

# Cage & Needle Roller Assemblies

NSK cage and needle roller assemblies are high-quality products that offer users higher reliability and greater ease of handling and installation.





**Adaptable to severe operating conditions, including strong impact load, complex operations, and high temperatures.**



**1. Easy handling**

Unitized design facilitates easy handling and installation.

**2. High load capacity**

Low cross-section provides high load capacity within the smallest envelope.

**3. High limiting speed**

Properly lubricated, the cage structure guides the rollers precisely enabling high-speed operations.

**4. Long life**

Roller crowning reduces stress on the roller ends and prolongs bearing life.



NSK cage and roller assemblies consist of a complement of needle rollers held in place by a cage. Their unitized design makes for easy handling and installation. With no inner or outer ring, the low cross-section provides maximum load-carrying capability within the smallest envelope. Properly lubricated, they can operate at high speeds thanks to the unique cage, which guides the rollers precisely. The controlled contour rollers in cage and roller assemblies have an optimum profile, which reduces end stress, allows operation under moderate misalignment and prolongs bearing life.

## 1. Design and Types

The most common cage used in cage and roller assemblies is the M type. M-type cages are either pressed from steel plate or machined.

These cages undergo surface hardening after processing to attain high wear-resistance and rigidity. The cages facilitate optimum lubricating conditions because lubricant can be easily replenished.

Other cages include those made by precision pressing, welded cages, and polyamide molded cages.

Welded cages produced by welding pressed steel are especially suited for mass production. Applying its considerable experience and knowledge, NSK supplies cage and roller assemblies of the highest quality.

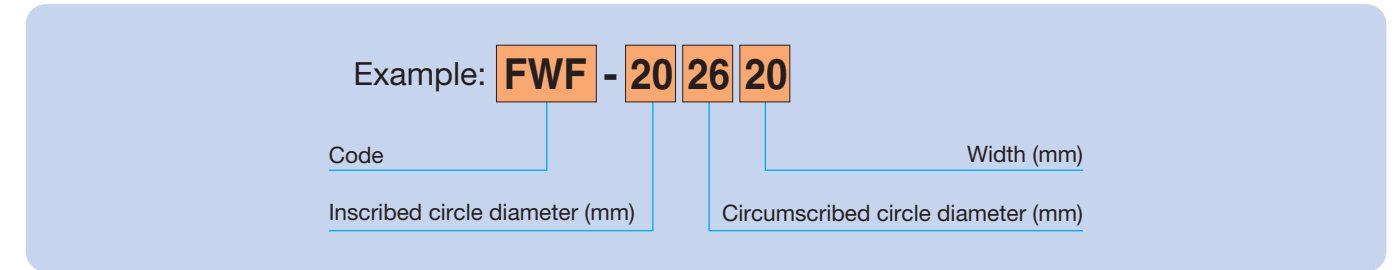
Codes for the various types of cage and roller assemblies are shown in **Table 1**. There are many types of cage and roller assemblies other than those in **Table 1**, including split cages.

**Table 1 Cage and Roller Assembly Codes**

Cage Type		Code		Example
		Metric	Inch	
Single Row	M Cage	FWJ, FWF	WJ	
	FBN Cage	FBN	—	
	Welded Cage	FWJC, FWJW FWJE	—	
	Polyamide Cage	FBNP	—	
Double Row	M Cage	FWF...W	—	
	FBN Cage	FBN...W	—	
	Welded Cage	FDJC, FDJS	—	
	Polyamide Cage	FBNP...W	—	

## 2. Specification Number

An example of a bearing specification number is as follows:



For inch bearings, each dimension is expressed with two-digit whole numbers in units of 1/16 of an inch following the code.

## 3. Accuracy Standard

NSK cage and roller assemblies usually use rollers classified as JIS Class 3 or higher. Roller accuracy is shown in **Table 2**.

**Table 2 Accuracy of Needle Rollers**

Units:  $\mu\text{m}$

Class	Tolerance in Average Value of Diameter		Diameter Variation in a Single Radial Plane, (°) $VD_{WP\text{max}}$	Deviation from Circular Form, (°) $\Delta R_{\text{max}}$	Diameter Variation within Gauge Lot, (°) $VD_{WL\text{max}}$	Deviation in Length, (°) $\Delta L_{ws}$
	high	low				
2	0	-5	1	1	2	h13
3	0	-5	1.5	1.5	3	h13
5	0	-5	2	2.5	5	h13

Note (°) Applies at the center of roller's length.

(°) Depends on  $L_w$  classification. h13 is shown in **Table 3**.

Remarks Deviation between the actual measured diameter at any point over the entire length of roller and the actual maximum diameter at the center of the entire length must not exceed the following values:

- Class 2:  $0.5 \mu\text{m}$
- Class 3:  $0.8 \mu\text{m}$
- Class 5:  $1.0 \mu\text{m}$

**Table 3 Tolerance of Deviation in Length**

Units: mm

Basic Dimension		h13	
over	incl.	over	incl.
3	6	0	-0.18
6	10	0	-0.22
10	18	0	-0.27
18	30	0	-0.33
30	50	0	-0.39

## 4. Applications to Maximize Performance

### ■ Mounting

In cage and roller assemblies, the shaft and housing are generally used as raceway rings. It is important to satisfy the finish accuracy and hardness requirements in Table 4.

### ■ Accuracy and roughness of the raceway surface

The shaft and housing bore of cage and roller assemblies are often used as raceway surfaces of needle bearings in order to achieve the most compact bearing design and enhance shaft rigidity, load capacity, and accuracy. Accuracy and roughness of the raceway surface greatly affect the life, noise, and accuracy of bearings. Therefore, shape, accuracy, and roughness have to be treated with great care.

In particular, harmful circumferential waviness and a polygonal shape are undesirable. Accuracy and roughness for raceway surfaces are shown in Table 4. Since these values may change depending on the desired performance, please contact NSK.

Table 4 Accuracy and Hardness for Shaft and Housing

Item	Shaft	Housing
Out-of-Roundness Tolerance	IT3 2	IT3 2
Cylindricity Tolerance	IT3 2	IT3 2
Roughness, $R_a$	0.4	0.8
Hardness	HRC58 to 64 Appropriate depth of hardened layer required	HRC58 to 64 Appropriate depth of hardened layer required

### ■ Material and heat treatment of raceway furnace

The raceway rings and rollers of needle bearings are repeatedly stressed on their relatively small contact surfaces. The materials for raceway rings, rollers, and shafts and housings that function as raceways, must therefore have high hardness, resistance to permanent deformation, and long rolling fatigue life. These materials are also required to be resistant to wear and shock, and have good dimensional stabilization. Common materials used for shafts and housings that function as bearing raceways include the following:

Carbon steel for machine construction (for carbonizing)	S15CK (JIS G 4051)
Chrome molybdenum steel (for carbonizing)	SCM415-421 (JIS G 4105)
Chrome steel (for carbonizing)	SCr415, 420 (JIS G 4104)
Nickel chrome steel (for carbonizing)	SNC415-815 (JIS G 4102)
Nickel chrome molybdenum steel (for carbonizing)	SNM220, 415, 420 (JIS G 4103)

JIS: Japanese Industrial Standard

Other materials, such as S50C and S55C, can be utilized with through hardening or induction hardening.

The hardened layer, which is tempered at a temperature between 160°C and 180°C after hardening, has to develop a martensite structure with an even distribution of very fine carbides. In the case of cemented or induction hardening of the raceway surface, the surface hardness should not only be HRC58 to 64 (HRC60 to 64 is preferable), but also, the hardened layers with Vickers hardness of HV 653 (HRC58) and HV550 (HRC52.3) have to reach appropriate depths. When the values of hardness are below these values, bearing fatigue life significantly decreases. The hardened layer depth (up to HV550) after grinding finish is estimated by using the following equation:

$$t \geq (0.08 \sim 0.10) D_w$$

where,  $t$ : Effective hardened layer depth (mm)

$D_w$ : Roller diameter (mm)

Core hardness is generally HRC30 to 45.

### ■ Guide width for cage and roller assemblies

The tolerances for the guide width,  $b$ , are based on cage width,  $B_c$ , and shown in Table 5 (see Fig. 1).

Table 5 Tolerance for Guide Width,  $b$  Units: mm

Type	Tolerance for $b$
Metric	$B_c^{+0.2}_0$
Inch	$B_c^{+0.4}_{+0.2}$

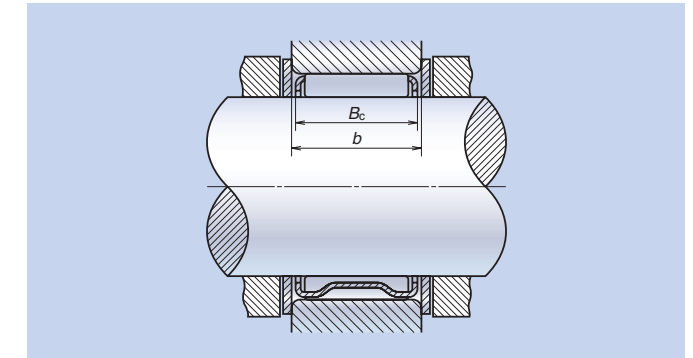


Fig. 1 Guide Width

### ■ Fillet radius

The fillet radius of the shaft and housing shoulder in contact with the cage end surface should not interfere with the cage itself.

### ■ Fitting tolerances for shafts and housing bores

Fitting tolerances for shafts and housing bores under various operating conditions are shown in Table 6.

Table 6 Fitting Tolerances for Shafts and Housing Bores

Operating Conditions		High Accuracy, Oscillating Motion	Normal	High Temperature, Large Shaft Deflection, Mounting Error
Fitting Tolerance for Housing Bore		G6	G6	G6
Fitting Tolerance for Shaft	$F_w \leq 50$ mm	j5	h5	f6
	$F_w > 50$ mm	h5	g5	

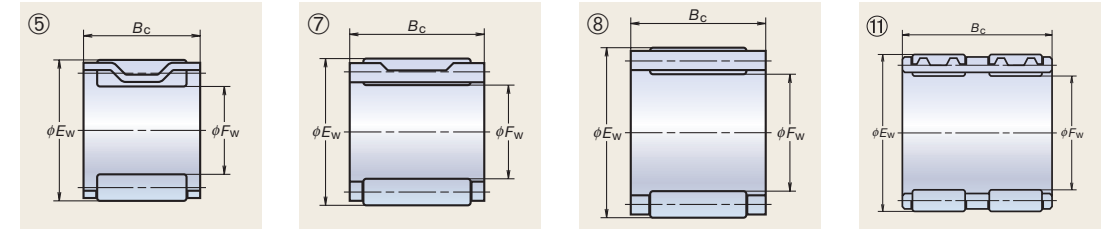
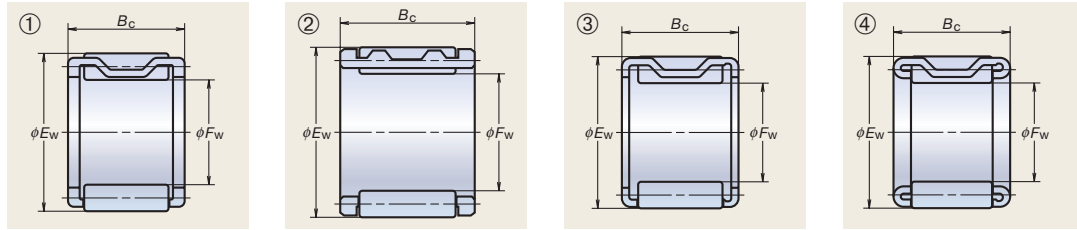
### ■ Shaft inclination

Permissible shaft inclinations from elastic deflection by an external force and mounting error are shown in Table 7. When shaft inclination exceeds that in this table, please contact NSK, as it is necessary to change the amount of roller crowning and increase internal clearance.

Table 7 Shaft Inclination

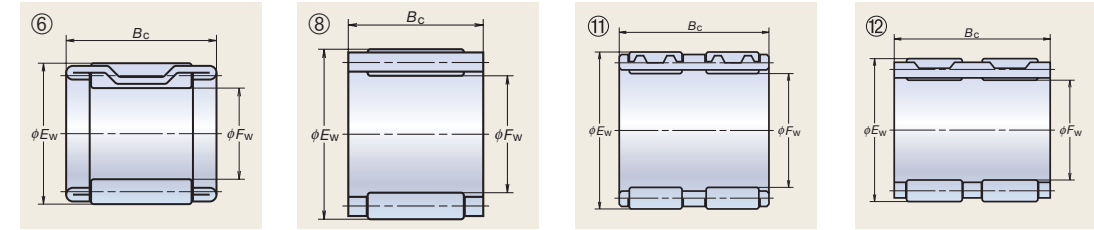
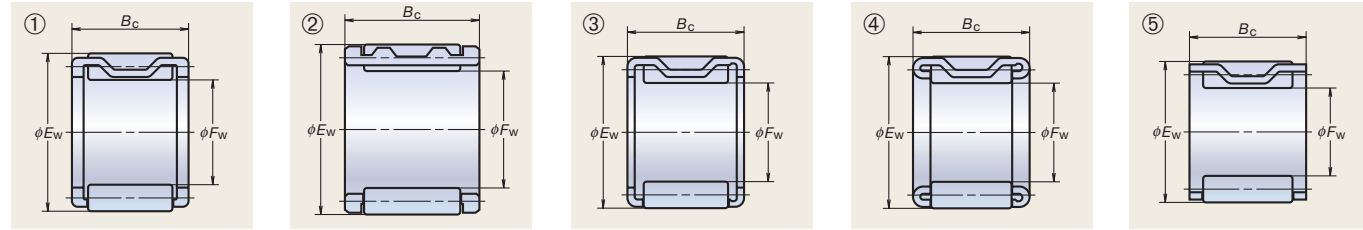
Cage Width (mm)		Permissible Inclination (mm/mm)
over	incl.	
—	25	0.0015
25	50	0.0010
50	—	0.0005

- M Cage
  - FBN Cage
  - Welded Cage
  - Polyamide Cage
- (includes inch design)



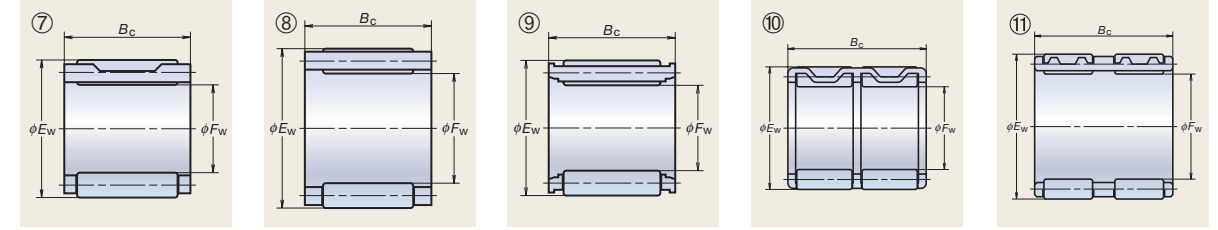
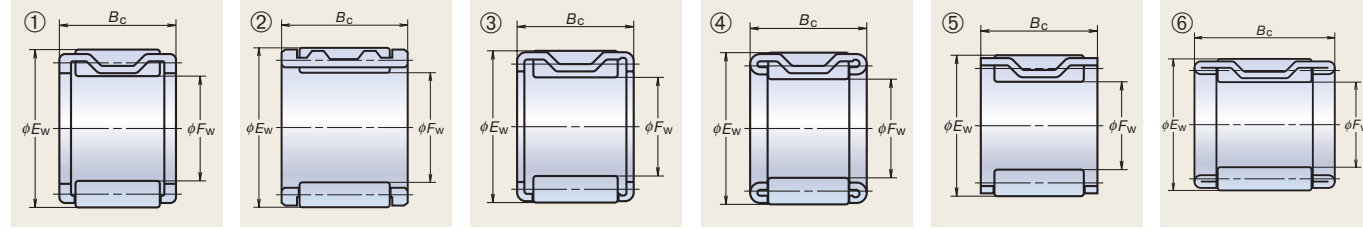
Bearing Numbers	Boundary Dimensions (mm)			Basic Load Ratings (N)		Drawing
	$F_w$	$E_w$	$B_c$	$C_r$	$C_{Or}$	
FBNP-476Z	4	7	6.5	1 710	1 220	⑧
FBNP-588	5	8	8	2 330	1 860	⑧
FBNP-698	6	9	8	2 200	1 790	⑧
FBNP-6910	6	9	10	3 350	3 050	⑧
FBNP-7108	7	10	8	2 840	2 560	⑧
FBNP-71010	7	10	10	3 650	3 550	⑧
FBNP-8118	8	11	8	3 050	2 910	⑧
FBN-10138	10	13	8	3 450	3 600	②
FBN-101310	10	13	10	3 950	4 300	②
FBN-10148	10	14	8	3 750	3 300	②
FBN-101410	10	14	10	4 850	4 650	②
FBN-101413-E-1	10	14	13	6 500	6 750	②
FBN-111515A-E	11	15	15	7 450	8 200	②
FBN-12159	12	15	9	4 350	5 100	②
FBN-121510	12	15	10	4 350	5 100	②
FBN-121512	12	15	12	5 400	6 750	②
FBN-121513	12	15	13	5 950	7 600	②
FWF-121610	12	16	10	5 700	5 950	①
FWF-121613	12	16	13	7 350	8 350	①
FWF-121812	12	18	12	9 150	8 650	①
BN501305	13	17	14	8 450	10 100	①
FWF-141810	14	18	10	6 750	7 750	①
FWF-141811	14	18	11	6 750	7 750	①
FWF-141813	14	18	13	8 050	9 750	①
FWF-141817	14	18	17	10 700	14 100	①
FWF-141820	14	18	20	12 100	16 400	①
FWF-142012	14	20	12	9 850	9 800	①
FWF-151910	15	19	10	7 050	8 400	①
FWF-151913	15	19	13	8 400	10 500	①
FWF-151917	15	19	17	11 200	15 200	①
FWF-152121A	15	21	21	16 300	18 900	①
FWJS-15209Z	15.875	20.615	9	6 000	6 150	⑧
WJ-101410	15.875	22.225	15.88	15 400	17 300	③
FWF-162010	16	20	10	7 350	9 000	①
FWF-162013	16	20	13	8 800	11 300	①
FWF-162017	16	20	17	11 700	16 300	①
FWF-162110	16	21	10	8 650	9 600	①
BN501622E	16	22	12	9 850	10 000	①
FWF-162113	16	21	13	10 500	12 300	①
FWF-162212	16	22	12	10 500	10 900	①
FWF-162213	16	22	13	10 900	11 500	①
FWF-162217	16	22	17	14 700	16 900	①

Bearing Numbers	Boundary Dimensions (mm)			Basic Load Ratings (N)		Drawing
	$F_w$	$E_w$	$B_c$	$C_r$	$C_{Or}$	
FWF-162220	16	22	20	17 000	20 300	①
FWF-162222	16	22	22	18 700	22 900	①
FWF-162224	16	22	24	20 300	25 600	①
FWF-162420	16	24	20	20 800	22 200	①
FWF-172110	17	21	10	7 650	9 650	①
FWJC-172113	17	21	13	9 100	12 100	⑧
FWJ-172113	17	21	13	11 000	14 000	③
FBNP-172113	17	21	13	8 400	10 900	⑦
FWF-172221Z	17.57	22.6	21	16 600	22 700	①
FWF-172332Z	17.57	23.6	32	29 300	42 000	①
FWF-182210	18	22	10	7 900	10 300	①
FWF-182213	18	22	13	9 450	12 900	①
FWF-182217	18	22	17	12 600	18 600	①
FBN-182228W	18	22	28	16 100	25 400	⑩
FWF-182320	18	23	20	16 600	22 900	①
FWF-182412	18	24	12	11 700	13 000	①
FWJ-182417	18	24	17	18 700	21 600	③
FWF-182420A	18	24	20	18 900	24 100	①
FWF-182420	18	24	20	18 900	24 100	①
FWF-182517	18	25	17	16 500	18 300	①
FWF-182522	18	25	22	21 300	25 500	①
FWF-192313	19	23	13	9 900	13 900	①
FBN-192323Z-E	19	23	23.7	16 000	25 800	②
FBNP-192417	19	24	17	12 000	15 200	⑦
FWJ-192428	19	24	28	25 700	37 000	③
BN501903	19	35	32	30 500	45 500	④
WJ-121616	19.05	25.4	25.4	26 600	36 500	③
FWJ-193124ZB	19.1	31.1	24	31 000	30 500	③
FWJ-193124Z	19.1	31.1	24	33 000	30 500	③
FWF-202410	20	24	10	8 000	10 700	①
FWF-202413-0-2	20	24	13	9 700	13 700	①
FWF-202413	20	24	13	9 700	13 700	①
FWF-202417	20	24	17	12 400	18 800	①
FWF-202612	20	26	12	12 200	14 100	①
FWF-202613	20	26	13	13 100	15 500	①
FWF-202616	20	26	16	16 600	21 000	①
BN502043-E	20	26	16.7	14 100	16 800	①
FWJ-202617	20	26	17	19 400	23 200	③
FWF-202620	20	26	20	19 200	25 200	①
FWF-202624	20	26	24	23 200	32 000	①
FWJE-202629	20	26	29	26 100	37 500	⑤
FWF-202820	20	28	20	19 800	21 700	①



Bearing Numbers	Boundary Dimensions (mm)			Basic Load Ratings (N)		Drawing
	$F_w$	$E_w$	$B_c$	$C_r$	$C_{Or}$	
BN502020	20	30	19	25 600	26 700	①
BNE47770	20.152	28.097	25.27	29 500	37 000	③
FWF-212517	21	25	17	13 100	20 600	①
FWF-222610	22	26	10	8 650	12 200	①
FWF-222613	22	26	13	10 300	15 300	①
FWF-222813	22	28	13	13 700	16 700	①
FWF-222817A	22	28	17	16 500	21 300	①
FWF-222817	22	28	17	17 300	22 700	①
FWF-222823	22	28	23	23 600	34 000	①
FBNP-222829Z	22	28	29.2	27 200	40 500	⑧
BN502210-E	22	29	15.5	18 300	21 900	①
FWF-222916	22	29	16	17 100	20 200	①
FWF-223014	22	30	14	17 400	19 000	①
FWF-223020HSC	22	30	20	25 200	30 500	①
BN502220	22	30	24	30 000	38 500	③
FWJ-223027A	22	30	27	30 000	38 500	④
BN502250	22	32	14	19 600	19 300	①
WJ-141816	22.225	28.575	25.4	29 000	42 500	③
FWF-232824	23	28	24	22 400	36 000	①
BN502311A-E	23.1	28.1	13.9	13 100	18 200	①
FWF-242813	24	28	13	10 500	16 100	①
FWJC-242817A	24	28	16.8	13 100	21 400	⑧
FWF-242817	24	28	17	14 600	24 700	①
FBN-242825W	24	28	25	15 900	27 400	⑩
FBN-242913	24	29	13	10 700	14 100	②
FWF-243017	24	30	17	17 900	24 300	①
FWJ-243017	24	30	17	17 900	24 300	④
FWJE-243017	24	30	17	16 800	22 300	⑤
FBNP-242924Z	24.9	29.9	24.9	22 100	36 500	⑧
FWF-252910	25	29	10	9 350	14 100	①
FWF-252913	25	29	13	11 300	18 000	①
FWF-252917	25	29	17	14 800	25 500	①
FWF-253013	25	30	13	13 900	20 200	①
FWF-253017	25	30	17	17 200	26 400	①
FWF-253020	25	30	20	18 800	29 700	①
FWF-253025	25	30	25	23 600	39 500	①
FDJC-253046	25	30	46	33 500	62 000	⑫
FWF-253113	25	31	13	15 000	19 500	①
FWF-253117	25	31	17	19 200	26 800	①
FWF-253216	25	32	16	18 700	23 500	①
FWF-253224	25	32	24	28 300	40 000	①
FWF-253320	25	33	20	25 100	31 500	①

Bearing Numbers	Boundary Dimensions (mm)			Basic Load Ratings (N)		Drawing
	$F_w$	$E_w$	$B_c$	$C_r$	$C_{Or}$	
FWJN-253320	25	33	20	29 300	38 500	③
FWJ-253324	25	33	24	34 000	47 000	③
FWJ-253324B	25	33	24	34 000	47 000	③
FWJ-253324H	25	33	24	34 000	47 000	③
BN502552	25	35	24.5	34 500	41 500	①
FWJ-253524Z	25	35	24.5	36 000	43 500	③
BN502535	25	37	24.5	36 500	40 000	①
BN502526W	25.4	30.4	11.5	10 700	14 400	⑧
WJ-162112	25.4	33.338	19.05	27 800	36 000	③
WJ-162116	25.4	33.338	25.4	36 500	51 500	③
FWF-263013	26	30	13	10 400	16 200	①
FWF-263017	26	30	17	14 400	24 900	①
FBN-263024	26	30	24	17 900	32 500	②
BN502615-E	26	31	15.8	15 600	23 600	①
BNE25730	26.444	34.389	18.34	26 800	35 000	③
FWF-283313	28	33	13	13 700	20 400	①
FWJC-283313	28	33	13	12 500	18 200	⑧
FBNP-283313	28	33	13	12 100	17 400	⑧
FWF-283317	28	33	17	17 600	28 300	①
FWJ-283320	28	33	20	23 900	37 500	③
BN502838	28	33	22.7	20 700	34 500	①
FWF-283520	28	35	20	25 200	35 500	①
FWF-283620	28	35	20	26 200	34 000	①
FWJW-283532ZA	28	35	32.5	35 000	54 500	⑥
BN502841-E	28	36	14	19 000	22 600	①
BN502817	28	38	17	28 800	33 500	①
BN502806-E3	28	38	20	30 500	36 000	①
FWJ-283826Z	28	38	26.5	40 500	51 500	④
BN502907	29	34	21.8	22 900	40 000	①
FWF-293424	29	34	24	25 400	46 000	①
FWF-293427	29	34	27	26 600	48 500	①
FWF-303513	30	35	13	14 000	21 600	①
FWJ-303513A	30	35	13	14 000	21 600	③
FWF-303517A	30	35	17	18 700	31 500	①
FWJ-303517	30	35	17	18 700	31 500	④
FWF-303520	30	35	20	21 000	36 000	①
FWF-303527	30	35	27	28 700	54 000	①
BN503020	30	36	14	18 400	26 900	①
FWF-303620	30	36	20	24 300	38 500	①
FWF-303626	30	36	26	29 600	49 500	①
FWF-303716	30	37	16	22 200	31 000	①
FWF-303720	30	37	20	26 000	38 000	①



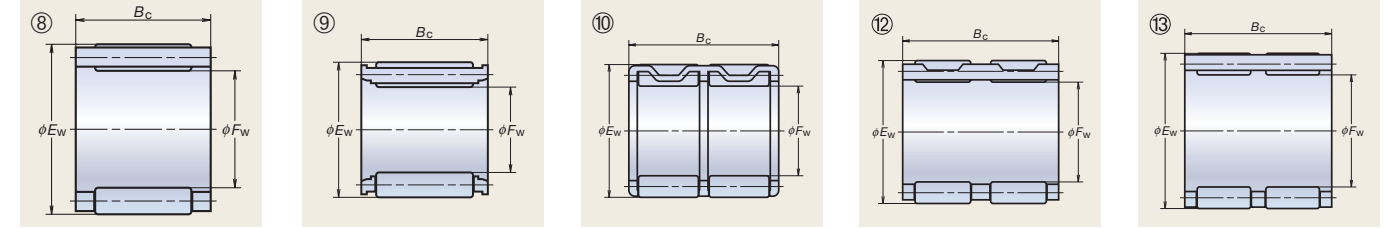
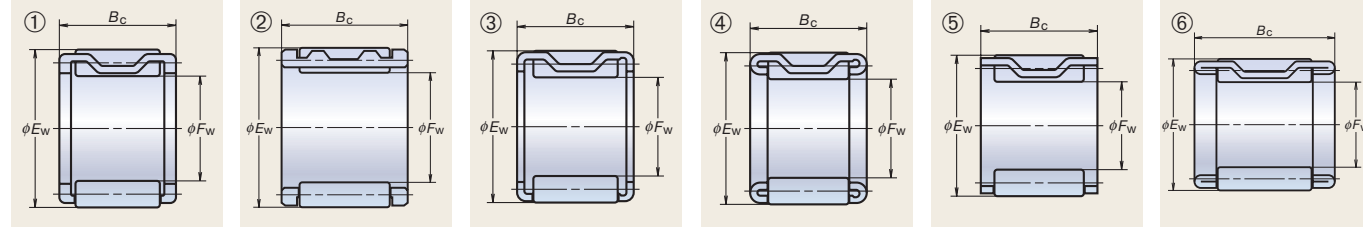
Bearing Numbers	Boundary Dimensions (mm)			Basic Load Ratings (N)		Drawing
	$F_w$	$E_w$	$B_c$	$C_r$	$C_{Or}$	
FWF-303818	30	38	18	25 500	34 000	①
FWF-303820	30	38	20	25 900	34 500	①
BN503015	30	38	26.5	40 000	60 000	③
FWF-303827	30	38	27	38 500	57 500	①
BN503036A	30	39	10	17 900	19 800	①
FWF-304025	30	40	25	38 500	49 500	①
BN503039-1	30	42	15	27 400	28 600	①
BN503039-2	30	42	15	27 400	28 600	①
BN503039-3	30	42	15	27 400	28 600	①
BN503053-1	30	42	17	33 000	36 500	③
BN503053-2	30	42	17	33 000	36 500	③
BN503053-3	30	42	17	33 000	36 500	③
FWF-304230	30	42	30	50 000	62 000	①
BN503041	30	42	30	53 500	67 500	③
BN503002	30	45	30	57 000	64 000	①
BN503002A	30	45	30	57 000	64 000	①
BN503002E	30	45	30	57 000	64 000	①
BN503002G	30	45	30	57 000	64 000	①
FWJ-314324	31	43	24	39 000	45 000	④
WJ-202612	31.75	41.275	19.05	33 000	42 500	③
WJ-202616	31.75	41.275	25.4	44 000	61 000	③
WJ-202624	31.75	41.275	38.1	63 000	98 000	③
FBNP-313617Z	31.8	36.8	17	16 700	27 400	⑧
FBN-323629WA	32	36	29	22 300	46 500	⑪
FWF-323713	32	37	13	15 100	24 400	①
FWJ-323717	32	37	17	20 200	31 500	③
FWJ-323723	32	37	23	26 600	44 500	③
FWJ-323727	32	37	27	34 500	63 000	③
FWF-323728W	32	37	28	25 200	47 000	⑩
FWJE-323726	32	37	36	25 500	47 500	⑤
FWJW-323736	32	37	36	31 000	61 000	⑥
FWF-323820	32	38	20	24 900	40 500	①
FBNP-323826Z	32	38	26.5	30 500	52 000	⑧
FWJ-323916	32	39	16	24 900	33 000	③
FWF-324020	32	40	20	28 400	39 500	①
BN503223	32	42	21	38 000	49 500	①
BN503225	32	45	25	45 500	52 500	①
BN503230	32	47	30	61 500	71 000	③
BN503230A	32	47	30	61 500	71 000	③
BN503305	33	45	24.6	41 000	49 500	①
BN503304	33.5	48.5	30	65 500	78 500	①
FBNP-343922ZA	34	39	22.95	23 700	44 000	⑧

Bearing Numbers	Boundary Dimensions (mm)			Basic Load Ratings (N)		Drawing
	$F_w$	$E_w$	$B_c$	$C_r$	$C_{Or}$	
FWJ-343923	34	39	23	27 500	47 500	④
WJ-222816	34.925	44.45	25.4	45 500	66 000	③
WJ-222820	34.925	44.45	31.75	55 500	85 500	③
FBNP-344824Z	34.925	48.925	24.8	53 000	62 500	⑨
FWF-283516-YG	35	35	16	19 600	25 800	①
FWF-354013	35	40	13	14 900	24 600	①
FWF-354017	35	40	17	20 500	37 000	①
FWJ-354020	35	40	20	28 500	50 000	③
FWJC-354023A	35	40	23	22 100	40 500	⑦
FBN-354025	35	40	25	27 200	53 000	②
FBN-354026	35	40	26	27 200	53 000	②
FWF-354030	35	40	30	34 000	71 500	①
FBN-354032Z	35	40	32.5	30 500	61 000	②
BN503510	35	40	32.5	30 500	61 000	④
FWF-354216	35	42	16	22 700	33 500	①
BN503507	35	42	17	22 800	33 500	④
FWF-354220	35	42	20	28 400	44 500	①
FWF-354230	35	42	30	43 000	75 500	①
FWF-354418	35	44	18	28 800	38 000	①
BN503502A	35	47	30	54 000	70 500	①
BN503529	35	47	30	58 500	78 500	③
BNE26374	35.255	43.21	31.67	53 000	91 500	③
BNE25728	35.255	43.218	18.34	32 000	47 500	③
FWJ-364130Z	36	41	30.5	32 000	66 000	③
FBNP-364130ZA	36	41	30.5	32 500	67 500	⑧
BN503633	36	45	21.5	35 500	50 000	①
FWF-364822Z	36	48	22.5	45 500	57 500	①
BN503638-1	36	48	25	48 500	62 500	①
BN503638-2	36	48	25	48 500	62 500	①
FWF-364825	36	48	25	50 000	64 500	①
BN503618	36	48	29.5	56 500	76 000	①
BN503611	36	48	36	68 000	96 500	①
BN503612	36	51	28	63 000	76 000	①
FWF-374213	37	42	13	16 500	28 400	①
FWJ-374214ZA	37	42	14.5	15 400	26 000	④
FWJ-374217	37	42	17	20 300	37 000	③
FWJ-374227	37	42	27	31 500	66 000	③
FWF-374230	37	42	30	35 500	77 000	①
FWF-384313	38	43	13	16 400	28 500	①
FWF-384317	38	43	17	20 400	38 000	①
FBNP-384423ZA	38	44	23.5	29 300	53 000	⑧



# Cage & Needle Roller Assemblies

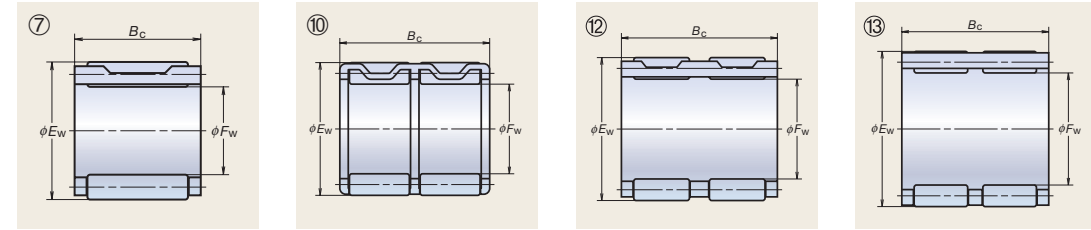
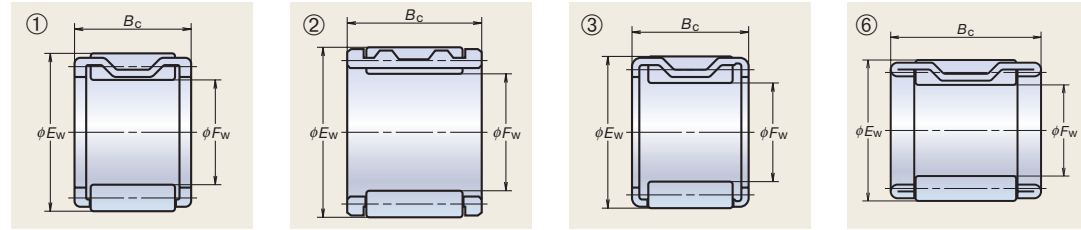
# Cage & Needle Roller Assemblies



Bearing Numbers	Boundary Dimensions (mm)			Basic Load Ratings (N)		Drawing
	$F_w$	$E_w$	$B_c$	$C_r$	$C_{Or}$	
FBNP-384426	38	44	26	32 000	59 500	⑧
FWJ-384427-A	38	44	27	39 000	76 500	③
BN503824	38	44	29	38 500	75 000	④
BN503814	38	44	33	42 500	85 000	④
FWF-384620	38	46	20	42 500	70 500	①
FWF-384632	38	46	32	47 500	80 500	①
FBNP-384744ZA	38.1	47.624	44.45	69 500	117 000	⑧
WJ-243016	38.1	47.625	25.4	47 000	70 500	③
WJ-243020	38.1	47.625	31.75	57 500	91 500	③
WJ-243024	38.1	47.625	38.1	68 000	113 000	③
FWJ-385024Z	38.1	50.8	24.5	50 500	64 000	③
FWJ-385429Z	38.13	54.17	29.8	73 500	90 000	③
BN503819	38.213	58.213	28	68 000	71 500	①
BN503820	38.213	62.213	28	85 000	86 500	①
FWFD-384443ZW-1	38.4	44.4	43.5	43 000	86 000	⑩
FWJE-394424B	39	44	24	28 900	59 500	⑤
FDJC-394440	39	44	40	37 000	81 500	⑫
BN503914	39	46	32.75	37 500	65 500	①
BN503911	39	46	44	55 000	107 000	⑩
BN503930A	39	55	20.5	51 000	57 000	③
BN503903	39	55	25	63 500	75 000	①
BN503903A	39	55	25	63 500	75 000	①
FBNP-395525	39	55	25	66 500	79 500	⑨
BN503924	39.7	45.7	31.9	41 500	83 500	④
FWF-404513	40	45	13	15 700	27 500	①
FWF-404517A	40	45	17	21 000	40 000	①
FWF-404527	40	45	27	32 000	68 000	①
FWF-404530	40	45	30	34 500	74 500	①
FWJ-404530	40	45	30	35 000	77 000	④
FWJ-404530C	40	45	30	35 500	78 500	③
FBNP-404530A	40	45	30	34 000	73 000	⑧
BN504005	40	45	37	35 500	78 000	②
FWJE-404620ZF	40	46	20.5	24 200	42 000	⑤
FWJE-404620ZF-DL	40	46	20.5	24 200	42 000	⑤
FWF-404630	40	46	30	35 000	67 000	①
FWJ-404716	40	47	16	25 400	40 000	③
FWJ-404716-DL	40	47	16	25 400	40 000	③
FWF-404820	40	48	20	32 500	49 500	①
FWF-404825A	40	48	25	40 500	66 500	①
FWF-404825	40	48	25	40 500	66 500	①
BN504001	40	48	34	53 500	95 000	①
FWF-404834	40	48	34	53 500	95 000	①

Bearing Numbers	Boundary Dimensions (mm)			Basic Load Ratings (N)		Drawing
	$F_w$	$E_w$	$B_c$	$C_r$	$C_{Or}$	
BN504034	40	54	50	104 000	154 000	①
BN504040	40	56	48	114 000	160 000	①
FBNP-405831Z	40	58	31.5	89 500	109 000	⑨
BN504029	40	60	40	105 000	126 000	①
BN504105	41	46	22.5	27 100	56 000	⑥
WJP-263627	41.275	57.15	42.86	965 000	130 000	③
FBN-424717	42	47	17	19 600	37 000	②
FWF-425020	42	50	20	33 000	52 500	①
BNE25563	42.395	51.948	25.27	54 000	87 500	③
FWF-434817	43	48	17	22 800	45 500	①
FWJ-434931	43	49	31	44 000	92 000	③
BN504323	43	63	54.5	147 000	197 000	①
BNE23380	44.405	57.117	26.85	68 500	99 500	③
WJ-283412	44.45	53.975	19.05	39 000	58 000	③
WJ-283416	44.45	53.975	25.4	51 500	83 500	③
WJ-283424	44.45	53.975	38.1	74 500	134 000	③
BN504424C	44.454	69.5	30	95 500	101 000	①
BN504411A	44.5	64.5	34	98 000	119 000	①
FDJS-454931Z	45	49	31.8	30 500	79 500	⑬
FWF-455017	45	50	17	21 600	43 000	①
FWF-455027	45	50	27	34 000	77 500	①
FDJC-455040	45	50	40	38 000	89 000	⑫
FBNP-455125Z	45	51	25.5	33 000	64 500	⑧
BN504510	45	51	31	44 000	94 500	④
FWJ-455135	45	51	35	46 000	99 500	④
BN504513	45	52	45	62 000	132 000	⑩
FWF-455320	45	53	20	34 000	55 000	①
BN504503	45	60	25	58 500	73 000	①
BN504538	45	60	28	59 000	73 500	①
BN504526	45	65	43	119 000	151 000	①
FWF-465237W	46	52	37	43 500	94 000	⑩
FWJC-465237	46	52	37	48 000	106 000	⑤
FWF-475217	47	52	17	23 400	47 500	①
FWF-475227	47	52	27	34 500	79 500	①
FWF-475230	47	52	30	36 500	86 000	①
BN504704	47	53	36	51 000	116 000	①
FWF-475528	47	55	28	51 500	96 000	①
FBN-485323Z	48	53	23.5	30 000	67 000	②
FWJW-485323Z-1	48	53	23.6	30 000	67 000	⑥
FDJS-485336Z	48	53	36.4	38 500	92 000	⑬
BN504806	48	53	37	45 000	113 000	⑩
FWF-485420	48	54	20	29 800	58 500	①

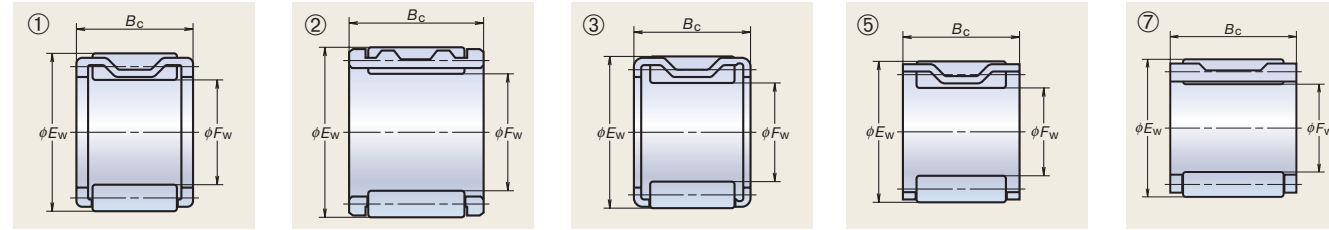




Bearing Numbers	Boundary Dimensions (mm)			Basic Load Ratings (N)		Drawing
	$F_w$	$E_w$	$B_c$	$C_r$	$C_{Or}$	
FWJC-485429	48	54	29	38 500	80 500	⑦
FWF-505520	50	55	20	26 900	59 000	①
FWF-505527	50	55	27	35 000	83 000	①
BN505027	50	55	28	37 000	88 500	①
FWF-505530	50	55	30	39 500	96 500	①
FDJC-505540	50	55	40	41 000	101 000	⑫
BN505019	50	57	35	57 500	123 000	①
FWF-505820	50	58	20	38 500	67 500	①
BN505013	50	58	22	38 500	67 000	①
FWF-505825A	50	58	25	48 500	90 500	①
FWF-505825	50	58	25	48 500	90 500	①
BN505057	50	70	28	86 000	102 000	①
BN505058	50	70	32	89 000	107 000	①
WJ-323812	50.8	60.325	19.05	42 500	67 500	③
BN505021	50.8	60.325	25.4	56 000	96 500	①
WJ-323816	50.8	60.325	25.4	56 000	96 500	③
WJ-323820	50.8	60.325	31.75	68 500	126 000	③
BN505022	50.8	60.325	38.1	81 000	155 000	①
WJ-323824	50.8	60.325	38.1	81 000	115 000	③
BN505023	50.8	64.8	25.4	66 000	91500	①
BN505026A	50.8	64.8	44.5	111 000	180 000	①
BN505026D	50.8	64.8	44.5	111 000	180 000	①
FWF-515650WZ	51	56	50.8	60 000	166 000	⑩
BN505206	52	72	35	115 000	150 000	①
WJ-333916	52.388	61.913	25.4	57 500	101 000	③
BN505306	53.975	63.5	25.4	52 000	90 000	①
WJ-344016	53.975	63.5	25.4	53 000	92 000	③
WJ-344024	53.975	63.5	38.1	78 000	151 000	③
FDJS-545936	54	59	34	41 500	105 000	⑬
FDJS-545938	54	59	38	44 000	114 000	⑬
FWJW-546030ZA	54	60	30.6	42 000	94 500	⑥
FWJW-546035ZA	54	60	35.9	45 500	104 000	⑥
BN505401	54	61	35.1	60 000	133 000	①
FWF-556020	55	60	20	27 500	62 500	①
FWF-556030	55	60	30	41 000	105 000	①
FWF-556320	55	63	20	40 000	73 000	①
FWF-556532C-2	55	65	32	67 000	120 000	①
WJ-354112	55.562	65.088	19.05	44 000	73 500	③
WJ-354116	55.562	65.088	25.4	58 500	105 000	③
FWF-566130	56	61	30	38 500	97 500	①
FWF-566133Z	56	61	33.5	41 000	105 000	①

Bearing Numbers	Boundary Dimensions (mm)			Basic Load Ratings (N)		Drawing
	$F_w$	$E_w$	$B_c$	$C_r$	$C_{Or}$	
BN505715	57	65	28.7	53 000	106 000	①
FWF-577330A	57	73	30	89 500	129 000	①
BN505703	57.15	66.675	25.4	53 500	94 000	①
WJ-364216	57.15	66.675	25.4	53 500	94 000	③
BN505801	58	63	33	45 500	122 000	①
FDJC-586336	58	63	36	42 500	111 000	⑫
FWF-586440W	58	64	40	54 000	132 000	⑩
FWF-586526Z	58	65	26.5	45 000	95 000	①
FWJW-586537ZA	58	65	37.4	57 500	130 000	⑥
FWF-606520	60	65	20	29 000	69 000	①
FWF-606527	60	65	27	38 000	98 500	①
FWF-606541W	60	65	41	50 500	141 000	⑩
FWF-606620	60	66	20	33 000	71 500	①
FWF-606723	60	67	23	41 500	86 500	①
FWF-606820	60	68	20	41 500	78 000	①
FWF-606827	60	68	27	51 500	103 000	①
BN506006	60	76	55	152 000	257 000	①
BN506018HSC	60	86	60	225 000	315 000	①
WJ-384424	60.325	69.85	38.1	81 000	165 000	③
FBN-636830	63	68	30	41 500	111 000	②
BN506301	63.5	73.025	25.4	55 500	102 000	①
WJ-404616	63.5	73.025	25.4	55 500	102 000	③
WJ-404624	63.5	73.025	38.1	82 500	171 000	③
BN506406	64	71	47.6	73 500	184 000	⑩
FBN-657020	65	70	20	27 900	67 500	②
FWF-657330A	65	73	30	61 000	132 000	①
FWF-657330	65	73	30	61 000	132 000	①
BN506804	68	73	20.5	30 000	75 500	①
FBN-687420A	68	74	20	36 500	84 500	②
FBN-687420	68	74	20	33 000	74 000	②
WJ-445016	69.85	79.375	25.4	57 500	110 000	③
FWF-707620	70	76	20	35 500	82 500	①
FWF-707630	70	76	30	53 500	141 000	①
FBN-707830	70	78	30	63 000	140 000	②
FWF-707830	70	78	30	63 000	140 000	①
BN507007	70	80	55	69 500	137 000	⑩
FWF-727840W	72	78	40	60 000	163 000	⑩
FWF-727921	72	79	21	41 000	91 000	①
BN507212	72	79	23.5	42 000	93 000	①
FBN-737920	73	79	20	36 000	86 500	②
FBN-758120	75	81	20	37 000	89 500	②

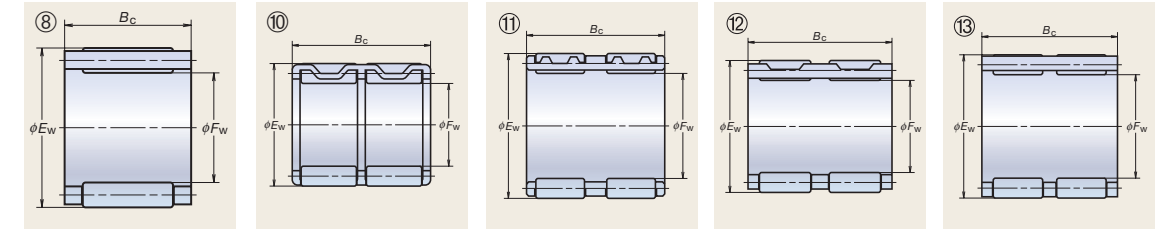
# Cage & Needle Roller Assemblies



Bearing Numbers	Boundary Dimensions (mm)			Basic Load Ratings (N)		Drawing
	$F_w$	$E_w$	$B_c$	$C_r$	$C_{Or}$	
FWF-758330	75	83	30	65 000	151 000	①
WJ-485416	76.2	85.725	25.4	59 000	118 000	③
WJ-485424	76.2	85.725	38.1	85 000	189 000	③
BN507805	78	85	19.5	37 500	83 000	①
BN507804	78	85	34	64 500	166 000	①
FBN-788535	78	85	35	65 000	168 000	②
FBN-788540	78	85	40	71 000	187 000	②
FWF-788540A	78	85	40	76 500	207 000	①
FWF-788540	78	85	70	76 500	207 000	①
FWF-808630-0-3	80	86	30	55 500	154 000	①
FWF-808830-0-2	80	88	30	69 000	166 000	①
FWF-808830	80	88	30	69 000	166 000	①
BN508002	80	110	46	215 000	289 000	①
WJ-525816	82.55	92.075	25.4	61 000	126 000	③
WJ-525824	82.55	92.075	38.1	87 500	201 000	③
FWF-859330	85	83	30	71 000	176 000	①
WJ-566216	88.9	98.425	25.4	62 500	134 000	③
WJ-566416	88.9	101.6	25.4	79 000	147 000	③
WJ-566424	88.9	101.6	38.1	113 000	23 000	③
FWJE-909820	90	98	20	46 000	102 000	⑤
FWJE-909825Z	90	98	25.2	58 500	139 000	⑤
FWF-909830	90	98	30	46 000	102 000	①
BN509012HSC	90	120	53	269 000	400 000	①
BN509508	95	102	20	435 000	107 000	①
FWJC-9510220	95	102	20	43 500	107 000	⑦
BN509507A	95	102	21.25	46 000	114 000	①
FWJC-9510221Z	95	102	21.25	46 000	114 000	⑦
BN509506	95	102	24	50 500	130 000	①
FWJC-9510224	95	102	24	50 500	130 000	⑦
BN509513	95	102	27.4	61 500	167 000	①
FWF-9510330	95	103	30	69 500	177 000	①
BN509510	95	103	48.3	101 000	289 000	⑩
FWF-10010830	100	108	30	51 000	121 000	①
BN510002	100	120	100	345 000	735 000	①
WJ-647216	101.6	114.3	25.4	83 000	163 000	③
WJ-647224	101.6	114.3	38.1	119 000	259 000	③
FWF-10511330	105	113	30	75 500	201 000	①
FWF-12513335	125	133	35	93 500	284 000	①
FWF-15016043	150	160	43	149 000	475 000	①

# Cage & Needle Roller Assemblies (Split Cage)

## Split Cage



Bearing Numbers	Boundary Dimensions (mm)			Basic Load Ratings (N)		Drawing
	$F_w$	$E_w$	$B_c$	$C_r$	$C_{Or}$	
BNF502204B	22	28	29.2	25 800	37 500	①
BNF502302	23	28	25	31 000	56 000	⑩
BNF502404	24.9	29.9	24.9	21 300	34 500	①
FBNPF-242926ZA	24.9	29.9	26.5	21 800	35 500	⑧
BNF502604	26	30	31	19 600	36 500	⑩
BNF502602	26	33	33.5	52 000	89 500	⑩
FWJEF-263333Z	26	33	33.7	34 000	50 000	⑤
FBNF-273227A	27	32	27	20 500	33 500	②
BNF502703	27.5	34	25	26 800	40 000	①
FBNF-283229W	28	32	29	16 300	29 700	⑪
BNF502814	28	32	30	17 500	32 500	⑩
BNF502809	28	32	34	23 600	48 000	⑩
BNF502816	28	34	20	16 200	22 000	①
BNF502815	28	34	25.7	21 600	32 000	①
BNF502820	28	35	25.7	24 500	34 000	①
BNF502811	28	38	20	25 600	28 700	①
FBNPF-293424Z	29	34	24.3	21 200	36 000	⑧
BNF503007	30	34	34	24 800	52 500	⑩
BNF503015	30	37	20	22 100	30 500	①
FBNPF-313622Z	31	36	22.2	20 600	35 500	⑧
BNF503306	33	40	30.1	36 500	59 500	①
BNF503301	33.1	38.1	25.6	24 800	46 500	①
FWJCF-343923Z	34	39	23.8	24 000	45 000	⑦
FWJCF-354030	35	40	30	25 200	48 000	⑦
BNF503502	35	45	25	38 000	50 500	①
FBNPF-364226	36	42	26	27 700	48 000	⑧
BNF503606	36	42	28.35	32 000	58 000	①
BNF503707	37	43	36.7	42 000	82 500	①
FWJCF-374544Z	37	45	44.7	60 500	108 000	⑦
FDJSF-384233Z	38	42	33.6	29 000	69 500	⑬
BNF504101A	41	48	18	23 700	37 000	①
BNF504504	45	50	41.5	40 000	95 000	⑩
BNF504508	45	52	36	50 000	99 000	①
FBNF-485438	48	54	38	45 500	99 500	②
FBNF-485440	48	54	40	45 500	99 500	②
BNF504806	48	54	43.5	50 000	113 000	⑩
BNF504809	48	54	44.7	50 000	113 000	⑩
BNF505001	50	56	42	47 000	106 000	⑩
BNF505102A	51	57	46	57 000	136 000	⑪
BNF506501A	65	70	40.9	51 500	148 000	⑩
FDJCF-657056Z-1	65	70	56.5	67 000	207 000	⑫
BNF507502A	75	81	50	70 000	233 000	⑩
BNF507501	75	81	52.4	81 500	246 000	⑩
BNF508001	80	88	52	95 500	252 000	⑩