SKF

Four-row taper roller bearings without spacer rings – mounting and maintenance instructions



Contents

Made by SKF® stands for excellence. It symbolises our consistent endeavour to achieve total quality in everything we do. For those who use our products, “Made by SKF” implies three main benefits.

Reliability – thanks to modern, efficient products, based on our worldwide application know-how, optimised materials, forward-looking designs and the most advanced production techniques.

Cost effectiveness – resulting from the favourable ratio between our product quality plus service facilities, and the purchase price of the product.

Market lead – which you can achieve by taking advantage of our products and services. Increased operating time and reduced down-time, as well as improved output and product quality are the key to a successful partnership.



User-friendly and reliable 3
Matched bearing components 4
Load zone markings 4

Mounting bearings without seals 5
Preparing the chock 5
Assembling the bearing 6
Lifting the bearing 7
Turning the bearing 8
Mounting the chock 10

Mounting sealed bearings 11

Maintenance 12
Measuring and correcting axial clearance 13
Determination of the axial internal clearance between roller rows A and B 14
Determination of the axial internal clearance between roller rows C and D 16
Determination of the axial internal clearance between roller rows B and C 17
Seal replacement 20
Checking the chock 21
Checking the roll neck 22

Supplement 23
Forms to copy
Bearing position
Bearing check list
Test report: Determination of axial internal clearance

The SKF Group – a worldwide organisation 28

User-friendly and reliable

Four-row taper roller bearings without spacer rings are an SKF development. They have the same envelope dimensions as the more conventional bearings with spacer rings but offer the following advantages:

- fewer bearing components which simplifies mounting and dismounting;
- reduced inner ring width tolerance which facilitates the axial location of the bearing on the roll neck;
- a more favourable load distribution in the bearing which extends bearing life.

These SKF taper roller bearings are quality products representing a considerable investment and as such should be handled carefully.

The trouble-free operation of such bearings is not just a question of bearing quality as several other factors, including the following, influence their service life.

Environment
Cleanliness during mounting is a prerequisite for the correct performance of the bearings and to ensure that they do not fail prematurely.

Correct mounting
It is necessary to employ the proper methods and use appropriate tools so that no damage is caused to the bearings.

Proper maintenance
The bearings should be regularly maintained and also dismounted at intervals to turn the position of the loaded zone through 90° in order to achieve maximum bearing life.

Experience
Skill and experience with mounting multi-row taper roller bearings are also important for long bearing life. It is therefore recommended that these instructions are studied and all tools and other aids prepared for the mounting operation. If experience is lacking, the nearest SKF Service Centre should be contacted.

Packaging
SKF four-row taper roller bearings are supplied in one or more packages, depending on size. All the components of a bearing are marked with the same consecutive number to avoid mixing if several bearings of the same size are to be mounted. The components of bearings of the same type and size are not interchangeable.



NB. To avoid contaminating the bearings, they should only be removed from their packaging immediately prior to mounting.

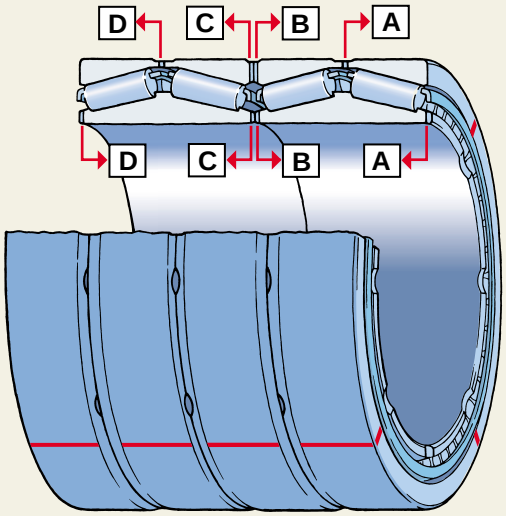
Matched bearing components

The components of four-row taper roller bearings must be assembled in a given order.

This order is indicated by letters and the consecutive number allocated to the bearing, e.g. 2A (➔ **fig** 1). The correct order must be followed if the bearing is to function properly.

To facilitate correct assembly mounting instructions (➔ **fig** 2) are supplied with each bearing.

Fig 1



Load zone markings

The side faces of the outer rings are divided into four zones marked I to IV (➔ **fig** 3). The marking for zone 1 also extends across the outside diameter of all four rings.

When mounting the bearing for the first time it is usual to arrange that zone I lies in the direction of the load, i.e. it will be the loaded zone. When remounting the bearing, the outer rings should be turned clockwise through 90° so that the next zone comes under load.

Fig 2

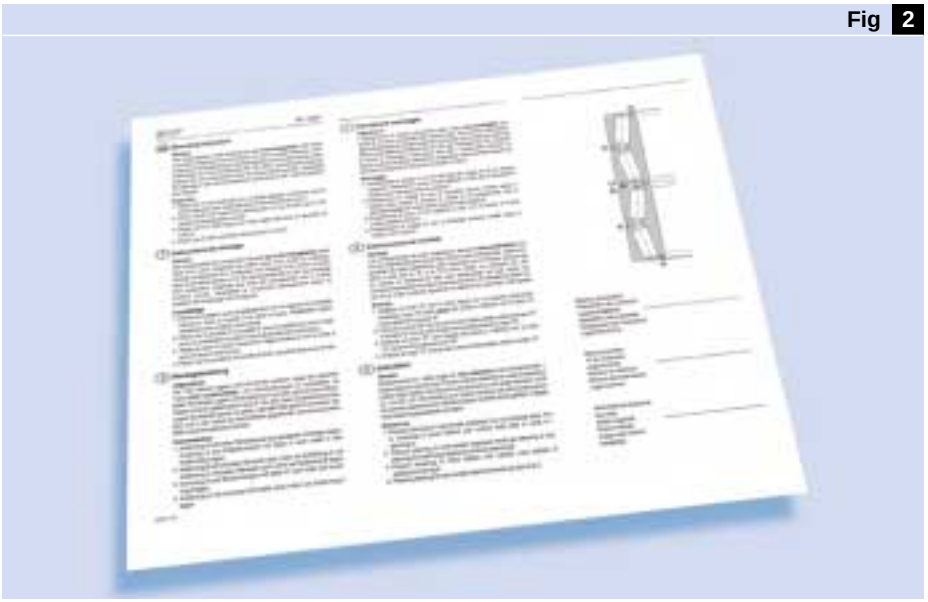
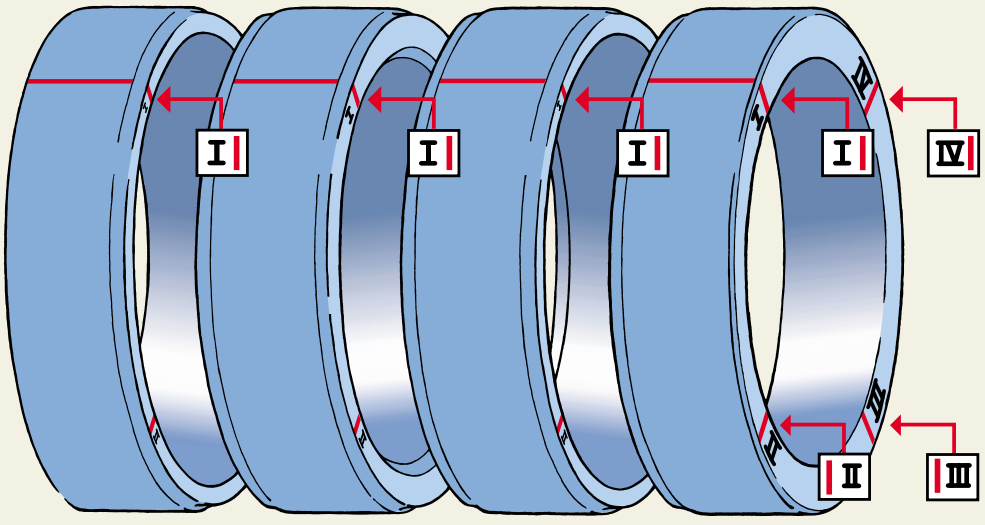


Fig 3



Mounting bearings without seals

Preparing the chock

- Take care to see that the area in which mounting is to take place is clean.
- Position the chock in the same way as it will be after mounting on the roll stand.
- Clean the lubrication and ventilation ducts with compressed air and solvent (➔ **fig** 4).
- Use a magnetic rod to remove any remaining turnings from all holes.
- Check that the transitions to the lubrication ducts in the chock are well rounded as otherwise the O-rings in grooves in the bearing outer rings (of sealed bearings) can be damaged when the bearing is lifted into the chock.
- Lightly coat the chock bore with SKF mounting paste LGAF 3.
- If required, lay the O-ring used to seal the roll-side cover in position.
- Screw the roll-side cover on to the chock (➔ **fig** 5).
- Stand the chock on the roll-side cover.

Fig 4

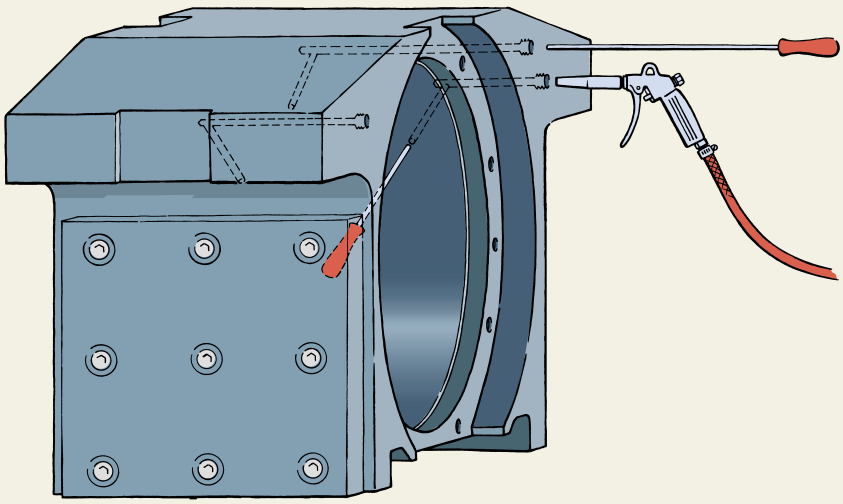
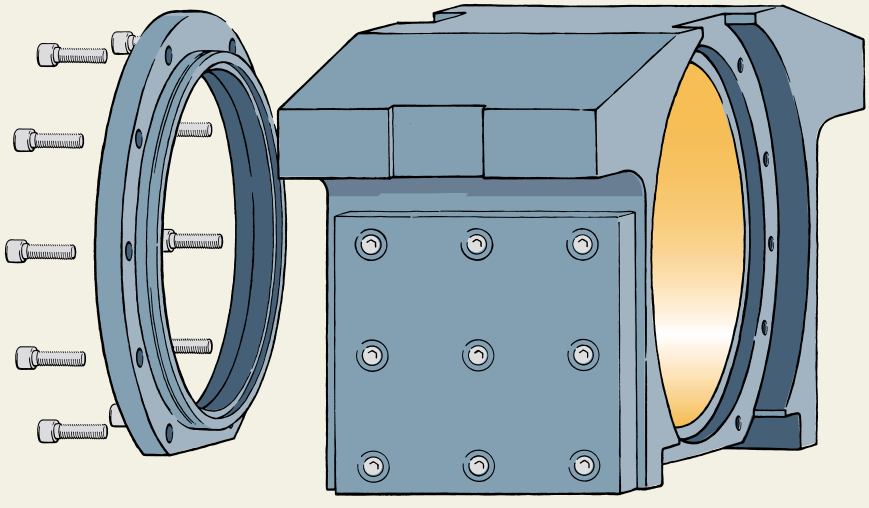


Fig 5



Assembling the bearing

- For grease lubricated bearings, fill the free space between the rollers and the roller rows with grease.
- Place wooden blocks under the inner ring C-D so that they do not come into contact with the cage (→ **fig** 6) as otherwise the cage may be damaged.
- Position the other bearing rings (except outer ring D) on the inner ring C-D (→ **fig** 7).
- Check that the lines indicating load zone 1 are in alignment.

Fig 6

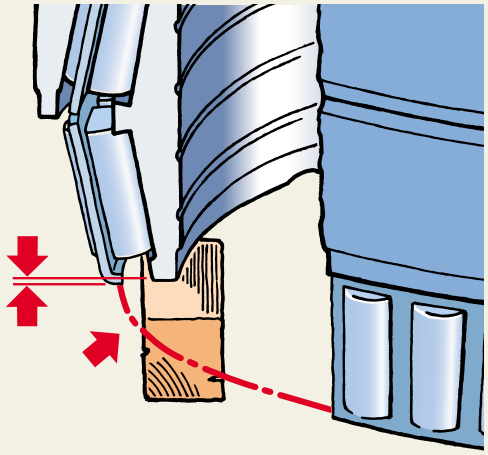


Fig 7

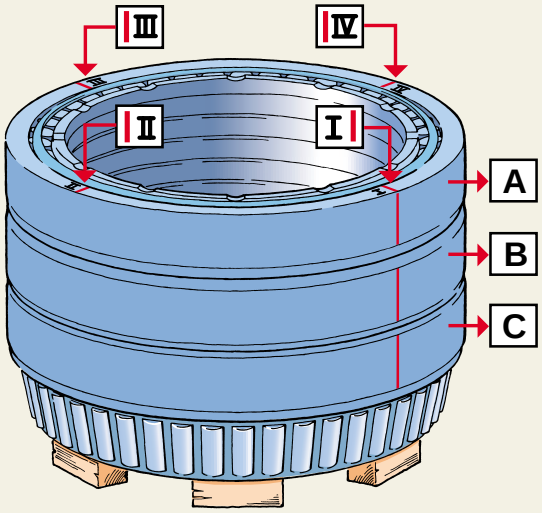
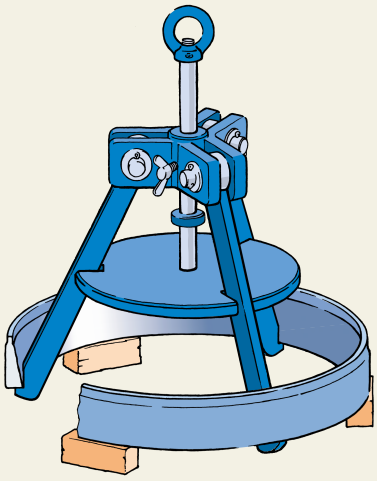


Fig 8



Lifting the bearing

- Apply the lifting tool under outer ring D (➔ **fig** 8) and lift into the chock bore. When mounting for the first time, the load zone I line should be positioned as shown (➔ **fig** 9). If appropriate, mark the position of zone I on the top of the chock.
- Lift the other bearing components into the chock bore taking care that the load zone I markings on all four outer rings line up (➔ **fig** 10).
- Note the bearing number, the chock number and the roll number as well as the actual loaded zone on the report sheet “Bearing position” (➔ **Supplement, page 23**).

Fig 9

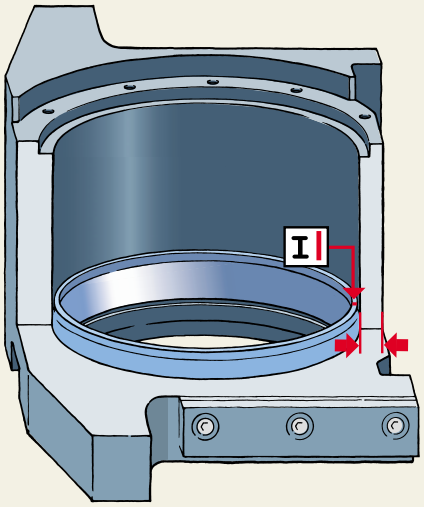
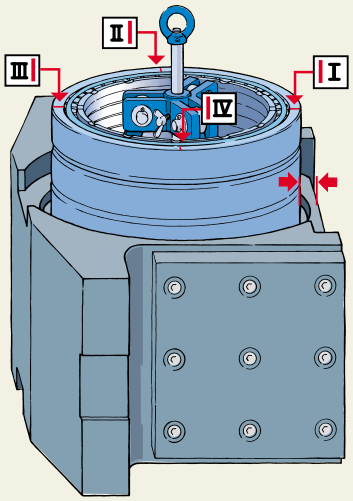


Fig 10



Turning the bearing

- Place second chock cover in position and hold in place using four screws (➔ **fig** 11).
- Turn chock into mounting position.
- Position tool in bearing bore.
- Turn inner rings with roller and cage assemblies alternately and tighten nuts and cover screws.
- Use a feeler gauge to check that inner rings abut each other (➔ **fig** 12).
- Measure gap between chock face and cover (➔ **fig** 13).
- Remove the cover.

Fig 11

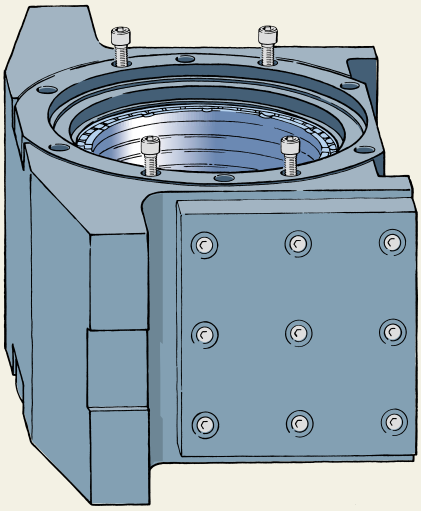


Fig 12

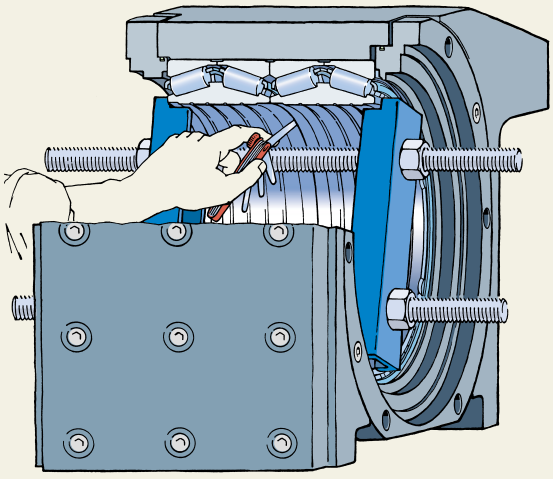


Fig 13

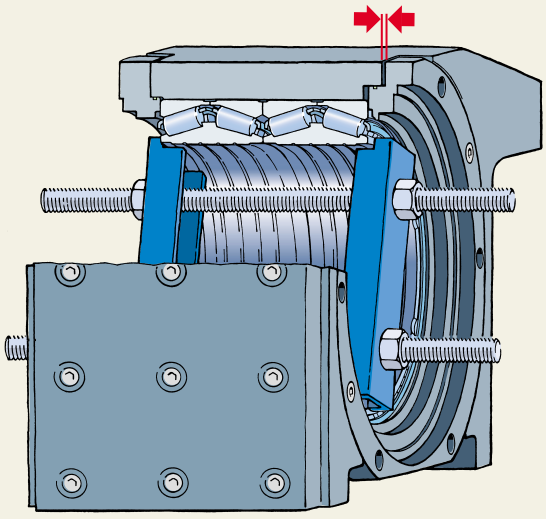
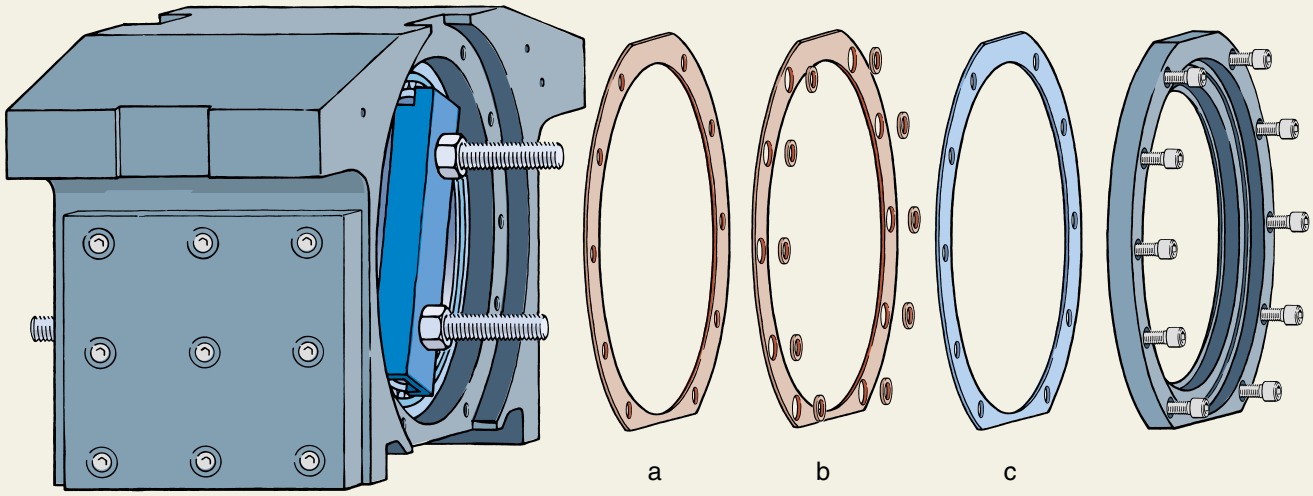


Fig 14



- Insert the seal (➔ **fig** 14).
  a) The elastic cork seal should be 1,2 times as thick as the measured gap.
  b) If axial loads are high, it may be necessary to use spacing washers between the chock and the end cover. These should be 0,05 mm thinner than the measured gap and be positioned under the screws. The cork seal should be 1,2 times as thick as the measured gap.
  c) If sheet metal shims are used together with an O-ring, the sheet thickness should be 0,05 mm thinner than the gap.
- Replace the cover and tighten screws crosswise and alternately.
- Remove tool from bearing bore.

Mounting the chock

Pushing the chock on to the roll neck (➔ **fig** 15):

- Coat bearing bore and seating surfaces with SKF mounting paste LGAF 3.
- Align the chock with assembled bearing and push the chock on to the roll neck until it abuts the roll.

Locating on the roll neck

Alternative 1:

Simple axial location (➔ **fig** 16)

- Push distance ring A on to the roll neck and fix the split clamping ring B in position. The requisite axial gap of 0,4 to 1,3 mm between the inner rings and the abutments will be obtained provided the distance ring, clamping ring and clamping ring groove are correctly dimensioned.

Alternative 2:

Conventional axial location (➔ **fig** 17)

- Push distance ring A and nut B into position and fix clamping ring C in position.
- Tighten nut B until it abuts the clamping ring C.
- Loosen nut B until the requisite axial gap of 0,4 to 1,3 mm has been obtained.

Fig 15

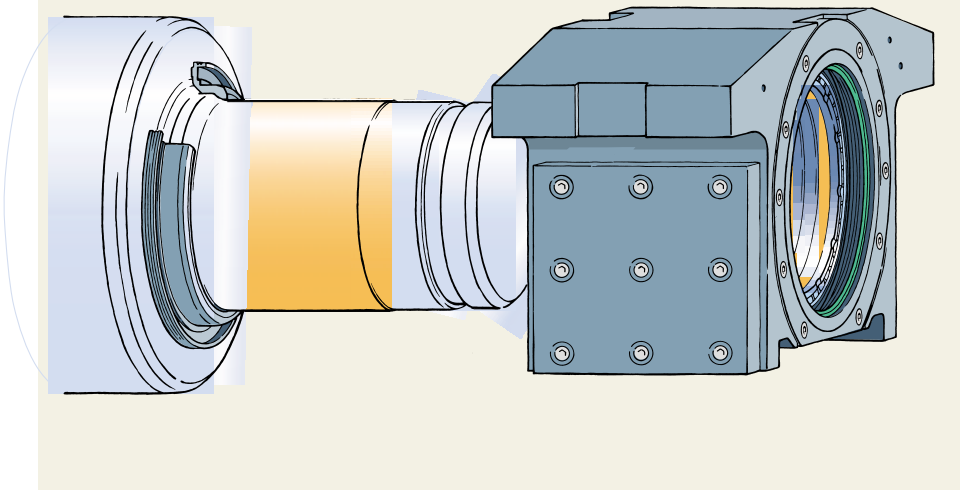


Fig 16

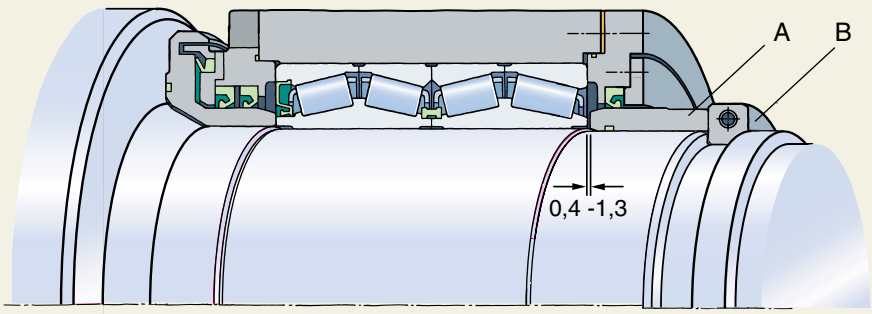
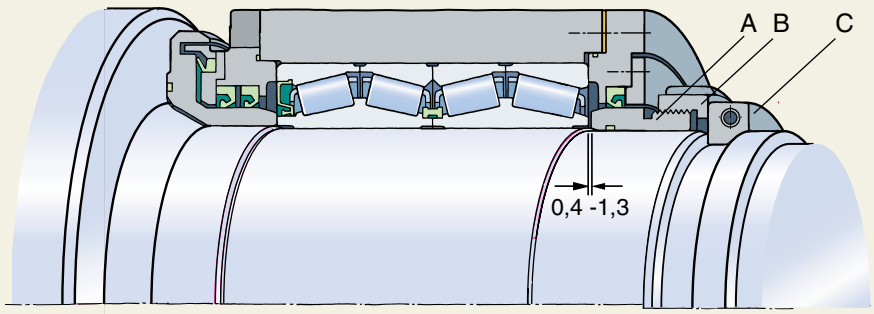


Fig 17



Mounting sealed bearings

- Fill the free space between the rollers and roller rows with grease.
- Fill the space between the two lips of the radial shaft seal with grease (➔ **fig** 18).
- Fill the annular groove in the bearing bore for the seal between the inner ring with grease (➔ **fig** 19).
- Coat the counterfaces (inner ring extensions) for the seals with grease.
- Assemble the bearing components in the correct order starting with outer ring D, supporting the bearing on wooden blocks (➔ **fig** 20).
- Use lifting tool to insert bearing into the chock bore so that the load zone I markings line up.
- Tip the chock and remove the lifting tool. Insert the clamping tool and ensure that the holding shoe (H) engages the inner ring face and tighten (➔ **fig** 21).
- Turn the bearing (➔ **pages 8** and **9**).

Fig 18

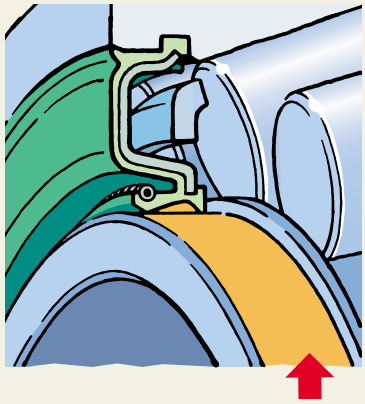


Fig 19

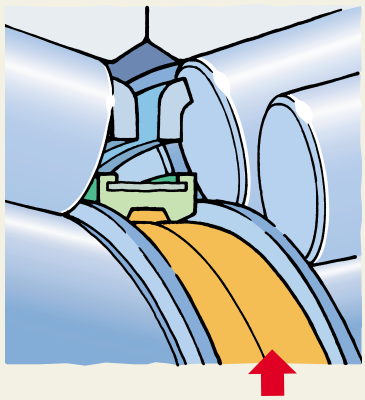


Fig 20

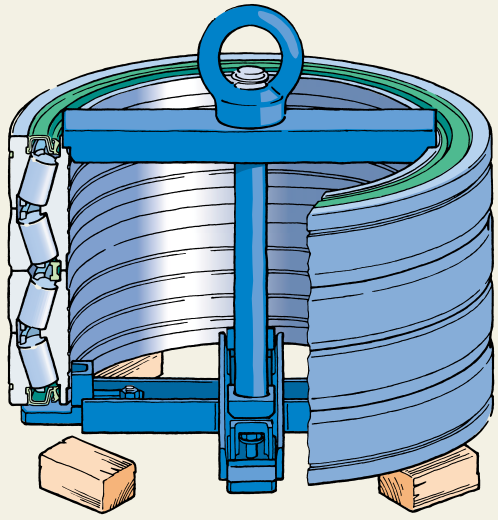
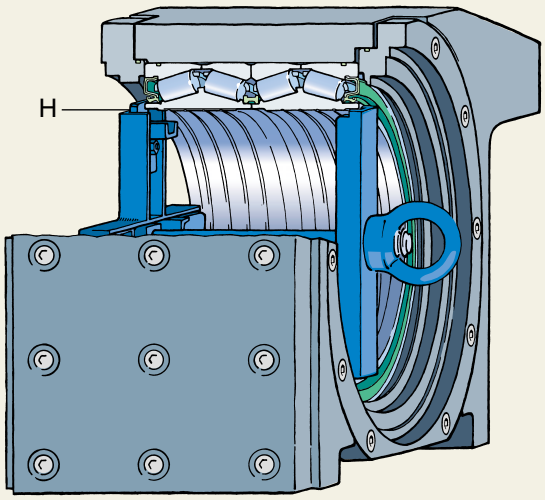


Fig 21



Maintenance

- Use “Bearing check list” (➔ **Supplement, page 23**).
- Dismount the bearing in the reverse order of mounting (➔ **fig** 22 and **pages 10** to **7**).
- Clean all the bearing components carefully and oil them.
- Check the raceways in the ring and on the rollers for damage.
- If damage is only slight it should be repaired by the user; where greater damage is seen, the nearest SKF Service Centre should be contacted.
- Clean the chock and roll neck and check the dimensional and form accuracy; rework if necessary (➔ **pages 21** and **22**).
- With sealed bearings clean any water drainage ducts (➔ **figs** 23 and 24).
- With sealed bearings, replace O-rings and damaged seals (➔ **fig** 25).

Fig 22

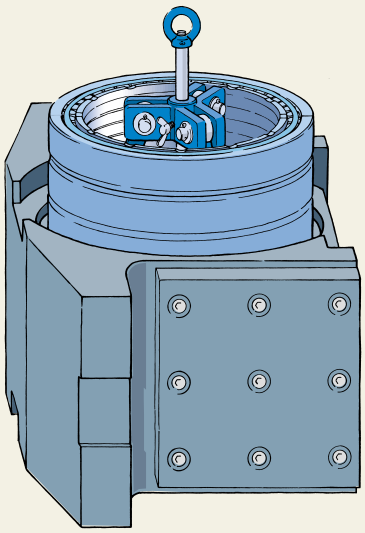


Fig 23

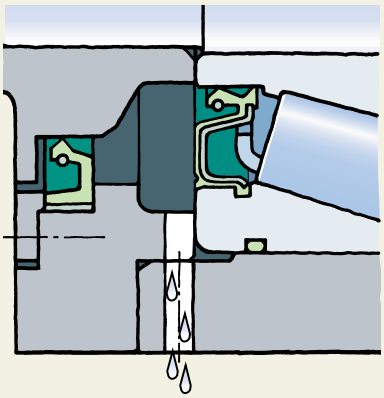


Fig 24

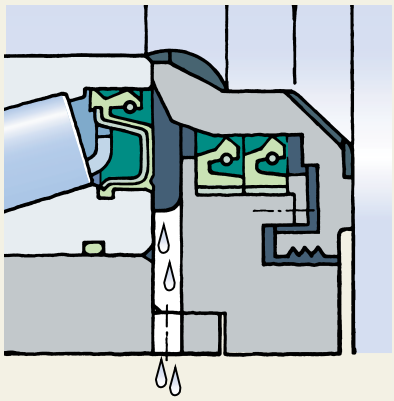
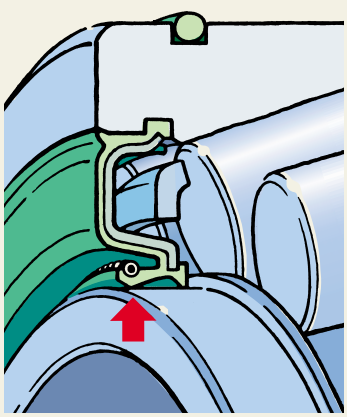


Fig 25



Measuring and correcting axial clearance

After an operating period of some 2 000 to 3 000 hours the axial internal clearance of four-row taper roller bearings should be checked. If required, this can be performed by an SKF Service Centre.

If the bearings are to be reworked on site, the actual bearing clearance should be accurately determined. If the clearance exceeds three times the original axial clearance of the bearing when new, the bearing should be reworked.

Measuring equipment

To measure the bearing clearance suitable measuring equipment must be used. Such equipment is, for example, the well-proven equipment shown in **fig** 26. This is adjustable and can be used for a range of diameters. The three-point support can also be adjusted. A gauge is mounted on each of the three arms which are at 120° to each other.

Measuring procedure

Before making the measurement, the equipment should be placed on a flat surface and the gauges should be adjusted to show zero.

To measure the stand-out or stand-in of the outer ring in relation to the inner ring, the equipment should be positioned on the face of the inner ring. The gauges placed on the face of the outer ring will then indicate the stand-out or stand-in of the outer ring. The results should be entered in a "Test report: Determination of axial internal clearance" (➔ **Supplement, page 23**) The mean value should be determined. The various steps required to determine the bearing axial internal clearance are given in the following. The evaluation of the measured results and the determination of the requisite new outer ring width are shown on **page 19** using four-row taper roller bearing BT4B 328817 BG/HA1VA901 as the example.

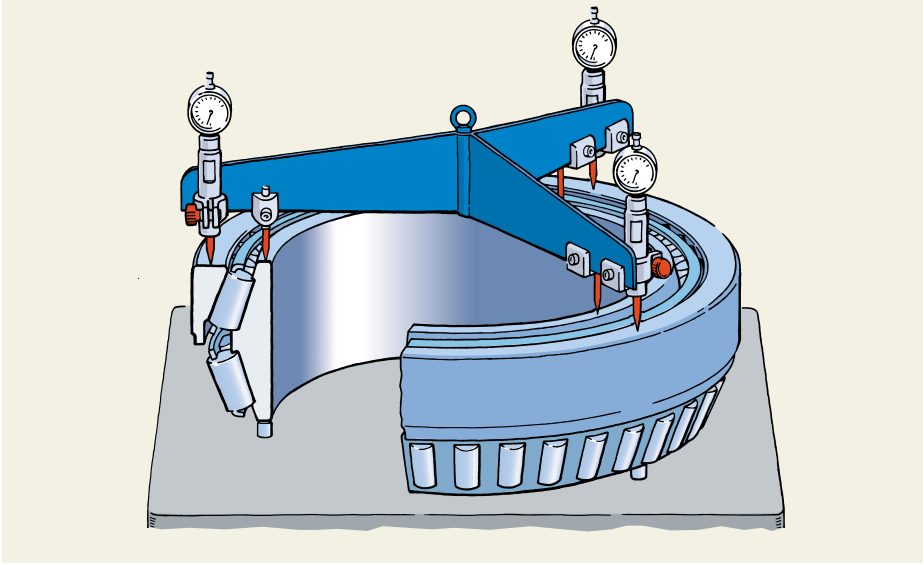
The flow chart on **page 18** gives an overview of the procedure.

Symbols

The symbols used in the evaluation of the bearing clearance are listed below and explained.

- A_{AB} Axial clearance between roller rows A and B
- A_{BC} Axial clearance between roller rows B and C
- A_{CD} Axial clearance between roller rows C and D
- A_0 Original axial internal clearance of the bearing as delivered (given on bearing drawing)
- B_{AB} Width of inner ring A–B
- B_{CD} Width of inner ring C–D
- C_A Width of outer ring A
- C_B Width of outer ring B
- C_{B1} Width of outer ring B after regrinding the narrow face
- C_C Width of outer ring C
- C_{C1} Width of outer ring C after regrinding the narrow face
- C_{C2} Width of outer ring C after regrinding the wide face
- C_D Width of outer ring D
- S_A Mean stand-out/stand-in of outer ring A with respect to inner ring A–B
- S_B Mean stand-out/stand-in of outer ring B with respect to inner ring A–B
- S_C Mean stand-out/stand-in of outer ring C with respect to inner ring C–D
- S_D Mean stand-out/stand-in of outer ring D with respect to inner ring C–D
- W Width of spacer ring

Fig 26



Determination of the axial internal clearance between roller rows A and B

- Check that bearing components are clean and if necessary wash and oil.
- Measure outer ring widths C_A and C_B and inner ring width B_{AB}.
- Lay inner ring A–B on a suitable support with the B side downwards and place outer ring A over the cage and roller assembly (➔ **fig** 27).
- Turn outer ring A so that all of the rollers of the upper roller row are in contact with the inner ring guide flange.
- Position measuring equipment on inner ring face and read off the three values of S_A on the gauges; enter in test report.
- Remove equipment.
- Turn inner ring A–B over so that the A side is downwards and place outer ring B over the cage and roller assembly (➔ **fig** 28).
- Turn outer ring B so that all of the rollers of the upper roller row are in contact with the inner ring guide flange.
- Position measuring equipment on inner ring face and read off the three values S_B on the gauges; enter in test report.
- Determine the axial clearance between roller rows A and B from

$$A_{AB} = C_A + C_B - S_A - S_B - B_{AB}$$

If the outer ring stands out (➔ **fig** 29) the measured values for S_A and S_B should be considered positive, i.e. entered with a + sign. If the inner ring stands out (➔ **fig** 30) then the values should have a – sign both in the test report and in the equation above. This is referred to as outer ring stand-in.

Fig 27

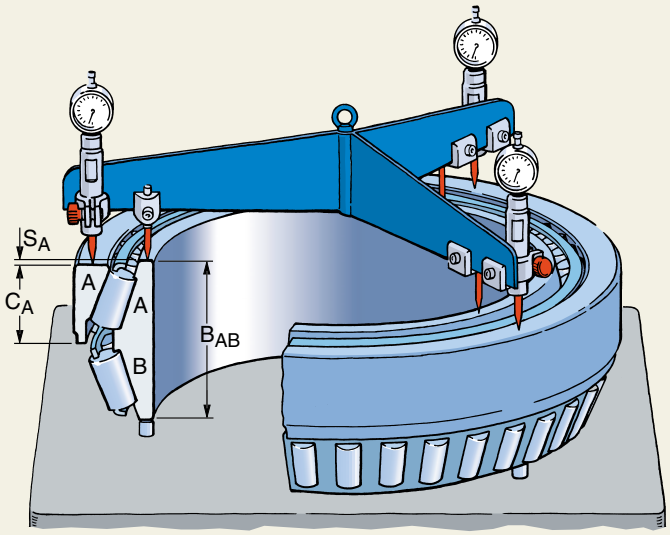


Fig 28

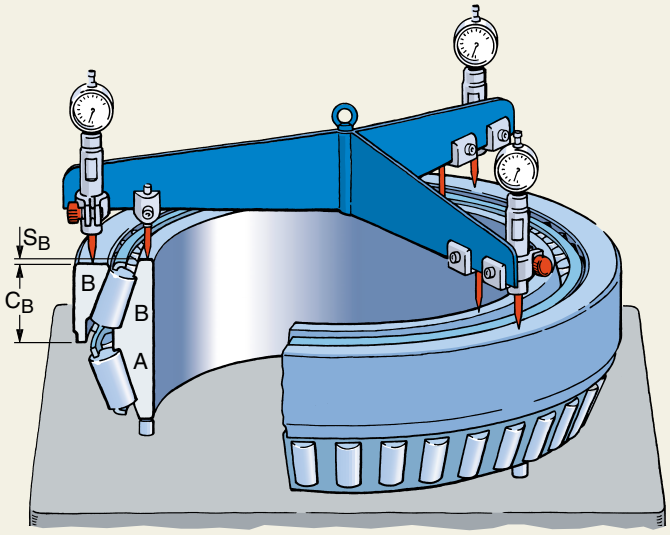


Fig 29

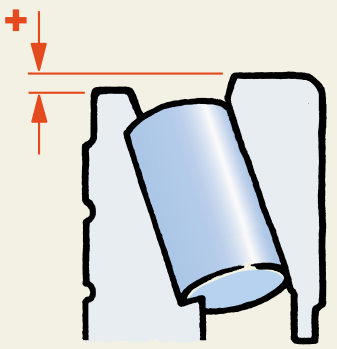
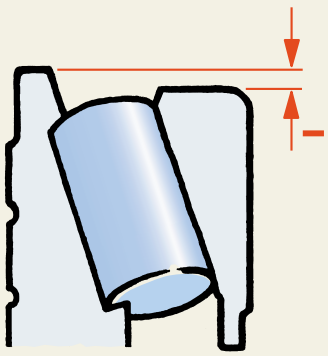


Fig 30

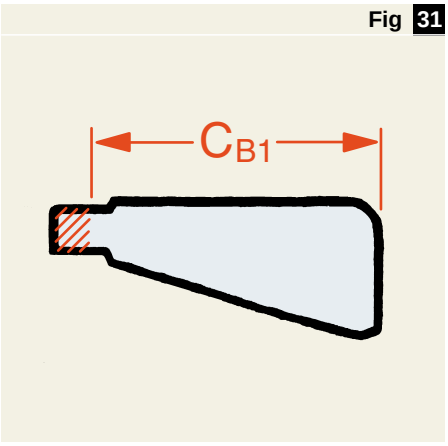


- If the value of the axial clearance A_{AB} determined as above is much greater than the original clearance A_0 ($A_{AB} \geq 3\ A_0$), the narrow face of outer ring B should be ground down (→ **fig** 31). The final width of the outer ring B after grinding is obtained from

  $C_{B1} = C_B - A_{AB} + A_0$

  The absolute value of the axial clearance A_{AB} should be inserted in the equation.

Fig 31



Determination of the axial internal clearance between roller rows C and D

- Check that bearing components are clean and if necessary wash and oil.
- Measure outer ring widths C_C and C_D and inner ring width B_{CD}.
- Lay inner ring C–D on a suitable support with the C side downwards and place outer ring D over the cage and roller assembly (➔ **fig** 32).
- Turn outer ring D so that all of the rollers of the upper roller row are in contact with the inner ring guide flange.
- Position measuring equipment on inner ring face and read off the three values of S_D on the gauges; enter in test report.
- Remove equipment.
- Turn inner ring C–D over so that the D side is downwards and place outer ring C over the cage and roller assembly (➔ **fig** 33).
- Turn outer ring C so that all of the rollers of the upper roller row are in contact with the inner ring guide flange.
- Position measuring equipment on inner ring face and read off the three values S_C on the gauges; enter in test report.
- Determine the axial clearance between roller rows C and D from

$$A_{CD} = C_C + C_D - S_C - S_D - B_{CD}$$

If the outer ring stands out (➔ **fig** 34) the measured values for S_C and S_D should be considered positive, i.e. entered with a + sign. If the inner ring stands out (➔ **fig** 35) then the values should have a – sign both in the test report and in the equation above. This is referred to as outer ring stand-in.

Fig 32

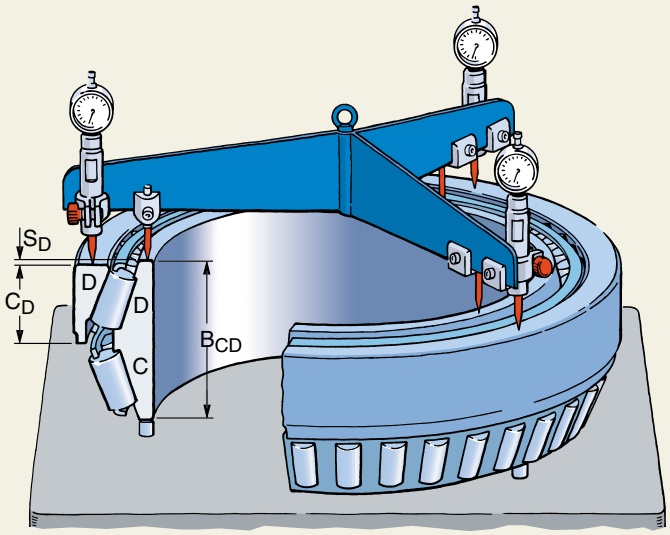


Fig 33

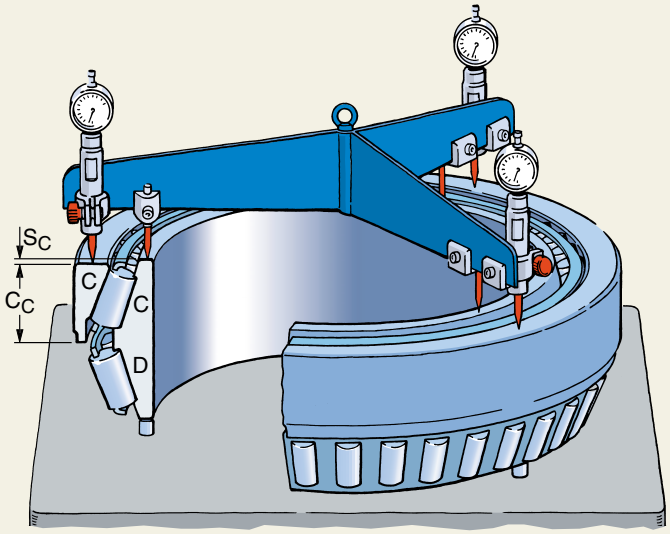


Fig 34

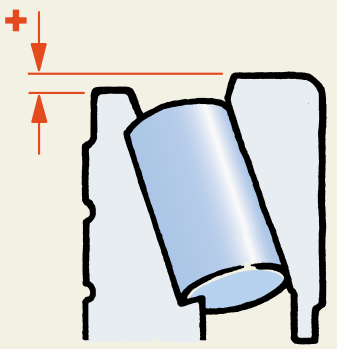
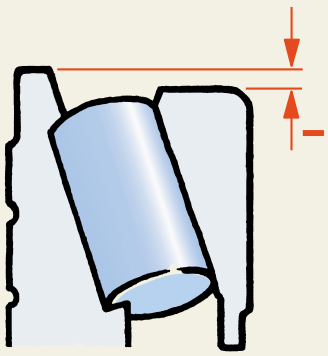


Fig 35



- If the value of the axial clearance A_{CD} determined as above is much greater than the original clearance ($A_{CD} \geq 3\ A_0$), the narrow face of outer ring C should be ground down (➔ **fig** 36). The final width of the outer ring C after grinding is obtained from

  $C_{C1} = C_C - A_{CD} + A_0$

  The absolute value of the axial clearance A_{CD} should be inserted in the equation.

Determination of the axial internal clearance between roller rows B and C

- Determine the axial clearance between the roller rows B and C using

  $A_{BC} = S_B + S_C$

  If the value obtained is much greater than the original axial clearance ($A_{BC} \geq 3\ A_0$) a spacing washer should be fitted between the outer rings B and C.
- The spacing washer can be made from commercial cold rolled steel sheet. The thickness should always be greater than the value of A_{BC}.
- Measure the actual thickness of the washer.
- The final width of the outer ring C after grinding can be calculated from

  $C_{C2} = C_{C1} + A_{BC} - W - A_0$

  The absolute value of the axial clearance A_{BC} should be inserted in the equation.

- Grind the wide face of outer ring C to the final width C_{C2} (➔ **fig** 37).

Fig 36

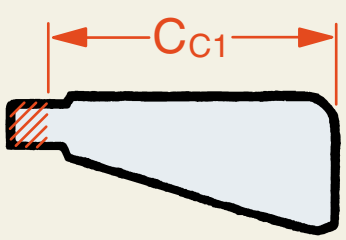
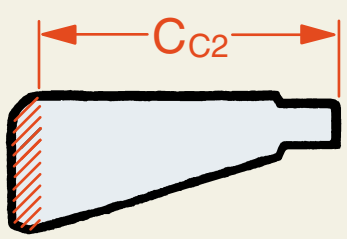
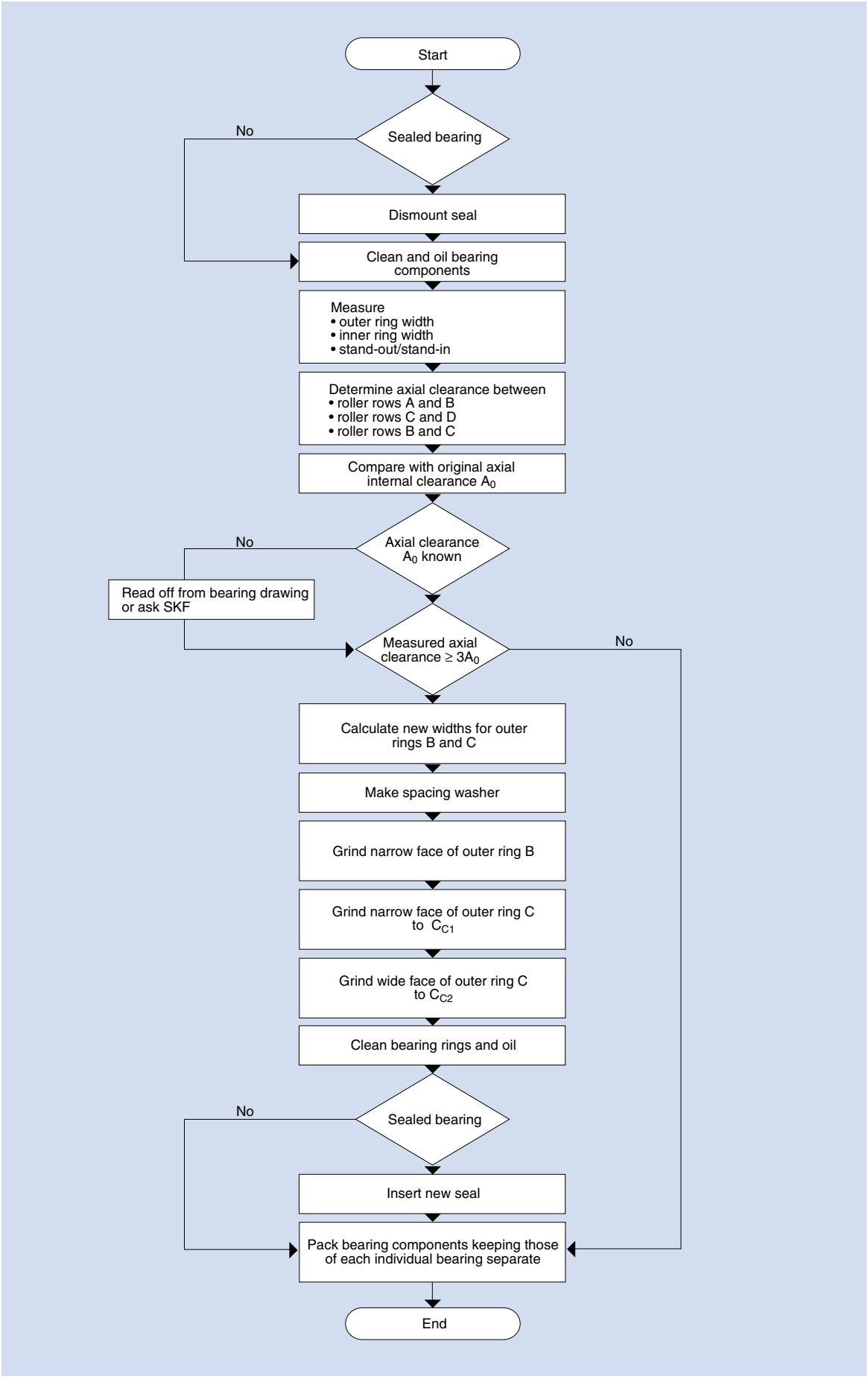


Fig 37



NB.
The outer ring C must only be ground on the wide face to give the final width C_{C2}. Any grinding of the narrow face at this stage would mean that the clearance between roller rows C and D would be too small and would lead to premature bearing failure.

Flow chart for measuring and correcting the axial internal clearance



SKF

Test report: Determination of axial internal clearance

Bearing designation: BT4B 328817 BG/HA1VA901

Consecutive number of bearing: 323

Part 1: Calculation of axial clearance

Dimensions	Measuring position a	Measuring position b	Measuring position c	Mean $\frac{a+b+c}{3}$	Calculated axial clearance
	mm	mm	mm	mm	mm
Axial clearance between roller rows A and B					Axial clearance A_{AB}
Outer ring width C_A	68,554	68,555	68,555	68,555	$A_{AB} = C_A + C_B - S_A - S_B - B_{AB}$
Outer ring width C_B	58,285	58,285	58,285	58,285	$A_{AB} =$ 68,555 + 58,285 − (−0,720)
Inner ring width B_{AB}	126,980	126,980	126,980	126,980	− (−0,920) − 126,980
Stand-out/in S_A	−0,835	−0,710	−0,615	−0,720	$A_{AB} =$ 1,500
Stand-out/in S_B	−0,932	−0,925	−0,903	−0,920	
Axial clearance between roller rows C and D					Axial clearance A_{CD}
Outer ring width C_C	58,959	58,960	58,960	58,960	$A_{CD} = C_C + C_D - S_C - S_D - B_{CD}$
Outer ring width C_D	68,641	68,640	68,640	68,640	$A_{CD} =$ 58,960 + 68,640 − (−0,507)
Inner ring width B_{CD}	126,980	126,980	126,981	126,980	− (−0,558) − 126,980
Stand-out/in S_C	−0,500	−0,506	−0,515	−0,507	$A_{CD} =$ 1,685
Stand-out/in S_D	−0,578	−0,570	−0,526	−0,558	
Axial clearance between roller rows B and C					Axial clearance A_{BC}
					$A_{BC} = S_B + S_C$
					$A_{BC} =$ (−0,920) + (−0,507)
					$A_{BC} =$ −1,427

Part 2: Calculation of new widths for outer rings

Outer ring/surface to be ground	Width	Width W of spacer washer	Calculated axial clearance	New width
	mm	mm	mm	mm
Outer ring B narrow face	$C_B =$ 58,285		$A_{AB} =$ 1,500	$C_{B1} = C_B - \lvert A_{AB} \rvert + A_0$
				$C_{B1} =$ 58,285 − 1,500 + 0,440
				$C_{B1} =$ 57,225
Outer ring C narrow face	$C_C =$ 58,960		$A_{CD} =$ 1,685	$C_{C1} = C_C - \lvert A_{CD} \rvert + A_0$
				$C_{C1} =$ 58,960 − 1,685 + 0,440
				$C_{C1} =$ 57,715
Outer ring C wide face	$C_{C1} =$ 57,715	1,500	$A_{BC} =$ −1,427	$C_{C2} = C_{C1} + \lvert A_{BC} \rvert - W - A_0$
				$C_{C2} =$ 57,715 + 1,427 − 1,5 − 0,440
				$C_{C2} =$ 57,202

NB. The absolute values (i.e. the numerical value without + or – sign) of the axial clearances A_{AB}, A_{CD} and A_{BC} should be used to calculate the new outer ring widths C_{B1}, C_{C1} and C_{C2}. This is signified by the two vertical lines, e.g. $\lvert A_{BC} \rvert$

Date: 1998-12-01 Reported by: Helmut Gläser Approved by: Thilo Nickel

Example of a test report *for bearing BT4B 328817 BG/HA1VA901*

Original axial internal clearance = 0,440 mm

Seal replacement

Sealed four-row taper roller bearings are supplied with the radial shaft seals already installed. If the seals have become so worn or damaged as to be unserviceable, they must be replaced by new seals which are available from SKF. During replacement, care must be taken not to damage the outer ring raceway.

- Lay outer ring on wooden blocks, leaving the seal unsupported (→ **fig** 38).
- Remove radial shaft seal.
- Press new seal into the outer ring (→ **fig** 39). The seal must fit tightly.
- Fix the seal at eight positions (→ **fig** 40).

Fig 38

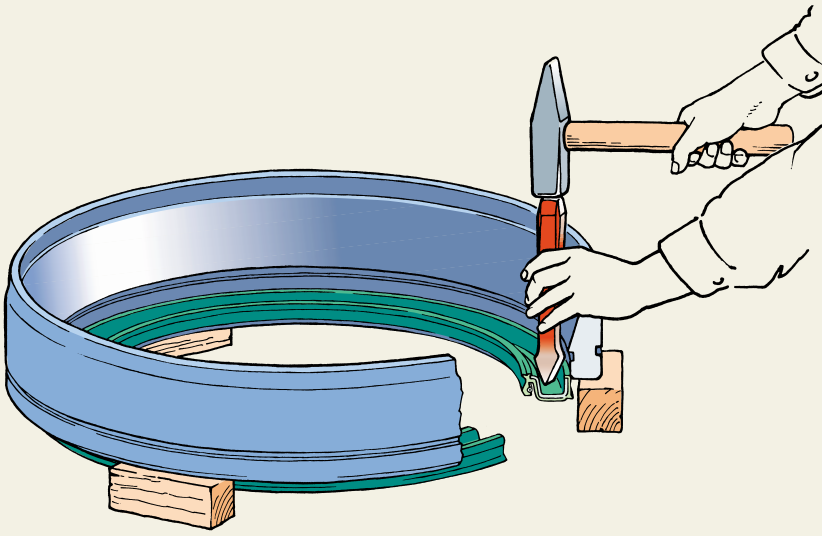


Fig 39

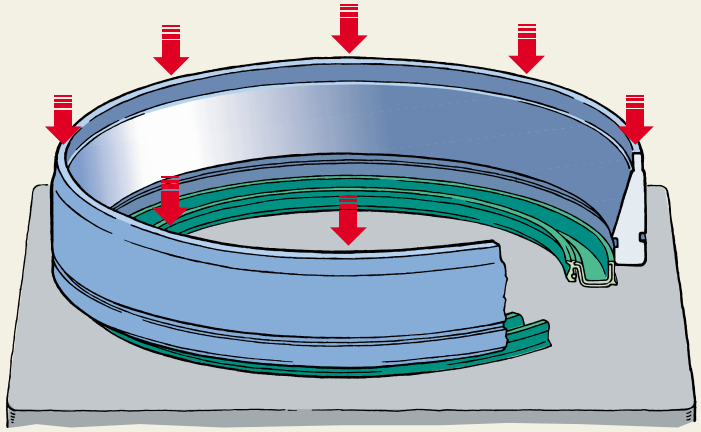
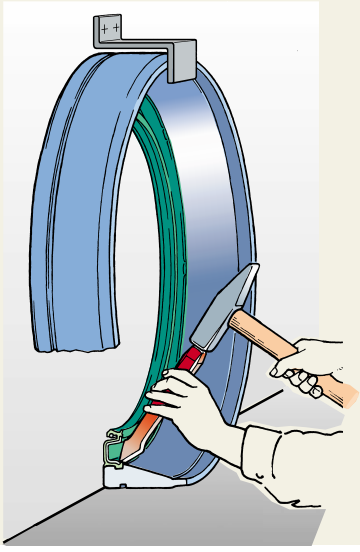


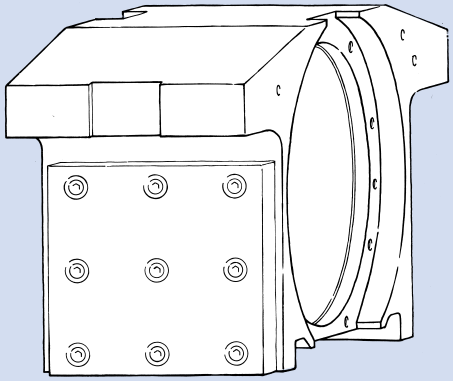
Fig 40



Checking the chock

The arduous operating conditions to which a roll neck bearing is subjected cause wear and deformation of the chock. This leads in turn to unfavourable load distribution in the bearing and foreshortens bearing life. It is therefore recommended that the chocks should be reworked provided the limits given in **Table 1** are not exceeded.

Table 1

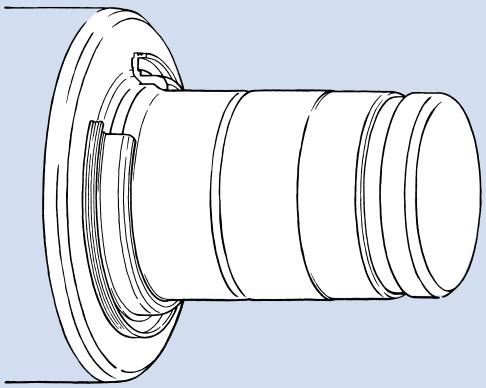


Bore diameter Nominal over	incl.	Tolerances high	low	Permissible deviation from nominal diameter max	cylindricity max
mm		mm		mm	mm
Bearings with inch dimensions					
–	**304,8**	+0,076	+0,050	+0,15	0,11
304,8	**609,6**	+0,152	+0,102	+0,25	0,15
609,6	**914,4**	+0,229	+0,152	+0,35	0,20
914,4	**1 219,2**	+0,305	+0,204	+0,47	0,23
1 219,2	**1 524**	+0,381	+0,254	+0,57	0,27
1 524	**1 960**	+0,420	+0,300	+0,64	0,32
Bearings with metric dimensions					
150	**180**	+0,041	+0,025	+0,12	0,11
180	**250**	+0,046	+0,025	+0,12	0,11
250	**315**	+0,051	+0,025	+0,12	0,11
315	**400**	+0,102	+0,051	+0,20	0,15
400	**500**	+0,107	+0,051	+0,20	0,15
500	**630**	+0,112	+0,051	+0,20	0,15
630	**800**	+0,129	+0,076	+0,25	0,20
800	**1 000**	+0,154	+0,076	+0,25	0,20
1 000	**1 250**	+0,180	+0,102	+0,35	0,23
1 250	**1 600**	+0,221	+0,127	+0,41	0,27
1 600	**2 000**	+0,250	+0,163	+0,47	0,32

Permissible chock bore diameter limits

Checking the roll neck

Four-row taper roller bearings are generally mounted with a loose fit on the roll neck. The resultant relative movements between bearing and roll neck lead to wear. To limit the misalignment of the roll and the eccentricity of the bearing to the roll, it is recommended that when grinding the roll neck, the limits given in **Table 2** are respected.



Permissible roll neck diameter limits

Table 2

Roll neck diameter Nominal over	incl.	**Tolerances (e7)** high	low	**Permissible deviation from nominal diameter** max
mm		mm		mm
Bearings with inch dimensions				
120	**152,4**	–0,085	–0,125	–0,35
152,4	**180**	–0,085	–0,125	–0,45
180	**250**	–0,100	–0,146	–0,45
250	**304,8**	–0,110	–0,162	–0,45
304,8	**315**	–0,110	–0,162	–0,60
315	**400**	–0,125	–0,182	–0,60
400	**500**	–0,135	–0,198	–0,60
500	**609,6**	–0,145	–0,215	–0,60
609,6	**630**	–0,145	–0,215	–0,80
630	**800**	–0,160	–0,240	–0,80
800	**914,4**	–0,170	–0,260	–0,80
914,4	**1 000**	–0,170	–0,260	–1,00
1 000	**1 219,2**	–0,195	–0,300	–1,00
1 219,2	**1 250**	–0,195	–0,300	–1,20
1 250	**1 524**	–0,220	–0,345	–1,20
Bearings with metric dimensions				
120	**180**	–0,110	–0,150	–0,37
180	**250**	–0,130	–0,171	–0,48
250	**315**	–0,145	–0,187	–0,48
315	**400**	–0,165	–0,233	–0,64
400	**500**	–0,180	–0,249	–0,64
500	**630**	–0,195	–0,266	–0,64
630	**800**	–0,235	–0,316	–0,87
800	**1 000**	–0,270	–0,336	–0,87
1 000	**1 250**	–0,320	–0,402	–1,10
1 250	**1 600**	–0,380	–0,472	–1,30

Supplement

Forms to copy

Bearing position
Bearing check list
Test report: Determination of axial internal clearance

Bearing position

Train

Stand and No.

Type

Bearing designation

Drive side

Chock No.

Bearing No.

Upper roll No./ Company

Load zone No.

Lower roll No./Company

Load zone No..

Bearing No.

Chock No.

Operator side

Chock No.

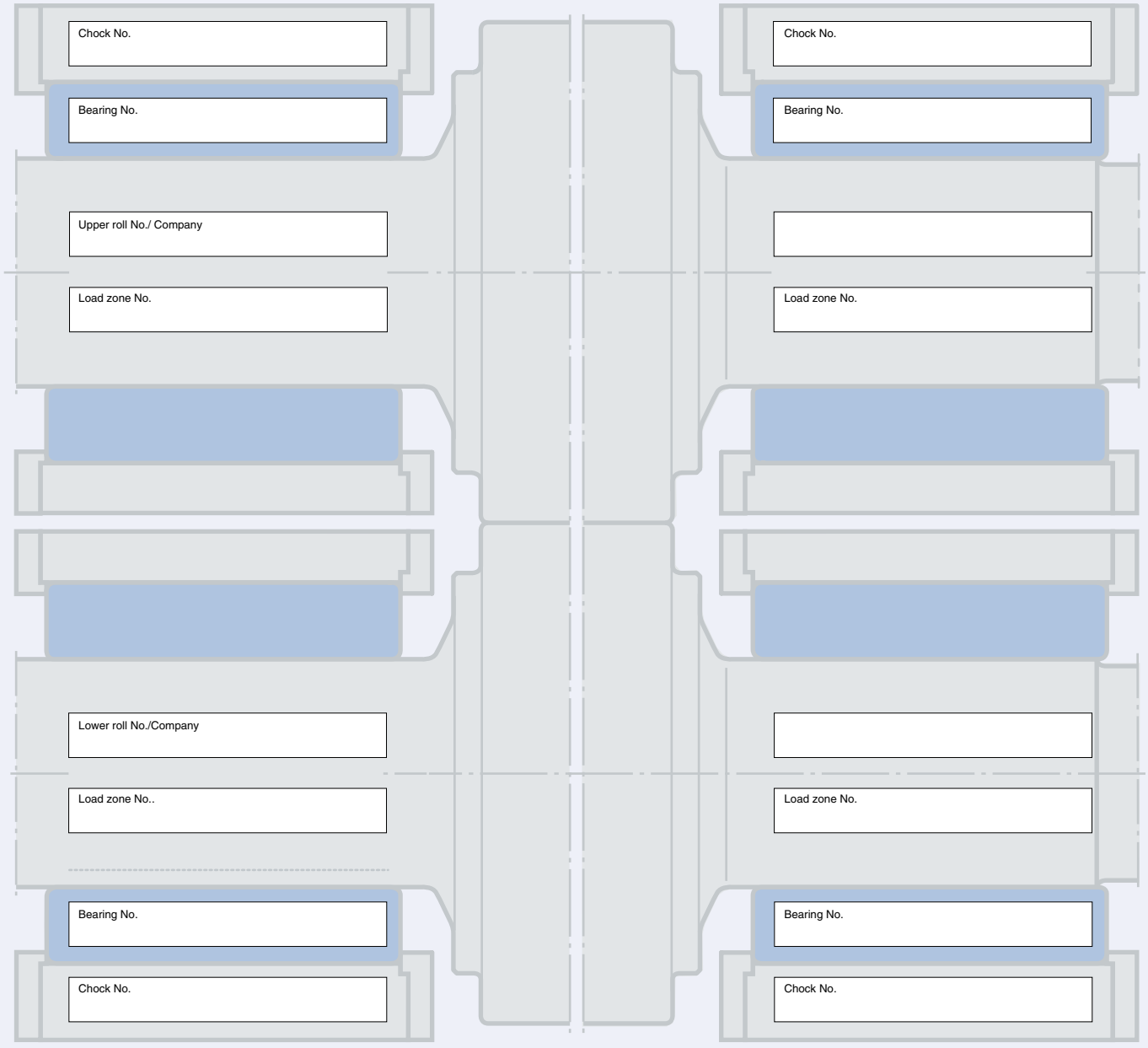
Bearing No.

Load zone No.

Load zone No.

Bearing No.

Chock No.



SKF

Bearing check list

Bearing type	Bearing designation	Consecutive number of bearing	Delivery date	Delivery number	from

Bearing dimensions: Bore diameter	Outside diameter	Width

Bearing Mounted Date	Dismounted Date	**Position** Dept./ Train	Stand No.	Roll No.	Roll side/ Outboard	Upper roll/ Lower roll	**Chock** No.	Drive side (A) Operator side (B)	Hours of operation	Production in tonnes	Lubricant	Remarks	Signed

SKF

Test report: Determination of axial internal clearance

Bearing designation	Consecutive number of bearing

Part 1: Calculation of axial clearance

Dimensions	Measuring position a	Measuring position b	Measuring position c	Mean $\frac{a+b+c}{3}$	Calculated axial clearance
	mm	mm	mm	mm	mm
Axial clearance between roller rows A and B					Axial clearance A_{AB}
Outer ring width C_A					$A_{AB} = C_A + C_B - S_A - S_B - B_{AB}$
Outer ring width C_B					$A_{AB} =$
Inner ring width B_{AB}					
Stand-out/in S_A					$A_{AB} =$
Stand-out/in S_B					
Axial clearance between roller rows C and D					Axial clearance A_{CD}
Outer ring width C_C					$A_{CD} = C_C + C_D - S_C - S_D - B_{CD}$
Outer ring width C_D					$A_{CD} =$
Inner ring width B_{CD}					
Stand-out/in S_C					$A_{CD} =$
Stand-out/in S_D					
Axial clearance between roller rows B and C					Axial clearance A_{BC}
					$A_{BC} = S_B + S_C$
					$A_{BC} =$
					$A_{BC} =$

Part 2: Calculation of new widths for outer rings

Outer ring/surface to be ground	Width	Width W of spacer washer	Calculated axial clearance	New width
	mm	mm	mm	mm
Outer ring B narrow face	**C_B =**		**A_{AB} =**	$C_{B1} = C_B - \lvert A_{AB}\rvert + A_0$ $C_{B1} =$
				$C_{B1} =$
Outer ring C narrow face	**C_C =**		**A_{CD} =**	$C_{C1} = C_C - \lvert A_{CD}\rvert + A_0$ $C_{C1} =$
				$C_{C1} =$
Outer ring C wide face	**C_{C1} =**		**A_{BC} =**	$C_{C2} = C_{C1} + \lvert A_{BC}\rvert - W - A_0$ $C_{C2} =$
				$C_{C2} =$

NB. The absolute values (i.e. the numerical value without + or – sign) of the axial clearances A_{AB}, A_{CD} and A_{BC} should be used to calculate the new outer ring widths C_{B1}, C_{C1} and C_{C2}. This is signified by the two vertical lines, e.g. $\lvert A_{BC}\rvert$

Date	Reported by	Approved by

The SKF Group – a worldwide corporation

SKF is an international industrial Group operating in some 130 countries and is world leader in bearings.

The company was founded in 1907 following the invention of the self-aligning ball bearing by Sven Wingquist and, after only a few years, SKF began to expand all over the world.

Today, SKF has some 45 000 employees and around 80 manufacturing facilities spread throughout the world. An international sales network includes a large number of sales companies and some 7 000 distributors and retailers. Worldwide availability of SKF products is supported by a comprehensive technical advisory service.

The key to success has been a consistent emphasis on maintaining the highest quality of its products and services. Continuous investment in research and development has also played a vital role, resulting in many examples of epoch-making innovations.

The business of the Group consists of bearings, seals, special steel and a comprehensive range of other high-tech industrial components. The experience gained in these various fields provides SKF with the essential knowledge and expertise required in order to provide the customers with the most advanced engineering products and efficient service.





The SKF Group is the first major bearing manufacturer to have been granted approval according to ISO 14001, the international standard for environmental management systems. The certificate is the most comprehensive of its kind and covers more than 60 SKF production units in 17 countries.



The SKF Engineering & Research Centre is situated just outside Utrecht in The Netherlands. In an area of 17 000 square metres (185 000 sq.ft) some 150 scientists, engineers and support staff are engaged in the further improvement of bearing performance. They are developing technologies aimed at achieving better materials, better designs, better lubricants and better seals – together leading to an even better understanding of the operation of a bearing in its application. This is also where the SKF Life Theory was evolved, enabling the design of bearings which are even more compact and offer even longer operational life.



SKF has developed the Channel concept in factories all over the world. This drastically reduces the lead time from raw material to end product as well as work in progress and finished goods in stock. The concept enables faster and smoother information flow, eliminates bottlenecks and bypasses unnecessary steps in production. The Channel team members have the knowledge and commitment needed to share the responsibility for fulfilling objectives in areas such as quality, delivery time, production flow etc.



SKF manufactures ball bearings, roller bearings and plain bearings. The smallest are just a few millimetres (a fraction of an inch) in diameter, the largest several metres. SKF also manufactures bearing and oil seals which prevent dirt from entering and lubricant from leaking out. SKF's subsidiaries CR and RFT S.p.A. are among the world's largest producers of seals.

© Copyright SKF 1999
The contents of this publication are the copyright of the publisher and may not be reproduced (even extracts) unless permission is granted. Every care has been taken to ensure the accuracy of the information contained in this publication but no liability can be accepted for any loss or damage whether direct, indirect or consequential arising out of the use of the information contained herein.

Publication **4416 E**

Printed in Sweden on environmentally friendly, chlorine-free paper (Multiart Silk) by SG idé & tryck ab.