MOTION&CONTROL

Roll Neck Bearing

Manual

NSK

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Thank you for your kind patronage of NSK roll neck bearings. Recently rolling mills have advanced tremendously in terms of functions. In line with such progress, the demands on bearings used in rolling mills are becoming increasingly more sophisticated and diversified.

NSK has been engaged in various research and development activities to meet market demands such as resource saving and environmental protection as well as higher reliability, maintenance free and high speed operation. However, the bearings incorporating new technology cannot realize their full performance potential if they are not handled properly.

This operating manual has been prepared and issued, so that users can gain a thorough understanding of NSK's roll neck bearings and enjoy the distinctive advantages of their functions and features. This manual describes four-row tapered roller, four-row cylindrical roller, and double-direction tapered roller thrust bearings which are used mostly as roll neck bearings. We hope that this manual will help you to operate these excellent bearings correctly in order to realize their top performance.

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1. Features, Part Name, and Marking by Bearing Type

1.1 Four-row tapered roller bearing, KV (TQO)

The roll neck bearing used in a rolling mill is limited in its dimensions by the roll neck diameter and minimum roll diameter. The four-row tapered roller bearing is so designed that its load rating may be as large as possible within this limited space. This type of bearing consists of two sets of cone assemblies, three cups and two cup spacers. To facilitate installation and removal of the roll and chock, this type of bearing is loose-fitted to the roll neck. Accordingly, lubrication to the fit surface is essential to prevent scoring between the roll neck and bearing bore due to creep. To prevent wear and seizure of cone and cone spacer, oil slots are provided on one side of the cone and both sides of cone spacer.

Double-row cup and cup spacers are provided with oil holes and oil grooves to supply the lubricant.

Hair cracks caused in the cone side surfaces by creep may lead to cracks in the cone. To prevent such cracking and to enhance the shock resistance of a bearing, the bearing rings are made from carburized steel usually. The cage is designed as a window type or pin type.

<Name and Marking of parts>

In addition to the bearing number, as shown in **Fig. 1.1**, the bearing is provided with a serial number that is common to one set of bearings and match marks indicating the combination order. The serial number is used to prevent mismatching during combination of bearings while match marks show the proper position of each part within a bearing.

A wrong combination of these parts may cause an excessively small bearing clearance, resulting in seizure. On the other hand, an excessively large clearance due to a wrong combination may cause reduction of the load zone, resulting in a shorter fatigue life.

The cup of a bearing is provided with load position numbers at four equally-divided points around the circumference. (These numbers are provided on the cone if the cup rotates.) So that the bearing life can be extended, each time the bearing is reassembled after disassembly and cleaning, shift the load position numbers by 90° to change the load zone.

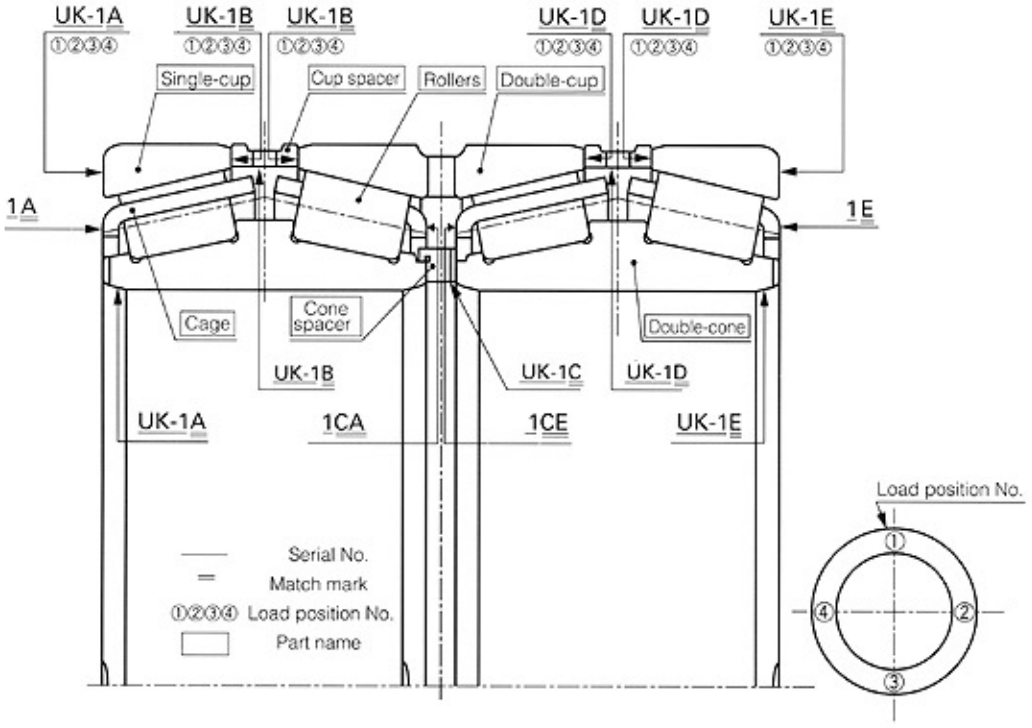


Fig. 1.1 Name of parts and marking examples (Four-row tapered roller bearing)
Note: Some markings may be omitted, if the marking space is not enough.

1.2 Sealed-clean four-row tapered roller bearing, KVE

Basically, this type of bearing is similar to the four-row tapered roller bearing and has the following features:

- Substantial reduction in the consumption of lubricating grease
- Longer interval until disassembly and cleaning, thereby cutting-down on the maintenance costs
- Cleaner environment around the rolling mill and roll shop
- Prevention of sudden failure due to foreign particle entry

Basically, there are two-seal and four-seal types of bearings. The standard feature of the sealed-clean tapered roller bearing is its ability to operate for a long time without the need for regreasing. Due to this feature, there are no oil holes in the cup spacers to supply lubrication to the bearing, but in the case of severe operating conditions, it could be designed to enable lubrication by making a lubrication groove and oil holes in the cup spacers. There is also a type compatible with oil-air lubrication (patent pending).

<Name and marking of parts>

In addition to the bearing numbers, as shown in **Fig. 1.2**, the bearing is provided with a serial number that is common to one set of bearings and match marks indicating the combination order. The serial number is used to prevent mismatching during combination of bearings while match marks show the proper position of each part within a bearing.

A wrong combination of these parts may cause an excessively small bearing clearance, resulting in seizure. On the other hand, an excessively large clearance due to a wrong combination may cause a reduction of the load zone, resulting in shorter fatigue life. The cup of a bearing is provided with load position numbers at four equally-divided points around the circumference. (These numbers are provided on the cone when the cup rotates.) So that the bearing life can be extended, each time the bearing is reassembled after disassembly and cleaning, be sure to shift the load position numbers by 90° to change the load zone.

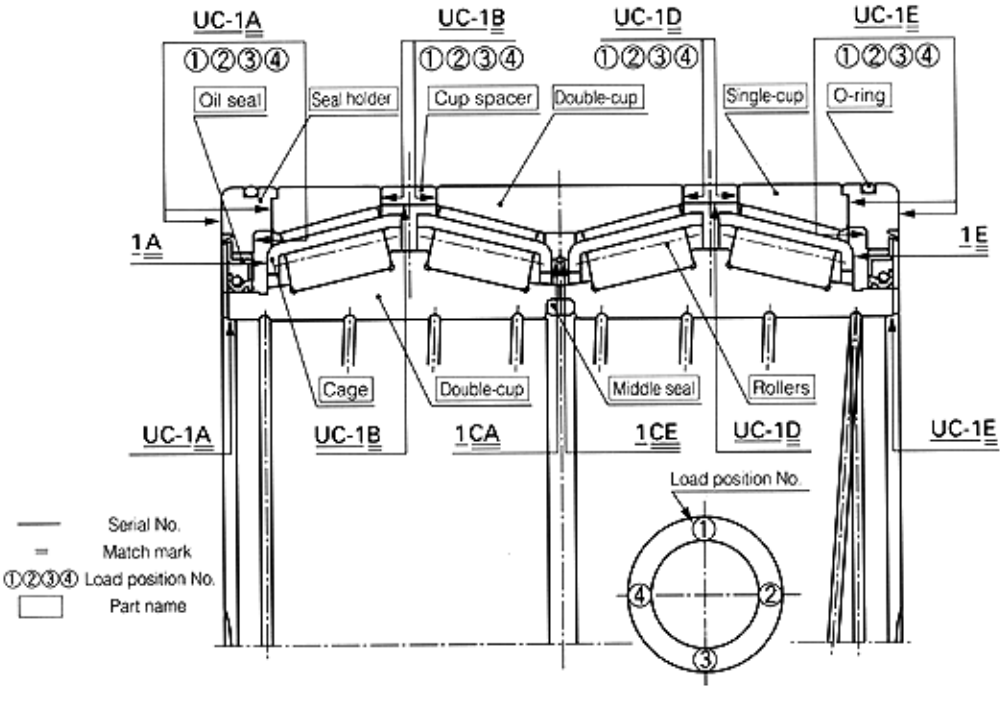


Fig. 1.2 Name of parts and marking examples (Sealed-clean tapered roller bearing)
Note: Some markings may be omitted, if the marking space is not enough.

1.3 Four-row cylindrical roller bearing, RV and RVK

A four-row cylindrical roller bearing is used in the work roll neck of wire, steel shape, and blooming mills, as well as in the backup roll of refining, hot, and cold rolling mills. This type of bearing has an outer ring rib that is either integrated with or separated from the outer ring. The inner ring is also either an integrated or a two-piece combination type. The bearing having a tapered bore type inner ring has "K" added to the bearing number. Both types of four-row cylindrical roller bearings carry radial load only and cannot carry axial load. A four-row cylindrical roller bearing is used in combination with another bearing type, such as an angular contact ball bearing set, or a tapered roller thrust bearing, or the like.

Since the raceway surface of the inner ring is cylindrical, it is easy to disassemble the outer ring assembly and inner ring. The roll can be reground with reference to the raceway surface of the inner ring that is tightly fitted to the roll neck. When a grinding allowance is provided for the inner ring raceway surface and ground together with the roll barrel after fitting to the roll neck, the roll run-out can be minimized. Accordingly, a four-row cylindrical roller bearing is best suited and used frequently as a backup roll bearing to assure precise product thickness.

<Name and marking of parts>

In addition to the bearing number, as shown in **Fig. 1.3**, the bearing is provided with a serial number that is common to one set of bearings and match marks indicating the proper combination order. The serial number is used to prevent mismatching during combination of bearings while match marks show the proper position of each part within a bearing. A wrong combination of these parts may cause an excessively small bearing clearance, resulting in seizure. On the other hand, an excessively large clearance due to a wrong combination may cause reduction of the load zone, resulting in a shorter fatigue life. The outer ring of a bearing is provided with load position numbers at four equally-divided points around the circumference. (These numbers are provided on the inner ring when the outer ring rotates.) So that the bearing life can be extended, each time the bearing is reassembled after disassembly and cleaning, shift the load position numbers by 90° to change the load zone.

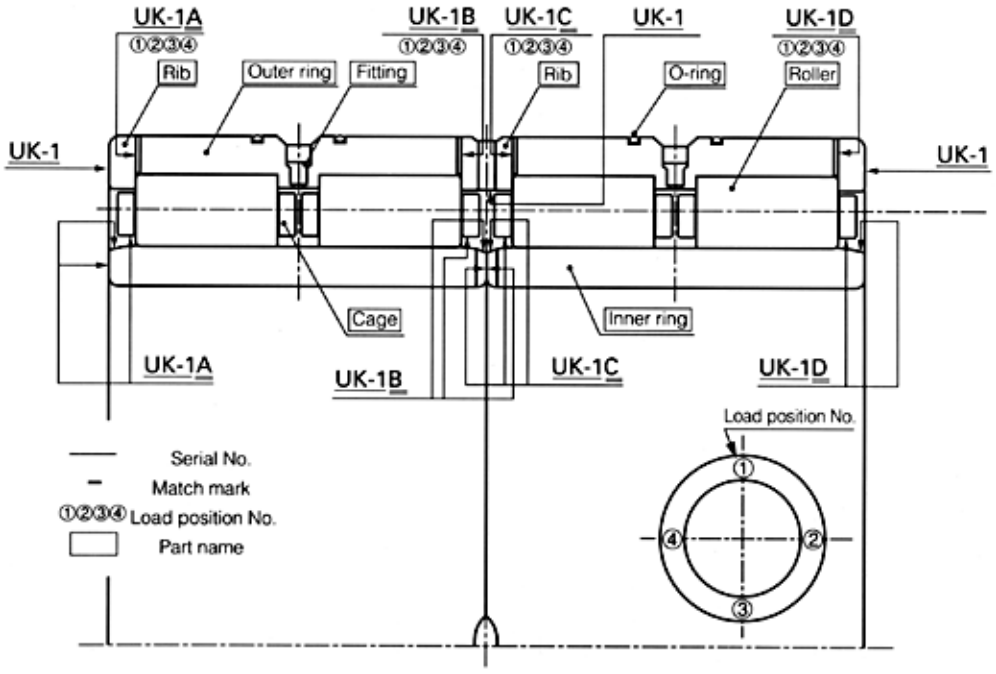


Fig. 1.3 Name of parts and marking examples (Four-row cylindrical roller bearing)
Note: Some markings may be omitted, if the marking space is not enough.

1.4 Double-cone tapered roller bearing, KDH, KH (TDI)

This type of bearing consists of a double-cone with rollers and two single-cups with or without a cup spacer. KDH Type has a steeper contact angle than the KH Type. This bearing is designed specifically for axial load and generally has a sufficient clearance between the housing bore and cup to avoid any radial load. The type without a cup spacer has a spring between the housing shoulder and cup end face. This spring preloads the bearing during use. The inner ring bore surface is loose-fitted to the shaft, with a keyway provided in the cone to prevent creep.

<Name and marking of parts>
In addition to the bearing number, as shown in **Fig. 1.4**, the bearing is provided with a serial number that is common to one set of bearings and match marks indicating the proper combination order. The serial number is used to prevent mismatching during combination of bearings while match marks show the proper position of each part within a bearing.

1.5 Double-direction tapered roller thrust bearing, TFD

This type of bearing can carry the net axial load in both directions and can support a heavier load than the double-row tapered roller bearing with steep angle. For higher loads and larger impacts, provide a spring between the housing shoulder and outer ring end face, which causes the bearing to be preloaded during use.

<Name and marking of parts>
In addition to the bearing number, as shown in **Fig. 1.5**, the bearing is provided with a serial number that is common to one set of bearings and match marks indicating the proper combination order. The serial number is used to prevent mismatching during combination of bearings while match marks show the proper position of each part within the bearing.

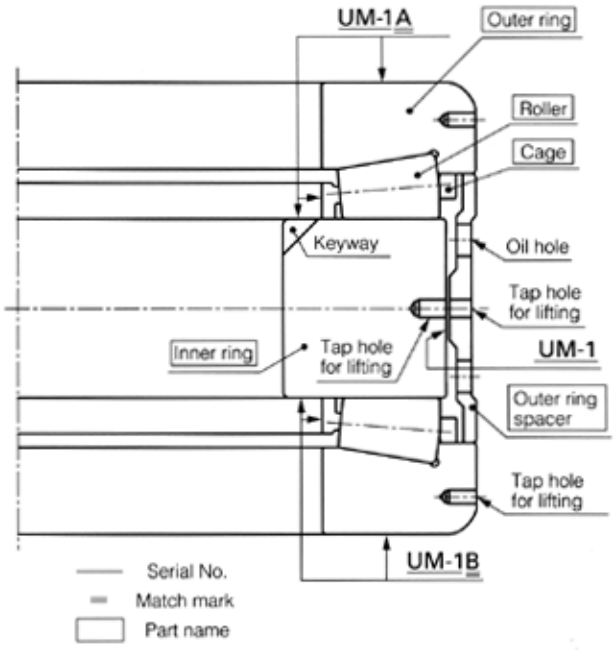


Fig. 1.5 Name of parts and marking examples (Double-direction tapered roller thrust bearing)

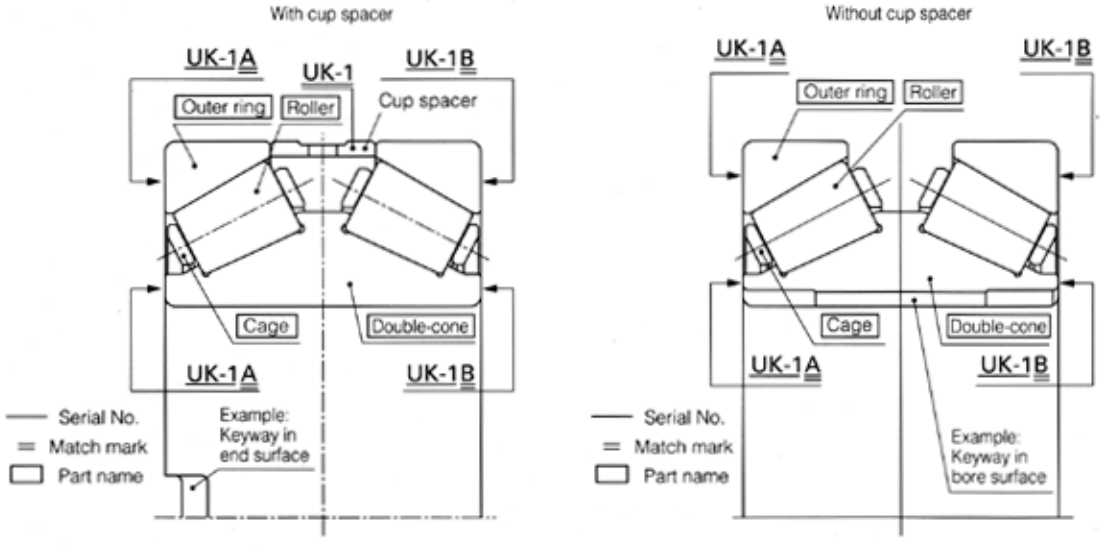


Fig. 1.4 Name of parts and marking examples (Double-row tapered roller bearing with steep angle)

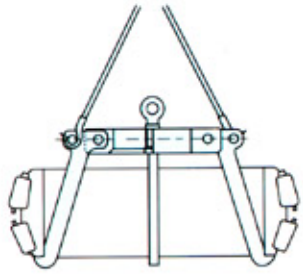
2. Cautions for Handling

2.1 Before assembling

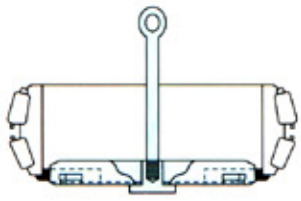
(1) Store the bearing in a clean, non-humid place which is not exposed to direct sunshine. The wooden box containing the bearing must not be placed directly on the floor. It needs to be elevated to allow air flow between the box and floor.
(2) Do not unpack the bearing until immediately before installation.
(3) Keep the environment clean by taking care not to allow any sand, iron powder, and dust to contaminate the bearing during assembly.
(4) Clean the roll neck and chock bore surfaces to completely remove any dust.
(5) Check carefully if the roll neck diameter and chock bore dimensions are within the allowable tolerance range and if the corner chamfering dimensions of the roll neck and chock bore are as specified, then begin to assemble. For a new chock, sufficiently flush the chock oil hole until all metallic powder and other foreign materials are removed.

2.2 Required Tools

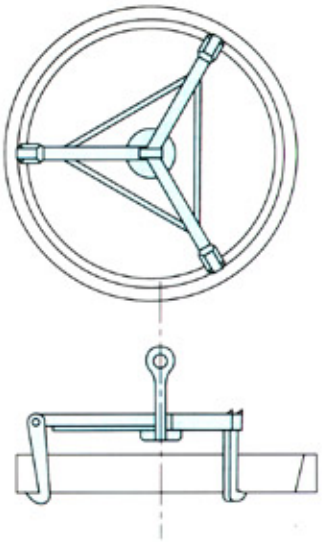
(1) Lifting tool: Used to assemble or remove bearing parts from the chock. Select a lifting tool appropriate in strength and function for each bearing type.
(2) Tools: Spanners, wrenches, and screwdrivers, which are appropriate for the application.
(3) Block: Used to secure a space for insertion of the lifting tool claw under the bearing.
(4) Brass rod: Used to true a bearing when it has become cocked during assembly or removal.



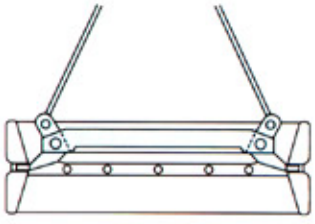
1. Lifting tool for double cone (a)



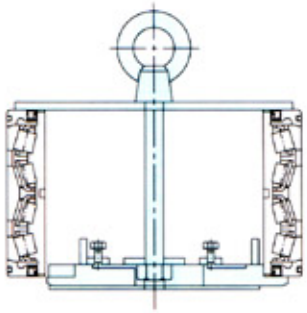
2. Lifting tool for double cone (b)



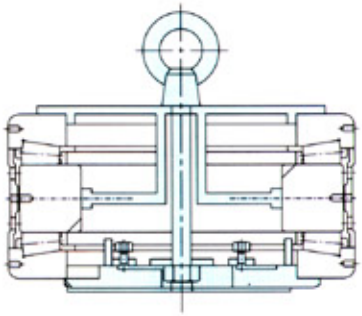
3. Lifting tool for single cup (a)



4. Lifting tool for double cup (b)



5. Lifting tool set (a)



6. Lifting tool set (b)

Fig. 2.1 Bearing lifting tools