

# The angular contact ball bearing

## Summary

- Angular contact ball bearings can be used universally and are more robust than deep groove ball bearings
- Use of a seal is optional
- Code number: 7 (single row), 3 or 5 (double row)
- Pairing of two angular contact ball bearings (in O, X or tandem arrangement) possible, but this leads to relatively complex mounting
- Other angular contact ball bearing types are spindle bearings and four-point contact bearings



*The angular contact ball bearing is virtually the brother of the deep groove ball bearing.*

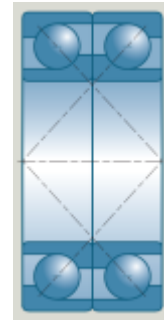
## Characteristics of angular contact ball bearings

Perhaps you already know some characteristics of the [deep groove ball bearing](#). This will be helpful in this text, because the angular contact ball bearing is very similar to the deep groove ball bearing in terms of its structure. Nevertheless, there are a few crucial differences. Angular contact ball bearings can also be used universally in many applications and are sometimes installed specifically in machine tools.

Just like [deep groove ball bearings](#),

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angular contact ball bearings cannot usually be dismantled. They have a defined **contact angle**  $\alpha$ , which is relative to the radial plane and represents a connecting line between the contact points on the **inner ring**, on the ball and on the **outer ring**.



*With paired angular contact ball bearings in an X arrangement, axial forces can be absorbed in two different directions.*



*A double-row angular contact ball bearing cross-section. The **rolling elements** have a common inner and outer ring.*

Angular contact ball bearings can support radial loads as well as axial loads from one direction. Depending on the ratio of axial and radial loads, angular contact ball bearings with different contact angles are used. With regard to axial forces, angular contact ball bearings are therefore also more robust than, for example, a **deep groove ball bearing**. Two angular contact ball bearings are often paired with each other, which results in two rows of rolling elements next to each other. As a result, axial forces acting on the bearings can run in two different directions (**O or X arrangement**) or a greater load can be supported in one axial direction (**tandem arrangement**). In addition, angular contact ball bearings may be preloaded so that there is little or no bearing play. The advantage of **preloading** is that angular contact ball bearings can thus be adapted to the application in terms of bearing rigidity, shaft guidance and **concentricity**.

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The fact that axial loads can only be absorbed in one direction, can be more of a curse than a blessing, as it is imperative to pay attention to the mounting direction when mounting individual angular contact ball bearings. However, if it is clear that axial forces can occur in both directions, the use of paired angular contact ball bearings is indispensable. Similar to [deep groove ball bearings](#), angular contact ball bearings can also have a [seal](#). Due to the paired installation, the mounting of angular contact ball bearings is more complicated than with deep groove ball bearings. In addition, the costs are higher if two bearings have to be installed.

According to the standard, single-row angular contact ball bearings are marked with the code number 7 and double-row angular contact ball bearings with 3 or 5. Cages for angular contact ball bearings are basically available in the three common [materials](#): plastic, sheet steel and brass. The [cage](#) material used can be adapted according to the application. For smaller sizes, a plastic or sheet steel cage is often used for cost reasons.

Type	Bearing series	Plastic cage	Sheet steel cage	Solid brass cage
Standard	79	7904-7913	---	7914-7960
	70	7000-7222	---	7026-7040
	72	---	7200-7222	7224-7240
	73	---	7300-7322	7324-7340
	72B	---	7200B-7222B	7224B-7224B
	73B	---	7300B-7322B	7324B-7340B
Double row	52	---	5200S-5317S	---
	53	---	5300S-5314S	---
4-point contact	QJ2	---	---	QJ208-QJ224
	QJ3	---	---	QJ306-QJ324

*Merrily mixed: some NTN bearing series come as standard with plastic cages, some with*

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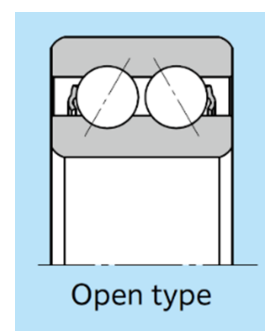
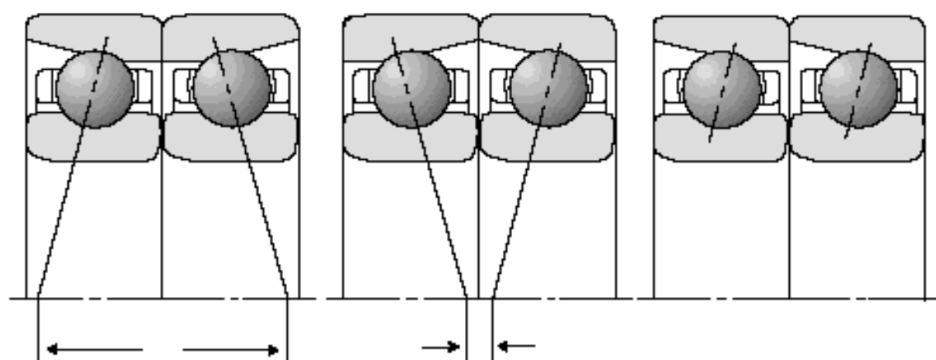
sheet steel cages and others with solid brass cages.

## Angular contact ball bearing pairing

As mentioned before, angular contact ball bearings can be paired. It is possible to install the rolling elements into different arrangements. The most common arrangements of the bearings are the **O**, **X** and **tandem arrangement**. Especially in machine tools, bearings can also be arranged in multiple combinations of more than two.

## Other angular contact ball bearing types: Spindle bearings and four point contact bearings

In addition to single and double row angular contact ball bearings, there are other types. These include, for example, spindle bearings or four-point contact bearings. Spindle bearings are manufactured in better tolerance classes than standard angular contact ball bearings and have smaller rolling elements. These are useful for achieving very high speeds. What is special about four-point contact bearings is that they can be loaded axially from any direction.



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*The O, X and tandem arrangement of rolling elements in paired angular contact ball bearings.*

*O arrangement of rolling elements in a double row angular contact ball bearing.*

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