BUR assembling. The numbering system is as shown below:

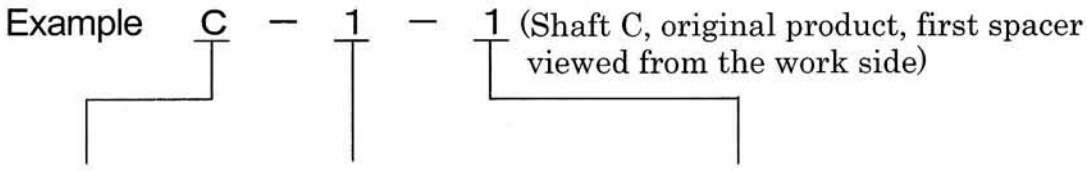
(1) Numbering system on spacers

① Upper side large-diameter BUR assembly



Shaft	Lot number	Position on the shaft
A: Shaft A (upper side large-diameter left-hand BUR assembly)	1: Original product	1: First spacer viewed from the work side
B: Shaft B (upper side large-diameter right-hand BUR assembly)	2: Spare parts 1	2: Second spacer viewed from the work side
	3: Spare parts 2	3: Third spacer viewed from the work side
		4: Fourth spacer viewed from the work side
		5: Fifth spacer viewed from the work side
		6: Sixth spacer viewed from the work side

② Lower side large-diameter BUR assembly



Shaft	Lot number	Position on the shaft
C: Shaft C (lower side large-diameter left-hand BUR assembly)	1: Original product	1: First spacer viewed from the work side
D: Shaft D (lower side large-diameter right-hand BUR assembly)	2: Spare parts 1	2: Second spacer viewed from the work side
	3: Spare parts 2	3: Third spacer viewed from the work side
		4: Fourth spacer viewed from the work side
		5: Fifth spacer viewed from the work side

(2) Numbering system on shafts

① Upper side large-diameter BUR assembly

Example A – 1 – 1 (Shaft A, original product, work side)

Shaft	Lot number	Shaft end position
A: Shaft A (upper side large-diameter left-hand BUR assembly) B: Shaft B (upper side large-diameter right-hand BUR assembly)	1: Original product 2: Spare parts 1 3: Spare parts 2	1: Work side 7: Drive side

② Lower side large-diameter BUR assembly

Example C – 1 – 1 (Shaft C, original product, work side)

Shaft	Lot number	Shaft end position
C: Shaft C (lower side large-diameter left-hand BUR assembly) D: Shaft D (lower side large-diameter right-hand BUR assembly)	1: Original product 2: Spare parts 1 3: Spare parts 2	1: Work side 6: Drive side

③ Upper side small-diameter BUR assembly

Example E – 1 – 1 (Shaft E, original product, work side)

Shaft	Lot number	Shaft end position
E: Shaft E (upper side small-diameter BUR assembly)	1: Original product 2: Spare parts 1 3: Spare parts 2	1: Work side 8: Drive side

④ Lower side small-diameter BUR assembly

Example F – 1 – 1 (Shaft F, original product, work side)

Shaft	Lot number	Shaft end position
F: Shaft F (lower side small-diameter BUR assembly)	1: Original product 2: Spare parts 1 3: Spare parts 2	1: Work side 8: Drive side

2. Back up roll bearings

2.1 Back up roll bearings: Overview

(1) Back up roll bearings

Back up roll bearings are served as BUR assembly in a CR-mill and play different roles compared with bearings for roll neck applications.

For the roll neck applications, a bearing is mounted between roll and chock and supports loads exerted on the shaft (with the inner ring rotating). A back up roll bearing supports loads on its outer ring surface (with the outer ring rotating).

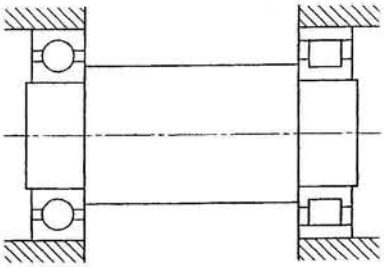


Fig. 2.1 Bearing for roll neck applications

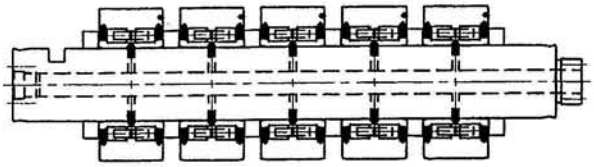


Fig. 2.2 Back up roll bearing

(2) Bearing inspection numbers and component control
(treatment as non-interchangeable components)

Components (outer ring, inner ring and rollers) of BUR bearing are produced with high precision to obtain specific bearing characteristics, such as bearing section height, radial internal clearance and running accuracy. However, they are not intended to be interchangeable.

Each component of BUR bearing is matched and assembled to satisfy demanded characteristics.

BUR bearings are thus not interchangeable. The precision characteristics, such as bearing section height and radial internal clearance, may be impaired if components having different inspection numbers are assembled into a BUR bearing, or if the first-row and second-row components are assembled in the wrong sequence.

It is important to use BUR bearings as shipped from JTEKT, without any modification of component assembly.

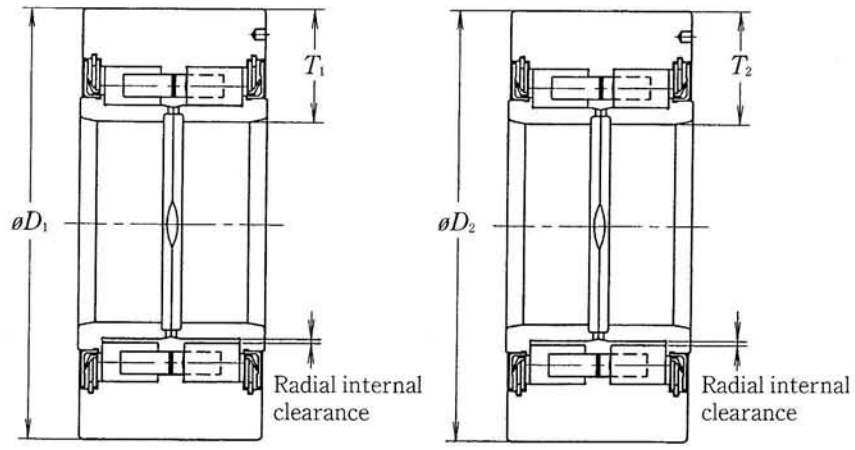
2.2 Bearing section height

The bearing section height is the cumulated section height of the outer and inner rings and rollers.

As shown in Fig. 2.3, the bearing section height of a BUR bearing can be obtained as cumulated these section height, where radial bearing internal clearance is zero.

BUR bearings having the same outside diameter of the outer ring may differ in the cumulated section height.

Therefore, it is necessary to consider not only outside diameter but also bearing section height.



Remark: When D_1 are equals to D_2, T_1 may or may not be equal to T_2.

Fig. 2.3 Bearing section height

2.3 Regrinding on outside-diameter surface of outer ring

When outside-diameter surface of the outer ring exhibits brinelling and nicks, the performance as a BUR bearing has deteriorated. If the surface is extremely rough, the bearing may be broke down entirely. It is important to maintain good condition and roughness on outside-diameter surface of the outer ring by removing brinelling and nicks from the surface.

The outside-diameter surface of the outer ring should be reground periodically.

(1) Hydraulic grinding jig used for regrinding (Example)

Table 2.1 Hydraulic grinding jig (See Fig. 2.4)

Number of hydraulic grinding jig	Number of BUR bearing	Maximum service pressure [1)]
RZ355//P0/18	19DC2085/87HR2CS38 FYPZ/00 19DC2096/98HR2CS38 FYPZ/00	57 MPa
RZ355A//P0/18	19DC20110/112HR2CZ FYPZA00	56 MPa
RZ356//P0/18	08DC1056/62HR2CS25 FYPZ/00	91 MPa

Note 1) Make sure to insert the grinding jig into the bearing before applying hydraulic pressure. If hydraulic pressure is applied to an uninstalled jig, the sleeve will be deformed plastically to such an extent to be no longer useful.

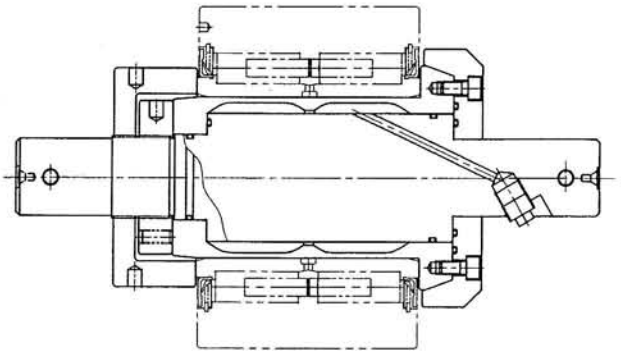


Fig. 2.4 Hydraulic grinding jig

(2) Variation of bearing section height

1) If one of the bearings on a shaft is reground and a significant variation is produced in the bearing section height among bearings on the shaft, bearings would be damaged shortly because of abnormal load distribution among bearings.

The variation of the bearing section heights are controlled not to exceed 0.006 mm on the shaft, and the variation between two bearings next to each other on the shaft is controlled not to exceed 0.002 mm at the time of shipment from JTEKT.

2) In case that two kinds of bearings with different bore diameter are used on one shaft for lower side large-diameter BUR assembly.

Example: 19DC2096/98 (bore diameter 95 mm) and 19DC20110/112 (bore diameter 94 mm).

The variation of bearing section height between bearings should be controlled that the outside diameter of outer rings to be in line after assembling on the shaft.

3) There are two methods to control the bearing section height for reground bearings:

① To control grinding removal ② To measure bearing section height

① To control grinding removal

Because the bearing section height at the time of shipment from JTEKT is recorded in the bearing inspection report, the bearing section height of a reground bearing can be obtained by controlling grinding removal.

The bearing section height of a reground bearing = The bearing section height at the time of shipment from JTEKT − (Grinding removal in diameter)/2

Grinding removal can be determined taking into consideration of the outside diameter of the outer ring at the time of shipment from JTEKT and after regrinding.

Grinding removal in diameter = Outside diameter of the outer ring at the time of shipment from JTEKT − Outside diameter of the outer ring after regrinding

② To measure bearing section height

The bearing section height is measured using an apparatus designed exclusively for the purpose. Fig. 2.5 below shows how bearing section height can be measured, as an example.

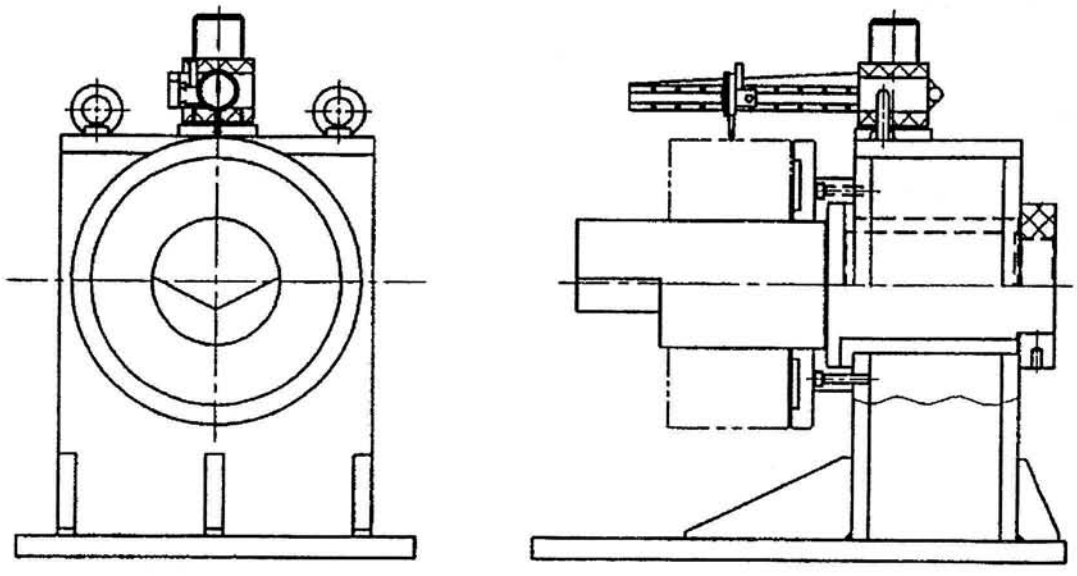


Fig. 2.5 Measurement of bearing section height

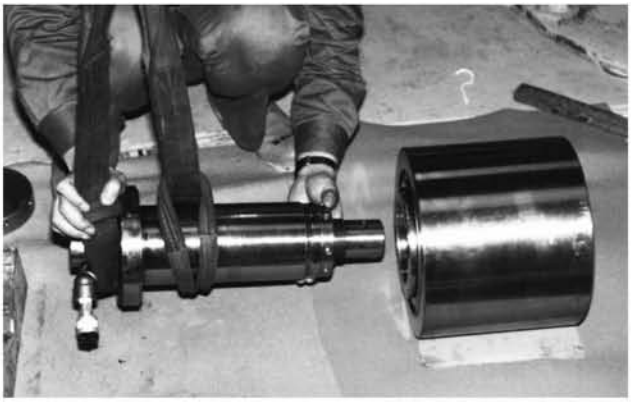
(3) Limit outside diameter of outer ring

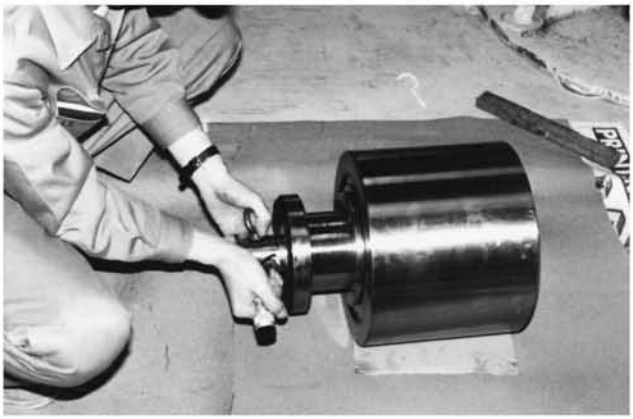
After repeated regrinding, outside diameter of the outer ring reduces to the extent where the bearing is no longer in use. This is called limit outside diameter, which is determined in terms of strength of the outer ring. Discontinue to use the bearing if its outside diameter has achieved to the limit diameter (Refer to Table 2.2)

Table 2.2 Limit outside diameter of the outer ring Unit mm

	Limit outside diameter of outer ring	Outside diameter of outer ring at the time of shipment
Small-diameter BUR bearing	ϕ 93	ϕ 95
Large-diameter BUR bearing	ϕ 198	ϕ 200

(4) Procedure for regrinding bearing on outside-diameter surface of outer ring



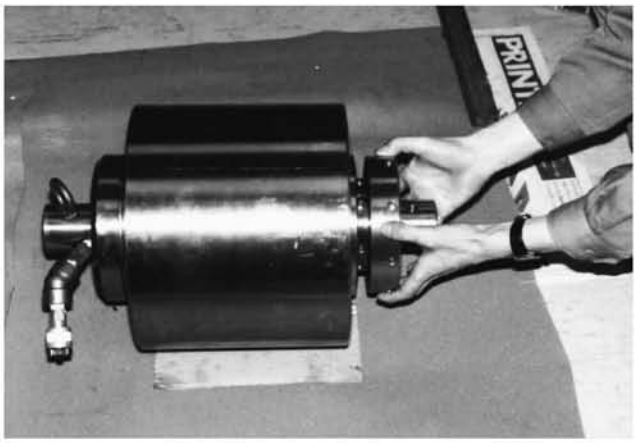


1) Wipe off any dust or oil on the bearing with a sponge or clean cloth.

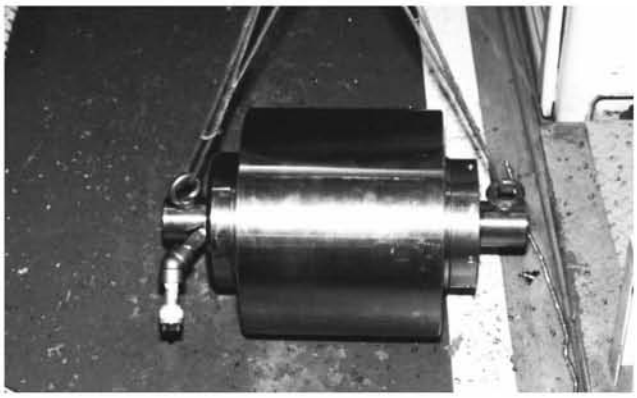
2) Wind sling for lifting around bearing outside-diameter surface mounted at the end of the shaft and place the bearing horizontally on a bench, ensuring that the bearing does not roll off.

3) Lift up a hydraulic grinding jig using the sling.

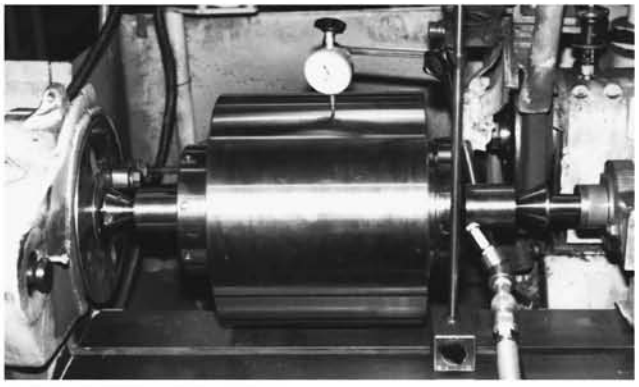
4) Insert the lifted hydraulic grinding jig into the bearing, and remove the sling.



5) Fasten the bearing with bearing fixture.



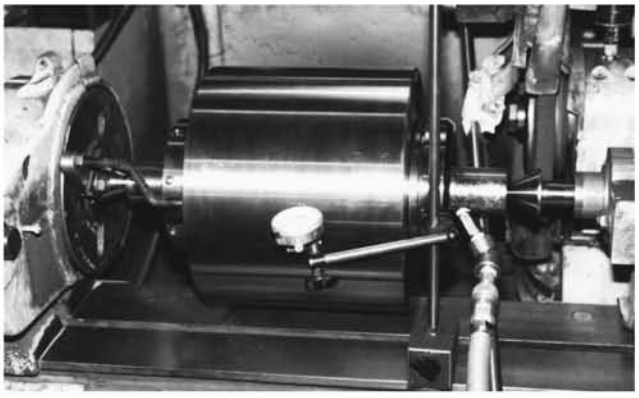
6) Lift up the hydraulic grinding jig and set it on the grinding machine.
Fasten the bearing-jig assembly on the grinding machine by means of the center holes of the shaft of the jig.



7) Set a carrier to rotate the outer ring of the bearing.

8) Connect a hydraulic hose to the hydraulic grinding jig.

9) To measure the radial runout of the bearing on the outside-diameter surface, set a stand equipped with a comparator with 1/1000 mm precision on the grinding machine.



10) Operate the hydraulic pump and expand the inner ring.
Accommodate hydraulic pressure on ensure that the outer ring rotate with almost zero bearing internal clearance.

The "almost zero bearing internal clearance" is a condition where the difference between radial runout measured on outside-diameter surface vertically at the uppermost position of the bearing outer ring and that measured horizontally should not exceed 0.002 mm.

(4) Procedure for regrinding bearing on outside-diameter surface of the outer ring (continued)

11) Measure outside diameter of the outer ring before regrinding.
12) Regrind the outside-diameter surface by rotating the outer ring through the carrier, while the shaft of the grinding jig being stationary.
13) When regrinding is completed, measure radial runout of the outer ring on outside-diameter surface keeping the bearing installed on the grinding machine (with hydraulic pressure). The radial runout should be measured vertically at the uppermost position on outside-diameter surface of the outer ring.
14) Release the pump hydraulic pressure to zero, and disconnect the hydraulic hose from the hydraulic grinding jig. Remove the hydraulic grinding jig from the grinding machine and extract the bearing from the hydraulic grinding jig.

(5) List of hydraulic grinding jig accessories

Table 2.3 List of hydraulic grinding jig accessories

Name	Model (for large-diameter BUR bearings)	Model (for small-diameter BUR bearings)
Manual pump	P−1B	UP−21
Pressure gauge	AS100−100M	AS150−250M
Gauge damper	GD−70	−
Pressure gauge fixture	T−5	−
Coupler	S−1R	S−4R
High-pressure hose	H3/8−2S	UH−2
High-pressure elbow with 45 degree angle	Q−3/8	−
High-pressure nipple	N−3/8−40	−
Male/female socket	−	Special product [1]

Note 1) Refer to JTEKT for the male/female socket as this is a special product.

(6) Crowning on outside-diameter surface of outer ring

The outside-diameter surface of the outer ring of a BUR assembly has contact with the intermediate roll. Therefore, if edge loads are generated, the bearing or the intermediate roll becomes damaged.

To prevent the generation of edge loads, crowning is formed at both ends of outside-diameter surface of the outer ring. However, after regrinding on outside-diameter surface of the outer ring, this crowning could be removed. Make sure to form the crowning after each regrinding on the outside-diameter surface of the outer ring. When the crowning is formed, smooth the intersection between the outside-diameter surface and the crowning by lapping. Fig. 2.6 shows the crowning dimensions for small-diameter BUR bearings and Fig. 2.7 shows those for large-diameter BUR bearings.

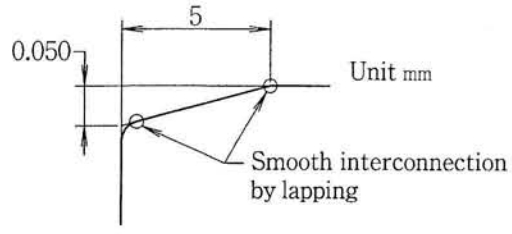


Fig. 2.6 Crowning dimensions for small-diameter BUR bearings

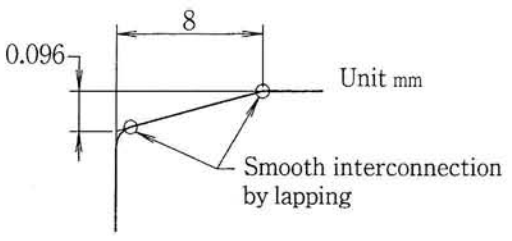


Fig. 2.7 Crowning dimensions for large-diameter BUR bearings

2.4 Bearing inspection

The frequency of bearing inspection should be determined with reference to the conditions of rolled material and experience-based knowledge concerning rolling conditions.

Inspect bearings if the luster on rolled strips surface is weaken or if the strip surface is roughened due to flaws on outside-diameter surface of the outer ring.

(1) BUR bearing components

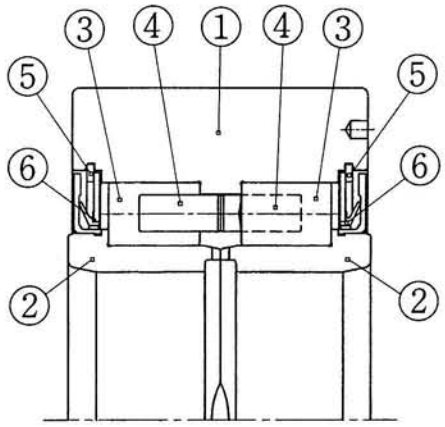


Table 2.4 BUR bearing components (Example)

NO.	Name of component	Qty. (per bearing)	
		Small-diameter BUR bearing	Large-diameter BUR bearing
1	Outer ring	1	1
2	Inner ring	2	2
3	Roller	1 6 × 2	1 7 × 2
4	Cage	2	2
5	Snap ring	2	2
6	Seal	2	2

(2) Marking on bearing side face

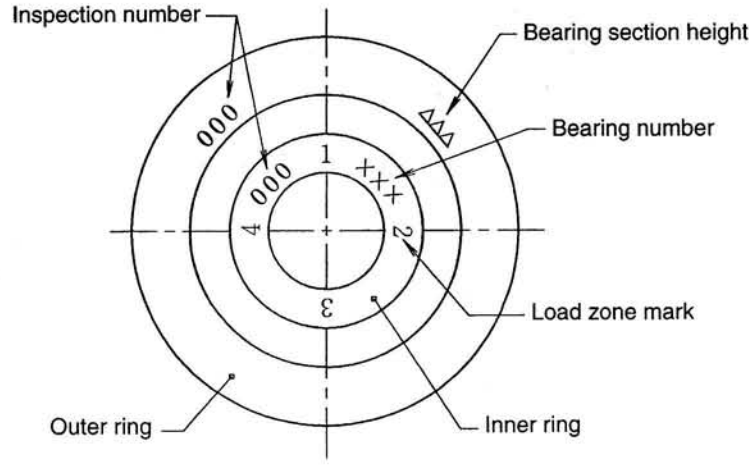
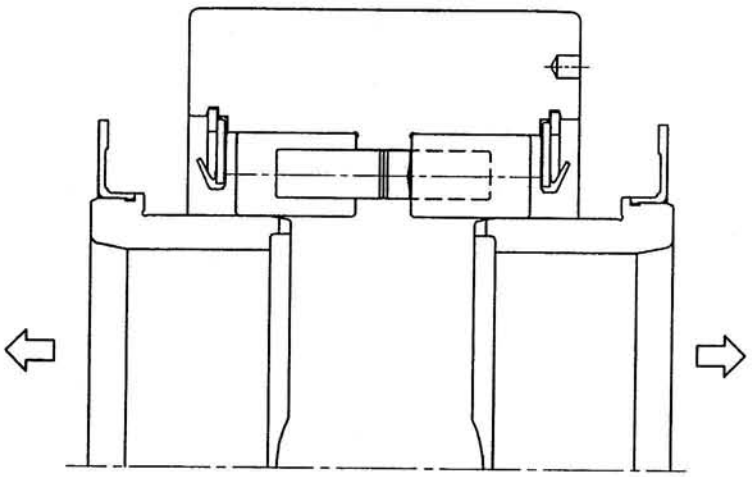
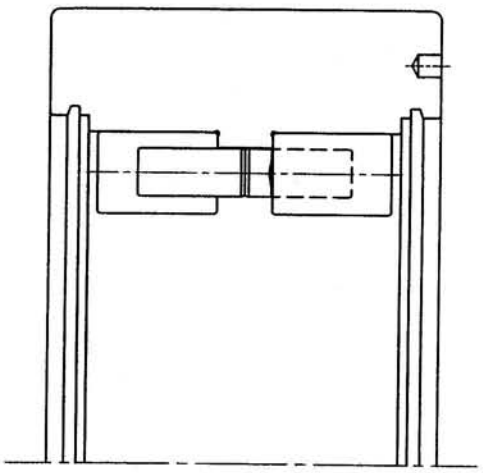


Fig. 2.8 Marking on bearing side face

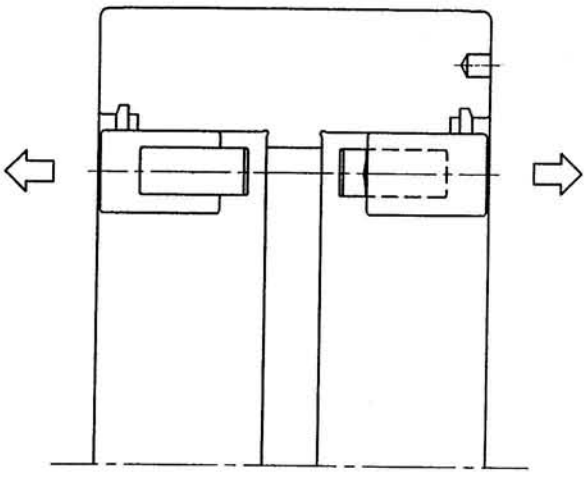
(3) Procedure for disassembling and assembling of BUR bearing



1) The first and second row inner rings shall be pulled out.



2) The snap rings and seals shall be disassembled.



3) The set of rollers and cage shall be pulled out.
(Note; Rollers shall be not dropped out from cage and mixed up with rollers in the other row.)

4) For bearing assembling, apply initial oil (mist oil) into the bearing inside and perform the above-described disassembling procedure in the reverse order.
Do not mix the bearing components of the first-row and those of the second-row or assemble the bearing components of another bearing (with a different inspection number).

(4) Bearing cleaning and removal of foreign matter

BUR bearings can be contaminated by the following types of foreign matter:

① Chipping and scales produced from strip ends or flaws during rolling conditions.
② Flaw chips and wear particles generated from outside-diameter surface of the outer ring.
③ Wear particles produced by the contact of components inside the bearing (outer ring, inner rings, rollers and cage).

Remove the bearing from the mill and clean the bearing carefully within 24 hours using cleaning oil (organic solvent such as kerosene).

(5) Inspection of bearing components

Bearing components are not interchangeable. During disassembling of BUR bearings, ensure that the components of individual bearings do not mix with the components of other bearings.

① Outer ring
- (Ⅰ) Flaws on the outside-diameter surface
- (Ⅱ) Roughness on the outside-diameter surface
- (Ⅲ) Cracking and chipping
- (Ⅳ) Smearing (hair cracks) on the side face
- (Ⅴ) Rust
- (Ⅵ) Flaws or discoloration on the raceway surface and rib face
- (Ⅶ) Outside-diameter dimension (Compare with the limit diameter)

② Inner ring
- (Ⅰ) Flaws on the bore-diameter surface
- (Ⅱ) Cracking and chipping
- (Ⅲ) Rust
- (Ⅳ) Flaws or discoloration on the raceway surface and rib face

③ Roller
- (Ⅰ) Flaws or discoloration on the rolling contact surface and end faces
- (Ⅱ) Cracking and chipping

④ Cage
- (Ⅰ) Cracking and broken pillar
- (Ⅱ) Abnormal contact-induced by flaws and wear

Examine and classify abnormalities by keeping a record of damage separately for each individual bearing inspection number.

2.5 Representative bearing damage and countermeasures

Each type of bearing damage is classified under a different name.

Table 2.5 shows representative BUR bearing damage and countermeasures, and Table 2.6 shows photographs of bearing damage.

When bearing damage is discovered, it is important to evaluate it correctly, to identify the causes and to implement countermeasures immediately.

Table 2.5 Representative BUR bearing damage and countermeasures

Problem		Fig.	Causes	Treatment of damaged product	Temporary countermeasure for prevention [1)]
Rolling fatigue	Flaking and/or spalling	1 2	Problem of the bearing (material and precision) or under rolling conditions (load, lubrication or mounting accuracy) → Flaking and spalling on bearing raceway surface and rolling contact surface	1) Minor flaking on raceway surface of the inner-ring →Repair the flaked area and change the loaded zone 2) Discontinue to use the bearing if there is major flaking on raceway surface of the inner ring or if the raceway surface of the outer ring or the rolling contact surface of the rollers exhibits flaking	Examine the problem and take appropriate measures accordingly
Cracking	Cracking on outer ring	3 4	1) Cracking developed from heat cracking due to grinding or slipping 2) Cracking initiating from flaking or brinelling on the raceway surface 3) Cracking caused by impact load or excessive load	Discontinue to use the bearing	Examine the problem and take appropriate measures accordingly
	Chipping	5	Impact load or excessive load →Bearing end section is chipped		
Wear	Wear	6	Foreign-matter ingress and/or insufficient lubrication → Lack of oil film → Mechanical wear and/or development of pear skin on the raceway surface and rolling contact surface	Grind outside-diameter surface or repair the worn area	Increase the amount of oil and/or use clean oil
	Fretting	7	Fretting caused when fitting with the shaft is loose	Repair the problem area using oilstones	Review fitting conditions
Seizure	Smearing	8	Insufficient lubrication → Lack of oil film	1) Repair the problem area or discontinue to use the bearing 2) Repair the inner-ring problem area and change the load zone	1) Review rolling conditions 2) Increase the amount of oil and/or use clean oil
	Scuffing	9	Lack of oil film and/or excessive axial load → Seizure	Repair the problem area or discontinue to use the bearing	
Scratches	Scratches	—	Scratches produced during bearing assembling or disassembling	Repair the problem area using oilstones	Improve bearing assembling or disassembling procedure
	Slip damage	10	Incorrect rotation due to abnormal load or insufficient lubrication → Slippage → Deformation	Grind on outside-diameter surface	Review rolling conditions
Rust	Rust and corrosion	11	Rolling fluid has entered the bearing and remained inside → Rust	1) Repair the problem area using oilstones 2) If the rust is significant, discontinue to use the bearing	1) Purge the moisture completely, take measures to prevent rust, and put into storage 2) Improve sealing devices
Plastic deformation	Dents	12 13	Foreign matter has entered the load zone and has been caught up inside → Plastic deformation	Grind on outside-diameter surface or repair the problem area	Use clean oil
	Nicks	—	The surface was hit by a hammer or similar object when the bearing was assembled → Plastic deformation	Repair the problem area or discontinue to use the bearing	Improve bearing assembling or disassembling procedure
Deformation	Deformation of configuration	—	Impact load, excessive load and abnormal ambient temperature on the bearing → Deformed axially	Discontinue to use the bearing	1) Review rolling conditions 2) Review bearing cooling method

Note 1) Final countermeasure for prevention shall be established by carefully examining damaged products and identifying the causes.

Table 2. 6 (1) Photographs of BUR bearing damage (Example)

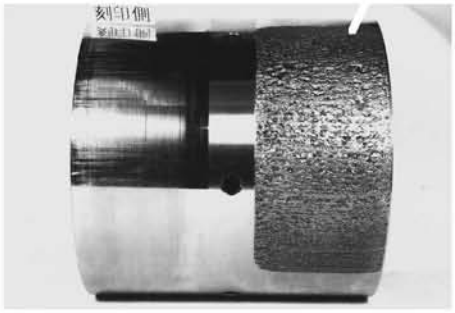


Fig. 1 Flaking (Inner ring raceway surface)

Fig. 2 Flaking (Rolling contact surface of rollers)

Fig. 3 Cracking (Outer ring)

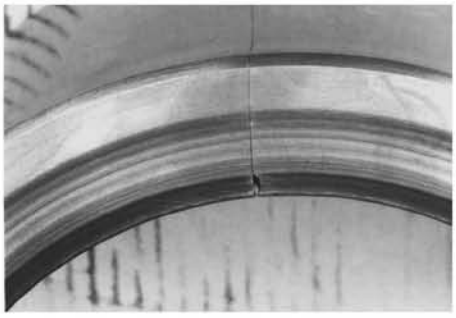


Fig. 4 Cracking (Outer ring)

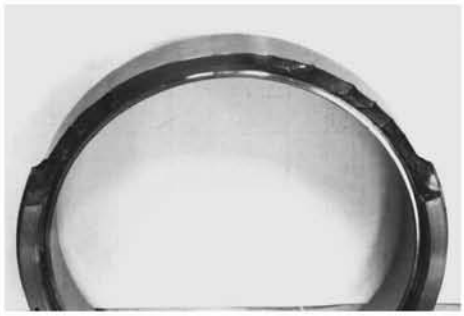


Fig. 5 Chipping (Outer ring)

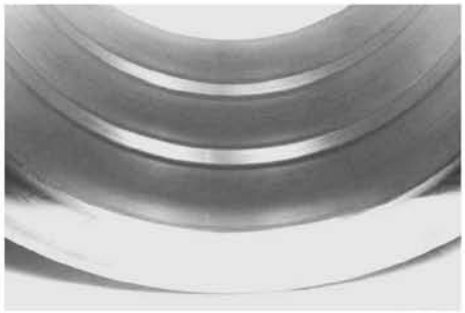


Fig. 6 Wear (Outer ring raceway surface)

Fig. 7 Fretting (Outer ring raceway surface)

Fig. 8 Smearing (Rolling contact surface of rollers)

Table 2. 6 (2) Photographs of BUR bearing damage (Examples)

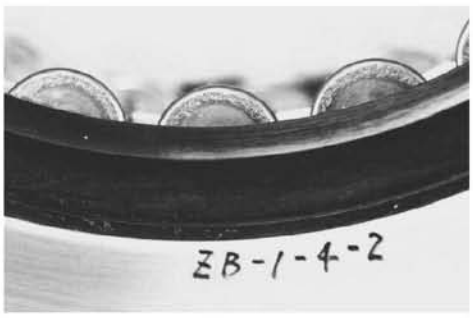


Fig. 9 Scuffing (Roller end face)

Fig. 13 Brinelling (Outer ring raceway surface)

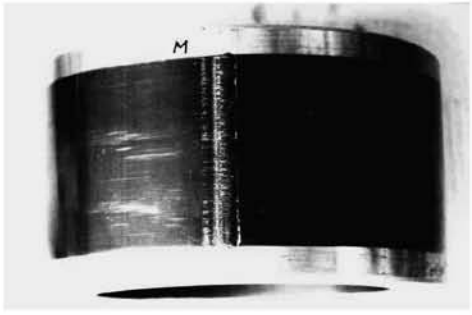


Fig. 10 Slip damage (Inner ring raceway surface)

Fig. 11 Rust and Corrosion (Outer ring raceway surface)

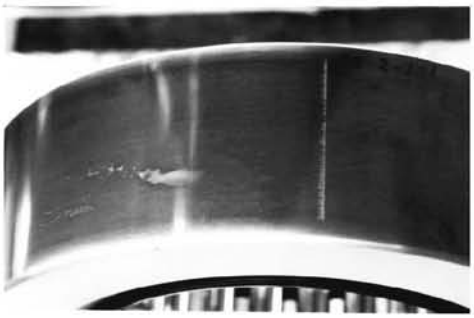


Fig. 12 Brinelling (Outer ring outside diameter surface)

2.6 How to repair bearing damage

(1) How to repair bearing damage

1) The raceway surface and rib face of inner and outer rings as well as rollers cannot be reground. If these have a minor damage, undertake repair using oilstones or sandpaper.
   ① Use oilstones of the following grades in this order: 220, 400, and 600.
   ② Apply sandpaper of the following grades in this order: 180, 240, and 400.

2) Serious damage (flaking and cracking) cannot be repaired. Consequently discontinue to use such seriously damaged bearings. Even if some components of extremely damaged bearings appear normal, do not apply them to other bearings.
   Components are not interchangeable between bearings.

(2) How to repair outside-diameter surface of outer ring

① If the damage is minor: Regrind the surface (0.1 to 0.2 mm removal in diameter) to remove the damaged area.
② If the damage is major: If the damage cannot be removed by regrinding on the outside-diameter surface, treat the damage as per instructions given in Table 2.7 below:

Table 2.7 Repair standards on outside-diameter surface of outer ring

Damage type	Damage length	Damage width	Damage depth	Repair method
Slip damage, scratches and scuffing	60 mm or less	5 mm or less	0.2 mm or less	After regrinding the damaged area, smooth the area around the damage using oilstones and/or sandpaper.
Flaking	5 mm or less	5 mm or less		

Remark) Discontinue to use the bearing if the damage is greater than the sizes specified in this table.

3. Disassembling, assembling and storage of back up roll assembly

3.1 Shafts

BUR bearings are lubricated by the oil mist method. Oil mist is supplied to the bearing via the shaft. The shaft is hollow and has nozzles at the position where the bearing is positioned.

When inspecting or repairing a shaft, keep the following in mind:
① Any burr produced due to damage on the outside-diameter surface of the shaft may obstruct BUR assembly. Remove any burr on the surface completely by using oilstones or equivalent.
② If there are scales or dust on the surface of the outside diameter or inside diameter, or if the nozzle hole is clogged, sufficient bearing lubrication is impossible.
   Remove foreign matter completely.

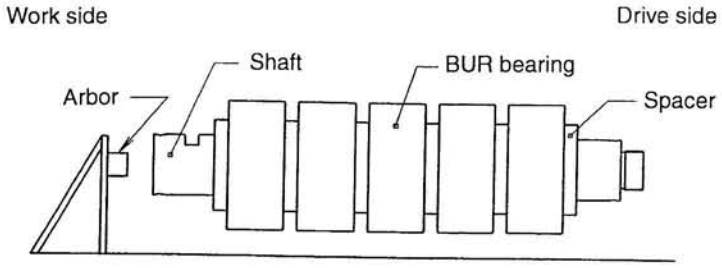
3.2 Spacers

Spacers are placed between bearings to support the shaft. The variation of spacer section height (= [outside diameter−inside diameter]/2) is well controlled in each shaft.

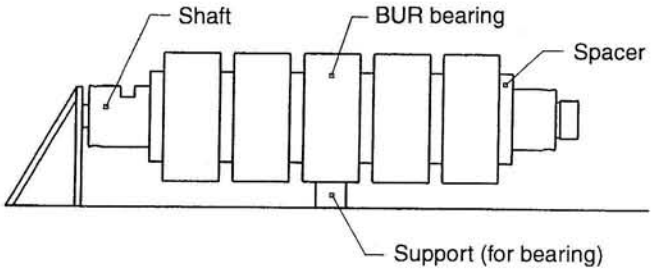
It is important not to mix the spacers of different shafts. An incorrect spacer may damage bearings. If a spacer has a swelling on the surface (outside-diameter surface, inside-diameter surface and side face) because of damage produced by hitting or other reasons, remove the swelling completely using oilstones or the equivalent.

3.3 Procedure for disassembling and assembling of large-diameter back up roll assembly

(1) Procedure for disassembling of an upper side large-diameter BUR assembly

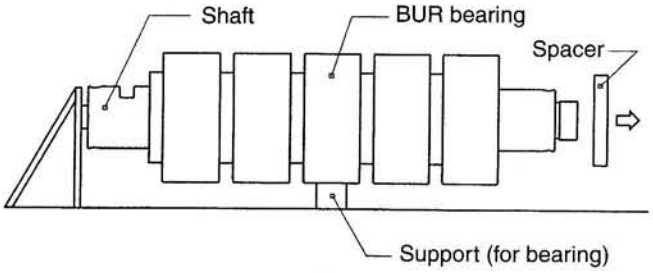


1) Place the BUR assembly on the assembling stand to come the work side to arbor side.

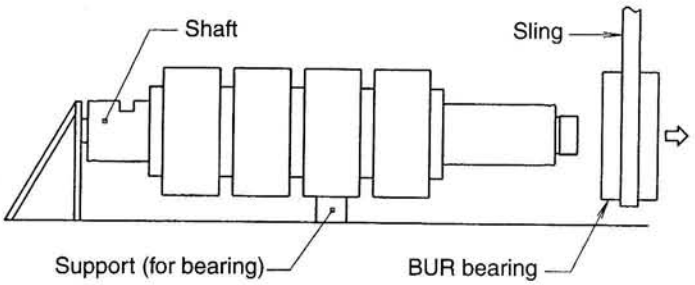


2) Secure horizontal of the BUR assembly by adjusting the support of the assembling stand, checking with level.

3) Clean outside-diameter surface of the shaft with clean cloth.
Remove any burrs on the surface using oilstones or by other suitable methods.

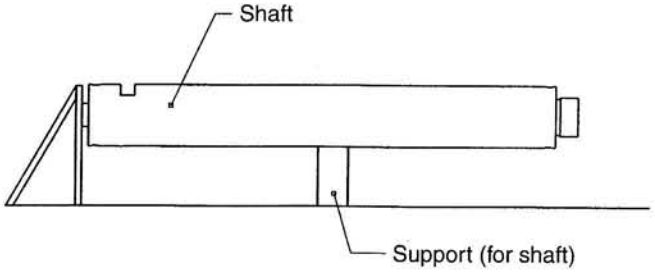


4) Pull and remove the spacer.



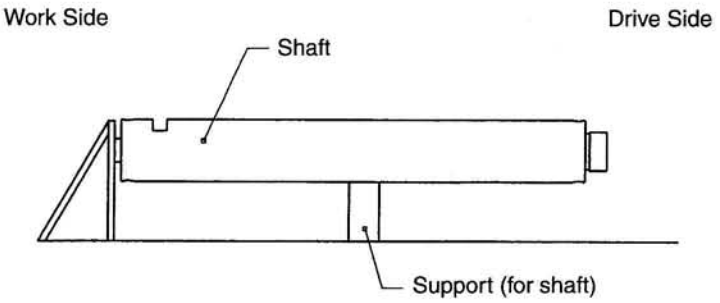
5) Pull and remove the bearing.

Note: If the bearing is heavy, wind a sling around the outside-diameter surface of the bearing and lift it with a crane for safety.



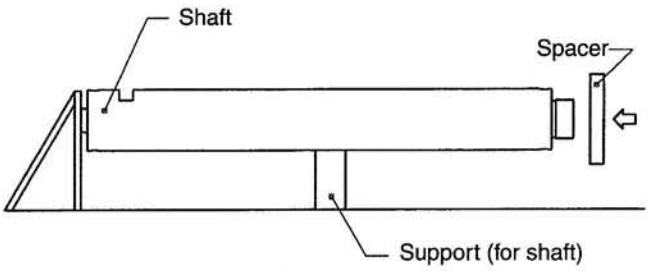
6) Pull and remove all spacers and bearings by repeating steps 4) and 5).

(2) Procedure for assembling of an upper side large-diameter BUR assembly



1) Clean the surface of the outside-diameter and the inside-diameter of the shaft and nozzle holes of scale and dust completely.

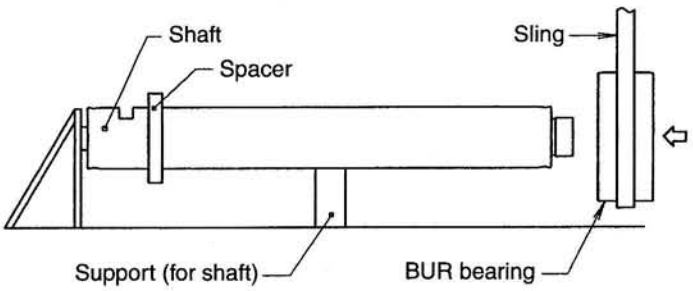
2) Place the shaft on the assembling stand to come the work side to arbor side.

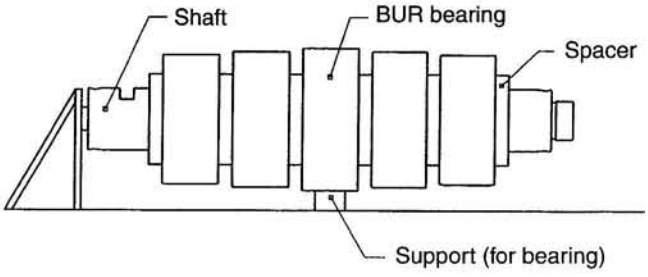


3) Assemble spacers and bearings to the shaft.

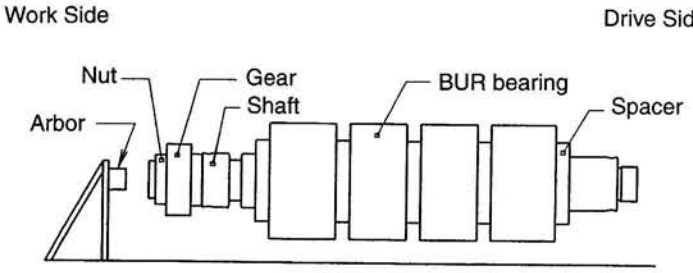
For spacer positions, refer to paragraph ① of section 1.1 (2).

Assemble the bearings such that the outside-diameter surface is highest at the center.

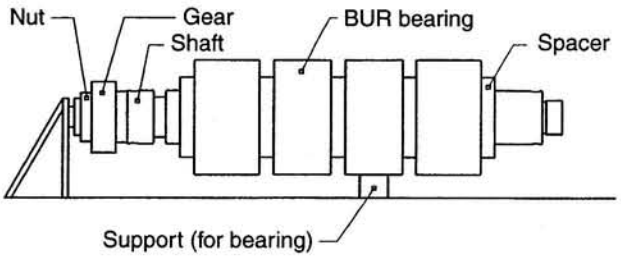




(3) Procedure for disassembling of lower side large-diameter BUR assembly

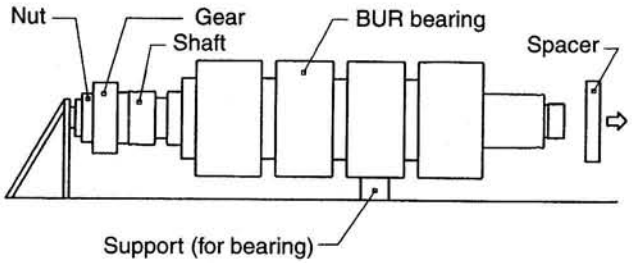


1) Place the BUR assembly on the assembling stand to come the work side to arbor side.

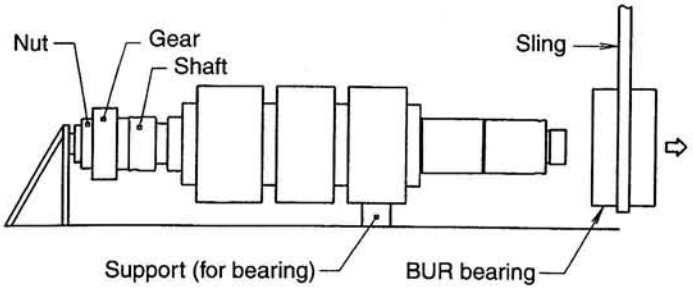


2) Secure horizontal of the BUR assembly by adjusting the support of the assembling stand, checking with level.

3) Clean outside-diameter surface of the shaft with clean cloth.
Remove any burrs on the surface using oilstones or by other suitable methods.

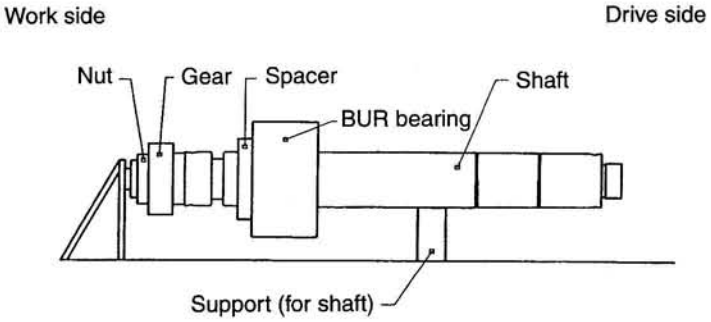


4) Pull and remove the spacer.

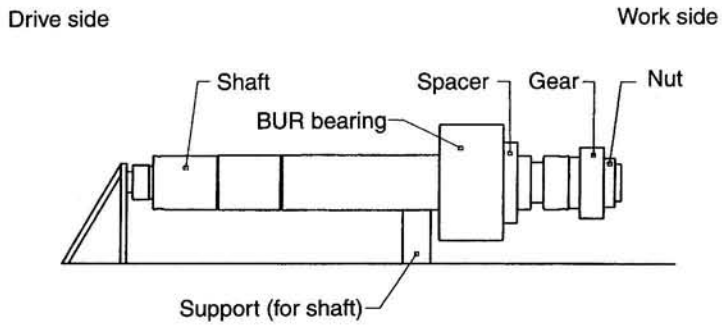


5) Pull and remove the bearing.

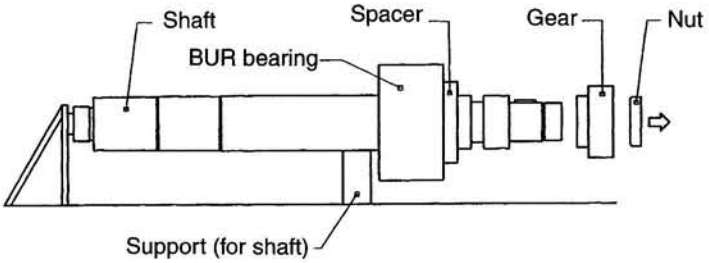
Note: If the bearing is heavy, wind a sling around the outside-diameter surface of the bearing and lift it with a crane for safety.



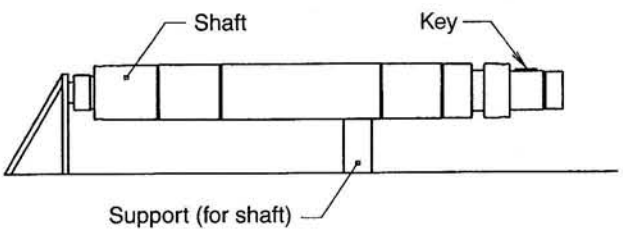
6) Pull and remove spacers and bearings by repeating steps 4) and 5) until only one spacer and one bearing remain on the work side.



7) Place the BUR assembly on the assembling stand to come the drive side to arbor side.



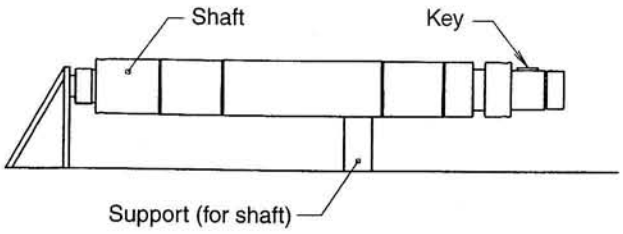
8) Remove the nut and gear.



9) Pull and remove the remaining spacer and bearing.

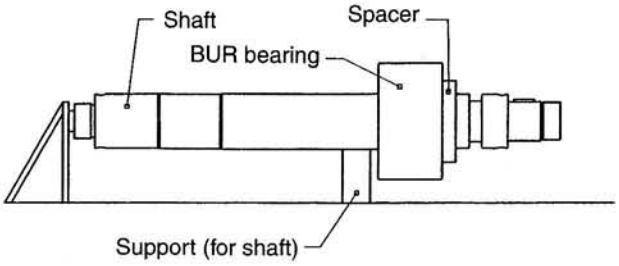
(4) Procedure for assembling of lower side large-diameter BUR assembly

Drive side Work side

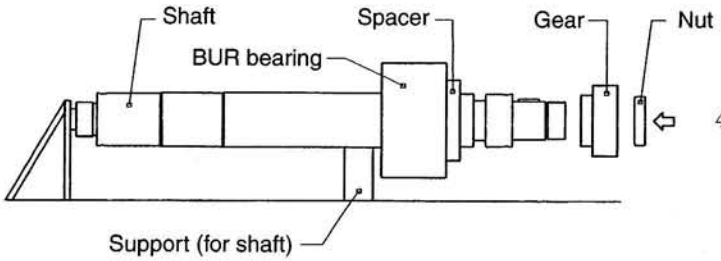


1) Clean the surface of the outside-diameter and the inside-diameter of the shaft and nozzle holes of scale and dust completely.

2) Place the shaft on the assembling stand to come the drive side to arbor side.

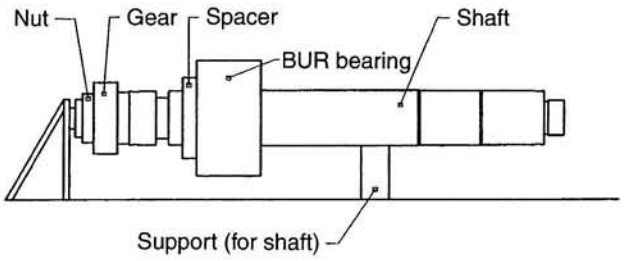


3) Assemble a spacer and a bearing on the shaft.
For spacer positions, refer to paragraph ② of section 1.1 (2).

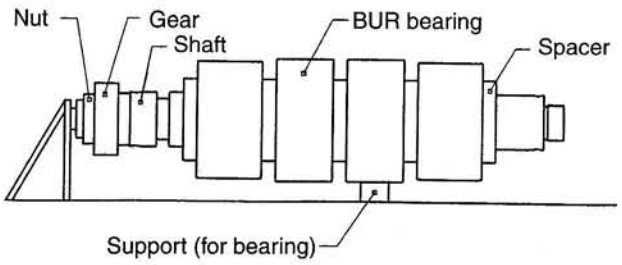


4) Set gear and nut.

Work side Drive side



5) Place the shaft on the assembling stand to come the work side to arbor side.



6) Assemble spacers and bearings to the shaft.
For spacer positions, refer to paragraph ② of section 1.1 (2).
Assemble the bearings such that the outside-diameter surface is highest at the center.

3.4 Storage of back up roll assembly

1) After an overhaul, supply initial oil (mist oil) into BUR bearings and then assemble. Apply anti-corrosion treatment to bearing surface.
2) Apply anti-corrosion treatment to the BUR assembly.
3) When these treatments are complete, store the BUR assembly covered with a sheet (e.g., oilpaper) to prevent rust (especially inside the bearing).

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