

1. Design features and special characteristics

1.1 Angular contact ball bearing

Angular contact ball bearings are non-separable bearings which have a certain contact angle in the radial direction relative to the straight line that runs through the point where each ball makes contact with the inner and outer rings (see **Diagram 1**). **Table 1** gives contact angle and contact angle symbol.

In addition to radial loads, single direction axial loads can also be accommodated by angular contact ball bearings.

Furthermore, since an axial load is generated from a radial force, these bearings are generally used in pairs facing each other. Standard type, high speed use type and ultra high speed varieties of angular contact ball bearings are available through **NTN**, and there are also many duplex varieties. A bearing accuracy of JIS Class 5 or higher is applied to duplex type angular contact ball bearings, and in many cases they are given a preload, in compliance with standard preload levels,

before being used in an application. **Table 2** shows information concerning angular contact ball bearings, and **Table 3** shows similar information for duplex angular contact ball bearings.

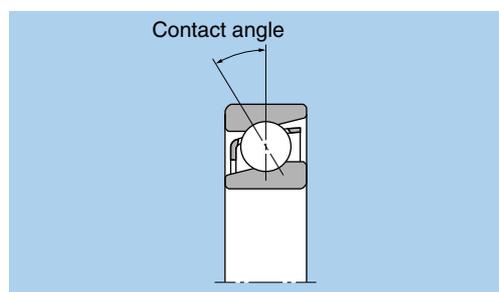


Diagram 1.

Table 1 Contact angle and contact angle codes

Contact angle	15°	30°	40°
Code	C	A ^①	B

① Contact angle symbol A is omitted.

Table 2 Angular contact ball bearing types and characteristics

Type	Design	Characteristics
Standard type		<ul style="list-style-type: none"> Available in bearing series 79, 70, 72, 72B, 73, and 73B. Contact angles: 30° and 40° (with B) available. Standard bearing cage type differs depending on bearing no. (Refer to Table 4)

Table 3 Duplex angular contact ball bearings — types and characteristics

Duplex type	Characteristics
Back-to-back duplex (DB)	<ul style="list-style-type: none"> Can accommodate radial loads and axial loads in either direction. Has a large distance l between the acting load center of the bearing, and therefore a large momentary force load capacity. Allowable misalignment angle is small.
Face-to face duplex (DF)	<ul style="list-style-type: none"> Can accommodate radial loads and axial loads in either direction. Has a smaller distance l between the acting load center of the bearing, and therefore a smaller momentary force load capacity. Has a larger allowable misalignment angle than back-to-back duplex type.
Tandem duplex (DT)	<ul style="list-style-type: none"> Can accommodate radial loads and single direction axial loads. Axial loads are received by both bearings as a set, and therefore heavy axial loads can be accommodated.

Note: 1. Duplex bearings are manufactured in a set to specified clearance and preload values, therefore they must be assembled together with identically numbered bearings and not mixed with other arrangements.

2. Triplex arrangements of angular contact bearings are also available. Consult **NTN** Engineering for details.

1.2 Four-point angular contact ball bearings

Four-point angular contact ball bearings have a contact angle of 30° and inner rings which are separated in half. As shown in **Diagram 2**, when the inner and outer rings receive a radial load the ball bearings contact the inner and outer rings at four points. This construction enables a single bearing to accommodate axial loads from either direction, and when generally under a simple axial load or heavy axial load, the bearing functions in reliance on two contact points like ordinary bearings.

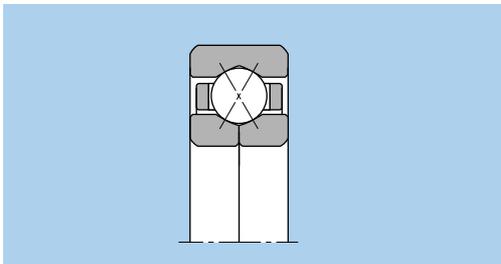


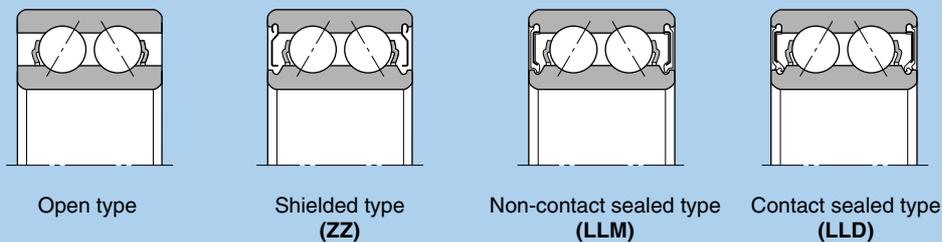
Diagram 2.

1.3 Double row angular contact ball bearings

The structure of double row angular contact ball bearings is designed by arranging two single row angular contact bearings back-to-back in duplex (DB) to form one united bearing with a contact angle of 25° .

These bearings are capable of accommodating radial loads, axial loads in either direction, and have a high capacity for momentary loads as well.

As shown in **Diagram 3**, sealed and shielded type double row angular contact ball bearings are also available. Standard loads vary from those of open type bearings.



Open type

Shielded type
(ZZ)

Non-contact sealed type
(LLM)

Contact sealed type
(LLD)

Diagram 3.

■ Flush ground

"Flush ground" is the name given to the finishing method shown in **Diagram 4** where the offset of the front and back faces of the bearing are ground to the same value. By doing this, a stated clearance or preload value can be achieved by using bearings with identical codes for these values, in other words by combining either DB or DF series bearings. DT series bearings can also be used in various arrangements to achieve uniform load distribution.

All BNT type bearings are flush ground, but other angular contact ball bearing series are not. If it is necessary to flush grind any of these other bearings, please consult NTN Engineering.

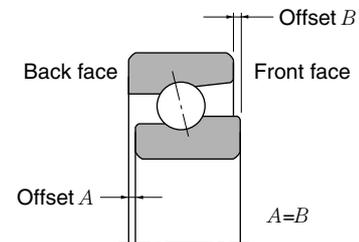


Diagram 4.

2. Standard cage types

Table 4 lists the standard cage types for angular contact ball bearings.

Table 4 Standard cages for angular contact ball bearings

Type	Bearing series	Molded resin cage	Pressed cage	Machined cage
Standard	79	7904~7913	—	7914 ~7960
	70	7000~7024	—	7026 ~7040
	72	—	7200 ~7222	7224 ~7240
	73	—	7300 ~7322	7324 ~7340
	72B	—	7200B~7222B	7224B ~7240B
	73B	—	7300B~7322B	7324B ~7340B
4-point contact	QJ2	—	—	QJ208 ~QJ224
	QJ3	—	—	QJ306 ~QJ324
Double row	52	—	5200S~5217S	—
	53	—	5302S~5314S	—

Note: Due to the material characteristics of molded resin cages, use at application temperatures in excess of 120°C is not possible.