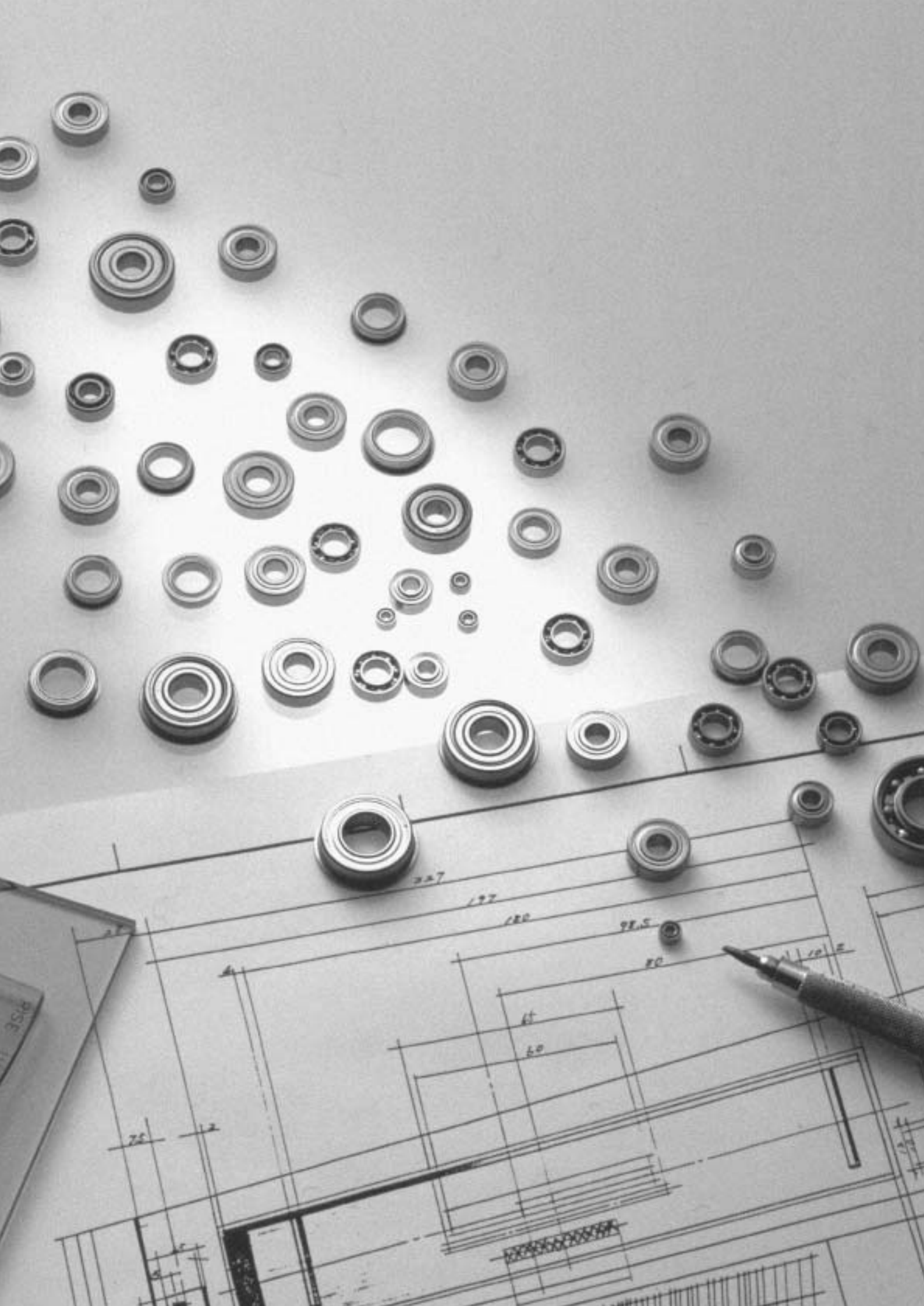



Open type


Shielded type


Shielded type with snap ring

1. Design features and special characteristics

The dimensional range of miniature and extra small ball bearings is given in **Table 1**. Boundary dimensions for both metric and inch systems are in accordance with the internationally specified ISO and ANSI/ABMA standards. The most widely used sealed and shielded type ball bearings have a 1–2 mm wider width dimension than open type bearings.

The main variations of these bearings are shown in **Table 2**. Bearings with snap rings, which simplify the bearing housing construction and design, have also been serialized and are listed in dimension tables. Among the most generally used sealed and shielded bearings are standard ZZ and ZZA type which incorporate non-contact steel shield plates. **Diagram 1** also shows non-contact type rubber sealed LLB and resin sealed SSA type bearings, and the contact-type rubber sealed LLU bearing.

Table 1 Dimensional range

Bearing	Dimensional range
Miniature ball bearings	Nominal outer diameter D<9mm
Extra small ball bearings	Nominal bore diameter d<10mm Nominal outer diameter D≧9mm

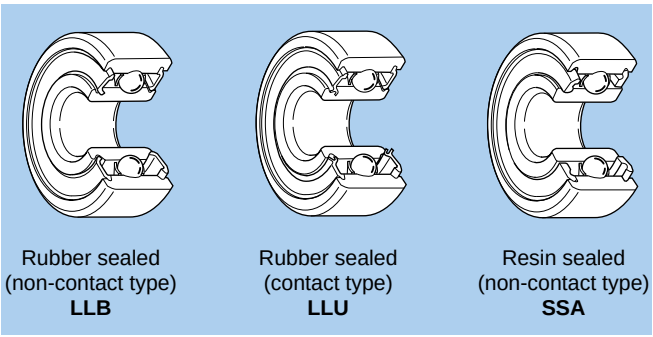
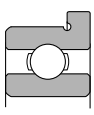
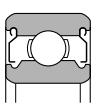
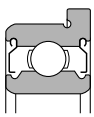


Diagram 1.

Table 2 Main types and construction

Type	Standard type code			Flange-attached type code		
	Construction	Metric series	Inch series	Construction	Metric series	Inch series
Open type		6 BC	R		FL6 FLBC	FLR
Shielded type		6 x x ZZ W6 x x ZZ WBC x x x ZZ	RA x x ZZ		FL6 x x x ZZ FLW6 x x x ZZ FLWBC x x ZZ	FLRA x x ZZ

Note: 1. Representative type codes are shown. For further details, please refer to dimension tables.
2. May change to ZA or SA for shielded type bearings, according to the bearing number.

2. Standard cage types

Pressed cage are standard for these bearings. However, molded resin cage are used for some bearings depending on the application.

3. Dimensional and rotational accuracy

The accuracy of miniature and extra small ball bearings complies with JIS standards. Accuracy standards are listed in the Bearings Tolerances clause on page A-35. Flange accuracies are listed in **Table 3**.

Table 3 Tolerance and tolerance values for outer ring flange

Units μm

Accuracy class		Outer diameter dimensional tolerance Δ_{D1s} or Δ_{D2s} Upper Lower	Outer ring surface runout for rear surface S_{D1} Max.	Back face axial runout S_{ea1} Max.	Width dimension tolerance Δ_{C1s} or Δ_{C2s} Upper Lower	Width unevenness V_{C1s} or V_{C2s} Max.
ISO standard	Class 0	∗ (see table below)	—	—	Identical to same bearing's inner ring V_{Bs}	Identical to same bearing's inner ring V_{Bs}
	Class 6		—	—		
	Class 5		8	11		5
	Class 4		4	7		2.5
	Class 2		1.5	3 ❶ 4		1.5

❶ Nominal outer diameter, 18 mm or less.

∗ Units μm

Flange nominal outer diameter D_1 or D_2 mm over	incl.	Outer diameter dimensional tolerance Δ_{D1s} or Δ_{D2s} Upper	Lower
—	10	+220	−36
10	18	+270	−43
18	30	+330	−52
30	50	+390	−62

4. Radial internal clearance

Radial internal clearance values should be applied as listed in the table regarding the Bearing Internal Clearance and Preload clause on page A-58.

However, for miniature and extra small bearings, the radial clearance values for high precision bearings given in **Table 4** are applied in many cases.

For more specific selection information, please refer to the NTN Miniature and Extra Small Ball Bearings Catalog, or contact NTN Engineering.

Table 4 Radial internal clearance for high precision bearings

Units μm

MIL Standard	Tight				Standard						Loose		Extra Loose	
Code	C2S		CNS		CNM		CNL		C3S		C3M		C3L	
Internal clearance	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
	0	5	3	8	5	10	8	13	10	15	13	20	20	28

Note: 1. These standards are specified in accordance with MIL B-23063. However, NTN codes are shown.
2. Clearance values do not include compensation for measuring load.