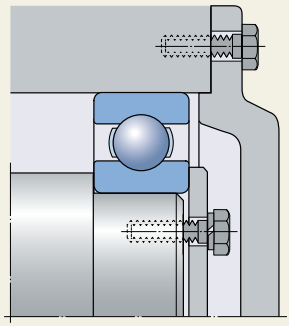
Axial location of bearings

An interference fit alone is inadequate for the axial location of a bearing ring. As a rule, therefore, some suitable means of axially securing the ring is needed.

Both rings of a locating bearing should be axially secured on both sides. However, for non-locating bearings, that are of a non-separable design, the ring having the tighter fit – usually the inner ring – should be axially secured; the other ring must be free to move axially with respect to its seating, except for CARB bearings where both the rings are axially secured. For "cross-located" bearings the bearing rings need only be axially secured on one side.

Fig 20



Methods of location

Bearings with cylindrical bore

Bearing rings having an interference fit are generally mounted so that the ring abuts a shoulder on the shaft or in the housing on one side (➔ **fig** 19). On the opposite side, inner rings are normally secured using lock nuts, as shown in the section "Lock nuts", starting on **page 1003**, e.g. of type KM + MB (➔ **fig** 19) or by end plates (➔ **fig** 20) attached to the shaft end. Outer rings are usually retained by the housing end cover (➔ **fig** 21) or possibly, in special cases, by a threaded ring (➔ **fig** 22).

Fig 21

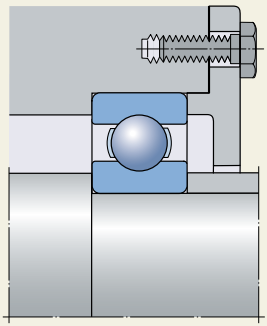


Fig 19

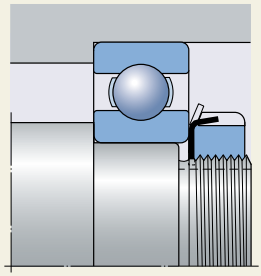
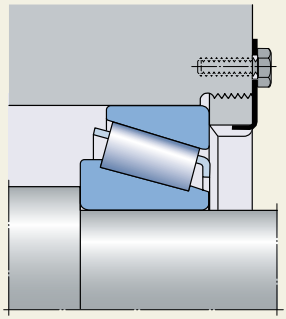


Fig 22



Instead of integral shaft or housing shoulders, it is frequently more convenient to use spacer sleeves or collars between the bearing rings or between a bearing ring and an adjacent component, e.g. a gear (➔ **fig** 23). Location on a shaft can also be accomplished using a split collar that is seated in a groove in the shaft (➔ **fig** 25) and retained either by a second one-piece collar or ring or by the bearing inner ring.

The use of snap rings for the axial location of rolling bearings saves space, permits rapid mounting and dismounting, and simplifies the machining of shafts and housing bores. If moderate or heavy axial loads have to be supported an abutment collar should be inserted between the bearing ring and the snap ring, so that the snap ring is not subjected to excessive bending moments (➔ **fig** 24). The usual axial play between the snap ring and snap ring groove can be reduced, if necessary, by choosing suitable tolerances for the abutment collar or by using shims. Bearings with a snap ring groove in the outer ring (➔ **fig** 23) can be secured in a very simple and space-saving manner using a snap ring (➔ section “Deep groove ball bearings”, starting on **page 287**).

Other methods of axial location which are suitable, especially for high precision bearing arrangements involve the use of press fits, e.g. in the form of stepped sleeve arrangements. Additional details are found in the SKF catalogue “High-precision bearings”.

Fig 23

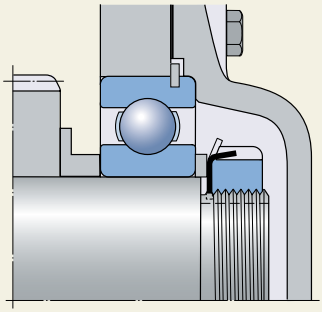
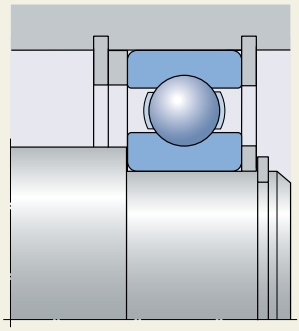


Fig 24



Bearings with tapered bore

Bearings with a tapered bore mounted directly on tapered journals are generally retained on the shaft by a lock nut, or by a lock nut on an externally threaded split ring inserted in a groove in the shaft (➔ **fig** 25).

When using an adapter sleeve on a stepped shaft, the lock nut positions the bearing relative to the sleeve, and a spacer ring is inserted between the shaft shoulder and inner ring on the other side (➔ **fig** 26). Where smooth shafts without integral abutments are used (➔ **fig** 27), the friction between the shaft and sleeve governs the axial load carrying capacity of the bearing, see sections

- "Self-aligning ball bearings" starting on **page 463** and
- "Spherical roller bearings" starting on **page 691**.

Where bearings are mounted on a withdrawal sleeve, an abutment, e.g. a spacer ring, which is frequently designed as a labyrinth ring, must support the inner ring. The withdrawal sleeve itself is axially located by an end plate or a lock nut (➔ **fig** 28).

Fig 25

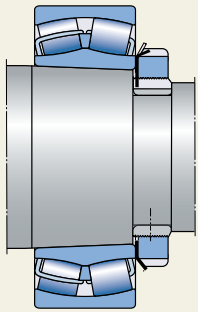


Fig 26

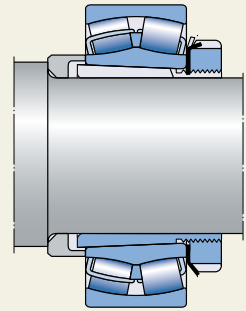


Fig 27

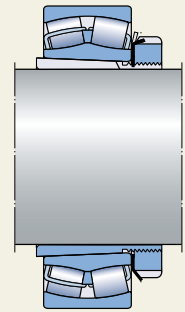
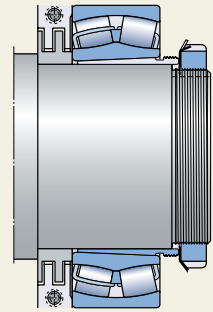


Fig 28



Abutment and fillet dimensions

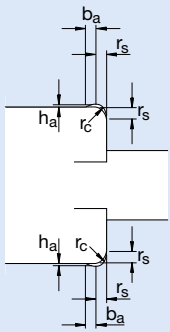
The dimensions of components adjacent to the bearing (shaft and housing shoulders, spacer sleeves etc.) must be such that sufficient support is provided for the bearing rings, but there must be no contact between the rotating parts of the bearing and a stationary component. Appropriate abutment and fillet dimensions are quoted for each bearing listed in the product tables.

The transition between the bearing seating and shaft or housing shoulder, may either take the form of a simple fillet according to the dimensions r_a and r_b in the product tables, or be relieved in the form of an undercut. **Table** 13 gives suitable dimensions for the relieved fillets.

The greater the fillet radius (for the smooth form curve), the more favourable is the stress distribution in the shaft fillet area. For heavily loaded shafts, therefore, a large radius is generally required. In such cases a spacing collar should be provided between the inner ring and shaft shoulder to provide a sufficiently large support surface for the bearing ring. The side of the collar facing the shaft shoulder should be relieved so that it does not contact the shaft fillet (➔ **fig** 29).

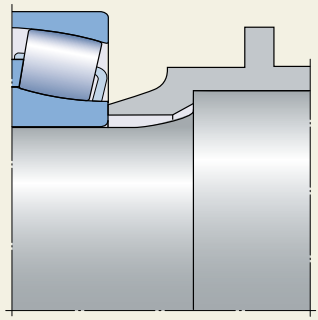
Table 13

Relieved fillets



Bearing chamfer dimension	Fillet dimensions		
r_s	b_a	h_a	r_c
mm	mm		
1	2	0,2	1,3
1,1	2,4	0,3	1,5
1,5	3,2	0,4	2
2	4	0,5	2,5
2,1	4	0,5	2,5
3	4,7	0,5	3
4	5,9	0,5	4
5	7,4	0,6	5
6	8,6	0,6	6
7,5	10	0,6	7
9,5	12	0,6	9

Fig 29



CARB toroidal roller bearings

CARB bearings can accommodate axial expansion of the shaft within the bearing. To be sure that these axial displacements of the shaft with respect to the housing can take place it is necessary to provide space on both sides of the bearing (➔ **fig** 30).

Additional information is found in the section “CARB toroidal roller bearings”, starting on **page 775**.

Fig 30