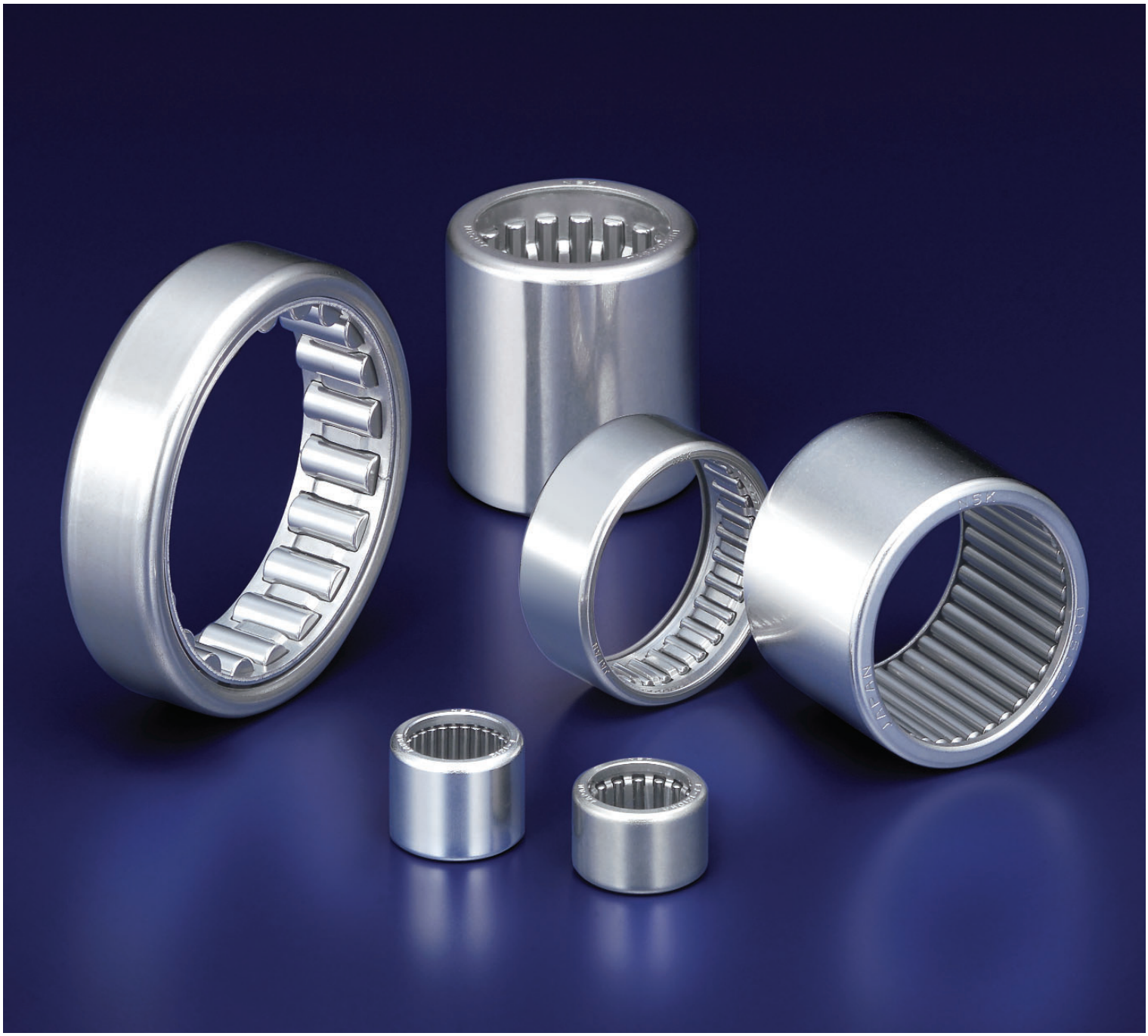
MOTION & CONTROL
NSK

Drawn Cup Needle Roller Bearings

NSK has introduced the most advanced bearing technology, offering unprecedented precision and reliability. Available in two types—caged and full complement.



High-quality bearings that meet demanding performance standards.

1. High load capacity

High load capacity with the thinnest outer ring among existing roller bearings.

2. High limiting load

High-load tolerance is made possible with a special steel plate carefully selected by NSK.

3. Wear resistant

The high-precision finished cage is surface-hardened to improve wear resistance.

4. Easy to mount

The simplified setup process allows the roller to flexibly adapt to various applications.

Drawn Cup Needle Roller Bearings

NSK drawn cup needle roller bearings (caged and full-complement types) have a unique outer ring structure including the following features: the thinnest outer ring among rolling bearings, high load capacity, high limiting load owing to the use of carefully selected special alloy steel plates, a surface-hardened and highly wear-resistant cage, high limiting speed, and ease of mounting.

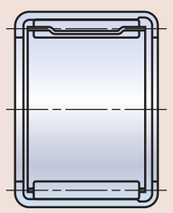
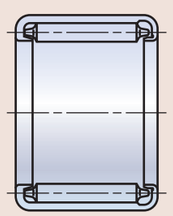
1. Design and Types

NSK drawn cup needle roller bearings consist of an outer ring made of carefully selected alloy steel that is surface-hardened after precision pressing, rollers made of vacuum-degassed bearing steel that is through-hardened and given a grinding finish, and a cage that accurately guides the rollers on the pitch diameter.

The bent lip of the drawn cup, which is the outer ring, improves rigidity, holds the rollers and cage in place, and functions as a labyrinth seal to prevent foreign matter from entering and lubrication from escaping. The inside of the outer ring is hardened to resist wear from contact with the roller or cage.

The bearing numbers of NSK drawn cup bearings are shown in combination with bearing codes and dimension numbers. The bearing codes are shown in **Table 1**.

Table 1 Bearing Codes

Category		Code		Example
		Metric	Inch	
With Cage Assembly	Standard Series	FJ FJP	J	
	High Load Series	FJL FJH	JH	
Full Complement	Standard Series	F NF DD	—	
	High Load Series	FH NFH	—	

2. Specification Number

Example (metric): **FJ - 16 12**

- Code: FJ means a metric open-type bearing with a cage
- Shaft dimension number
- Width dimension number

Example (inch): **JH - 16 12**

- Code: JH means an inch open-type bearing with a cage
- Shaft dimension number
- Width dimension number

The dimension number has the following meaning:

Metric	Inch
The first one or two numerals indicate the shaft dimension, and the next two numerals indicate the width, both expressed in mm units.	The first one or two numerals indicate the shaft dimension, and the next two numerals indicate the width, both expressed in units of 1/16 of an inch. With closed ends, the number “1” is added at the end of the width dimension number.

3. Accuracy

Although standard drawn cup needle bearings perform well for general use, higher-accuracy drawn cup needle bearings may be required, for example when:

- Dispersion of radial internal clearance needs to be sharply decreased
- Eccentric effects should be minimized
- The load must be shared evenly by a small number of bearings

Please consult with NSK when selecting high-accuracy bearings.

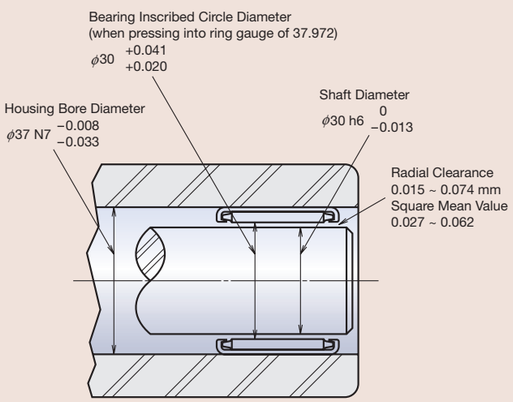


Fig. 1 Radial Internal Clearance

■ Internal clearance

When a drawn cup needle bearing is mounted in a housing, the radial internal clearance varies according to the bearing, shaft and housing bore tolerances. For example, the tolerances for the shaft and housing bore should be narrower when reducing the range of radial internal clearance.

When the dimensional tolerance for each part is as shown in **Fig. 1** (Example of F-3020-1), the radial internal clearance ranges from 0.015 to 0.074 mm.

4. Application to Maximize Performance

■ Shaft and housing specifications

For drawn cup needle bearings, the shaft is generally used as a substitute for the inner ring. Since the outer ring is made of thin steel plate, the correct shape and dimensional accuracy are determined after press fitting of the regular housing. Dimensional accuracy, shaft hardness, and housing bore directly affect bearing performance.

Therefore, the following specifications should be satisfied:

■ Accuracy, roughness, and hardness

Accuracy, roughness, and hardness of the shaft and housing bore should satisfy the specifications shown in **Table 2**.

■ Accuracy and roughness of fitting surfaces

Since the raceway rings of needle bearings are extremely thin, the raceway surface is greatly affected by the accuracy of the shaft and housing. For general operating conditions, a turned finish, smooth bored finish, or reaming finish is acceptable. For high accuracy and low noise under heavy load, however, a grinding finish is required.
A finish roughness of less than 1.6μmR_a is desirable.

■ Accuracy and roughness of the raceway surface

The shaft is often used as the raceway surface of needle bearings in order to achieve the most compact bearing design and enhance shaft rigidity, load capacity, and accuracy. In this case, accuracy and roughness of the raceway surface greatly affects 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 not desirable. Accuracy and roughness for raceway surfaces are shown in **Table 2**. Since these values may change depending on desired performance, please consult NSK.

■ Shaft inclination

Shaft inclination due to deflection by an external force and mounting error of the bearing should be within the values found in **Table 3**.

■ 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 stability. Common materials used for shafts and housings that function as bearing raceways include the following:

High-carbon chromium bearing steel (for through hardening)	SUJ2 (JIS G 4805)
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)	SNCM220, 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 160˚C to 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:

$$t \geq (0.08\sim0.10)\ D_w$$

where, t: Effective hardened layer depth (mm)
D_w: Roller diameter (mm)

Core hardness is generally HRC30 to 45.

Table 2 Accuracy, Roughness and Hardness

Category	Shaft	Housing Bore
Out-of-Roundness Tolerance	$\frac{IT3}{2}$	$\frac{IT4}{2}$ ~ $\frac{IT5}{2}$
Cylindricity Tolerance	$\frac{IT3}{2}$	$\frac{IT4}{2}$ ~ $\frac{IT5}{2}$
Roughness, R_a	0.4	1.6
Hardness	HRC58~64 Proper depth of hardening layer required	—

Table 3 Shaft Inclination

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

■ Housing rigidity

To maintain the accuracy of drawn cup needle bearings, it is necessary to design the housing thick enough to minimize deformation when load is applied. Split housings can only be used with drawn cup needle bearings after press fitting the bearing into a cylindrical sleeve.

5. Adjustment of Fitting

Drawn cup needle bearings perform as designed only after proper fitting. It is necessary to use the fitting tolerances shown in **Table 4** for the shaft and housing bore. The figures in **Table 4** are for fittings when housing materials are rigid steel or cast iron. The fit should be adjusted as follows in accordance with operating conditions:

(1) Oscillating motion
In order to reduce radial internal clearance, the shaft's fitting tolerance should be js6 (j6).

(2) Outer ring rotation
For metric bearings, the fitting tolerances of the shaft and housing bore should be f6 and R7, respectively.

(3) The housing is made from light alloy or steel with a thickness of less than 6 mm.
The fitting tolerances of the housing bore should be minimized to approximately 0.013 to 0.025 mm, provided that the optimized value should be determined by mounting into the actual housing, as the optimized value may vary depending on housing material and shape. Please contact NSK for details.

Table 4 Recommended Fits

Category		Fitting Tolerance			
		Shaft	Housing Bore		
Metric	F, FJ	h6	N7		
	FJL	h6	J7		
Inch	B, BH J, JH Y, YH	h6	Nominal Outside Diameter D, mm over	incl.	Tolerance, mm high	low
				7.144 ($^9/_{32}$)	+0.013	0
			7.144 ($^9/_{32}$)	8.731 ($^{11}/_{32}$)	0	–0.013
			8.731 ($^{11}/_{32}$)		J7	

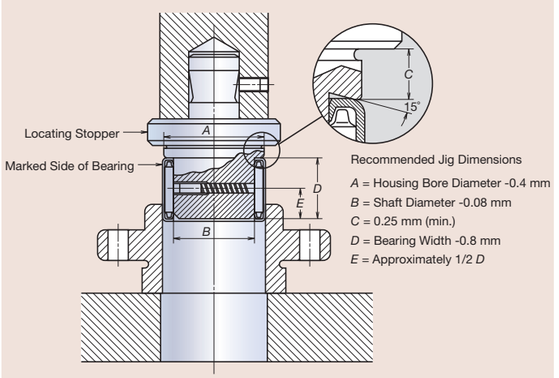


Fig. 2 Example of Jig

5. Mounting Precautions

When a drawn cup needle roller bearing is pressed into a housing bore, it is necessary to use an appropriate jig to prevent deformation of, and damage to, the outer ring, as shown in **Fig. 2**.

(1) The marked-side face should be placed onto the shoulder of the jig.

(2) A hand press should be used for press fitting. Avoid using a hammer or other such instruments.

(3) Use of a snap ring or shoulder to determine the position of the bearing is not necessary. However, when using a housing with a shoulder, the bearing side face should not touch the shoulder in order to prevent bearing deformation.

(4) The guide and locating stopper shown in **Fig. 2** are installed in order to apply press fitting accurately. The ball shown in **Fig. 2** helps the jig hold the bearing and prevent roller inclination while facilitating mounting work.

Drawn Cup Needle Roller Bearings

7. Inspection of Bearings

Deformation, to a certain degree, due to heat treatment is inevitable, even though the outer ring of the drawn cup needle bearings is processed by precise deep drawing. However, once the bearing is pressed into the regular housing, this deformation is corrected and the bearing performs to its full potential. Therefore, it is not appropriate to measure the drawn cup outside diameter before mounting. Correct inspection is carried out according to the following procedures:

(1) The bearing that is to be subject to testing is pressed into a ring gauge of given dimensions.

(2) The inscribed circle diameter at the GO and NO-GO plug gauges is inspected.

Metric inspection gauge dimensions are shown in **Table 5**. **Table 6** shows tolerance for the roller inscribed circle diameter based on ISO standards. For bearings based on ISO standards, "1" is added at the end of the bearing number. **Table 7** shows inch inspection gauge dimensions.

Table 5 Inspection Gauge Dimensions (General Metric)

Units: mm

Nominal Roller Inscribed Circle Diameter, F_w	Bore Diameter of Ring Gauge		Plug Gauge	
	F, FH, NF, NFH FJ	FJL	GO Gauge	NO-GO Gauge
4	7.996	—	4.023	4.048
5	8.996	—	5.023	5.048
6	9.996	—	6.028	6.053
7	10.995	—	7.031	7.056
8	11.995	15.010	8.031	8.056
9	12.995	16.010	9.031	9.056
10	13.995	17.010	10.031	10.056
12	15.995	19.012	12.031	12.056
FH12	17.995	—	12.031	12.056
13	18.993	—	13.034	13.059
14	19.993	22.012	14.034	14.059
NF14	18.993	—	14.034	14.059
15	20.993	22.012	15.034	15.059
16	21.993	24.012	16.034	16.095
17	22.972	23.991	17.013	17.038
18	23.972	24.991	18.013	18.038
20	25.972	26.991	20.013	20.038
22	27.972	28.991	22.013	22.038
NFH22	30.987	—	24.015	24.035
24	—	30.989	24.013	24.038
NFH24	31.967	—	24.013	24.038
25	31.967	32.989	25.013	25.038
28	34.967	36.989	28.013	28.038
30	36.967	39.989	30.013	30.038
32	—	41.989	32.013	32.038
35	41.967	44.989	35.013	35.043
40	46.967	49.989	40.013	40.043
45	51.961	54.988	45.013	45.043
50	57.961	61.988	50.013	50.043
55	62.961	66.988	55.013	55.043

Remarks This is the gauge dimension for inspection of minimum diameter, F_w, of roller inscribed circle diameter.

Table 6 Ring Gauge of Drawn Cup Needle Roller Bearings and Tolerance of Roller Inscribed Circle Diameter (ISO Standards)

Units: mm

Nominal Roller Inscribed Circle Diameter, F_w	Bore Diameter of Ring Gauge	Tolerance for Roller Inscribed Circle Diameter, F_w (1)	
	FJ, FJH, F, FH	min	max
3	6.484	3.007	3.021
4	7.984	4.010	4.028
5	8.984	5.010	5.028
6	9.984	6.010	6.028
7	10.980	7.013	7.031
8	11.980	8.013	8.031
H8	13.980	8.013	8.031
9	12.980	9.013	9.031
H9	14.980	9.013	9.031
10	13.980	10.013	10.031
H10	15.980	10.013	10.031
12	15.980	12.016	12.034
H12	17.980	12.016	12.034
13	18.976	13.016	13.034
14	19.976	14.016	14.034
15	20.976	15.016	15.034
16	21.976	16.016	16.034
17	22.976	17.016	17.034
18	23.976	18.016	18.034
20	25.976	20.020	20.041
22	27.976	22.020	22.041
25	31.972	25.020	25.041
28	34.972	28.020	28.041
30	36.972	30.020	30.041
35	41.972	35.025	35.050
40	46.972	40.025	40.050
45	51.967	45.025	45.050
50	57.967	50.025	50.050
55	62.967	55.030	55.060

Note (1) When using a cylinder instead of an inner ring, $F_{w\ min}$ is the diameter of the cylinder at which the internal clearance is zero in at least one radial direction. ($F_{w\ min}$ is the minimum diameter of each inscribed circle diameter where deviation is suspected.)

Remarks To measure the roller inscribed circle diameter, use the following plug gauges:
GO gauge: The same dimensions as the minimum tolerance of the roller inscribed circle diameter, F_w
NO-GO gauge: The dimensions should be the maximum tolerance of roller inscribed circle diameter, F_w, plus 0.002 mm

Table 7 Inspection Gauge Dimensional Table (Inch)

Units: mm

Nominal Roller Inscribed Circle Diameter, F_w	Bore Diameter of Ring Gauge	Plug Gauge	
	JP	GO Gauge	NO-GO Gauge
3.175 ($^1/_8$)	6.363	3.195	3.220
3.969 ($^5/_{32}$)	7.155	3.990	4.015
4.762 ($^3/_{16}$)	8.730	4.783	4.808
6.350 ($^1/_4$)	11.125	6.388	6.413
7.938 ($^5/_{16}$)	12.713	7.976	8.001
9.525 ($^3/_8$)	14.300	9.563	9.588
11.112 ($^7/_{16}$)	15.888	11.151	11.176
12.700 ($^1/_2$)	17.475	12.738	12.763
14.288 ($^9/_{16}$)	19.063	14.326	14.351
15.875 ($^5/_8$)	20.650	15.913	15.938
17.462 ($^{11}/_{16}$)	22.238	17.501	17.526
19.050 ($^3/_4$)	25.387	19.063	19.088
20.638 ($^{13}/_{16}$)	26.975	20.650	20.675
22.225 ($^7/_8$)	28.562	22.238	22.263
23.812 ($^{15}/_{16}$)	30.150	23.825	23.850
25.400 (1)	31.737	25.413	25.438
26.988 (1 $^1/_{16}$)	33.325	27.000	27.025
28.575 (1 $^1/_8$)	34.912	28.588	28.613
30.162 (1 $^3/_{16}$)	38.087	30.175	30.200
31.750 (1 $^1/_4$)	38.087	31.763	31.788
33.338 (1 $^5/_{16}$)	41.262	33.350	33.378
34.925 (1 $^3/_8$)	41.262	34.938	34.966
38.100 (1 $^1/_2$)	47.612	38.113	38.143
41.275 (1 $^5/_8$)	50.787	41.288	41.318
44.450 (1 $^3/_4$)	53.962	44.463	44.496
47.625 (1 $^7/_8$)	57.137	47.638	47.671
50.800 (2)	60.312	50.815	50.848

Nominal Roller Inscribed Circle Diameter, F_w	Bore Diameter of Ring Gauge	Plug Gauge	
	JH	GO Gauge	NO-GO Gauge
7.938 ($^5/_{16}$)	14.300	7.976	8.001
9.525 ($^3/_8$)	15.888	9.563	9.588
11.112 ($^7/_{16}$)	17.475	11.151	11.176
12.700 ($^1/_2$)	19.063	12.738	12.763
14.288 ($^9/_{16}$)	20.650	14.326	14.351
15.875 ($^5/_8$)	22.238	15.913	15.938
17.462 ($^{11}/_{16}$)	23.825	17.501	17.526
19.050 ($^3/_4$)	26.975	19.063	19.088
20.638 ($^{13}/_{16}$)	28.562	20.650	20.675
22.225 ($^7/_8$)	30.150	22.238	22.263
25.400 (1)	33.325	25.413	25.438
28.575 (1 $^1/_8$)	38.087	28.588	28.613
31.750 (1 $^1/_4$)	41.262	31.763	31.788
34.925 (1 $^3/_8$)	44.437	34.938	34.966

Drawn Cup Needle Roller Bearings

Caged

Inscribed Circle Diameter 3~16 mm

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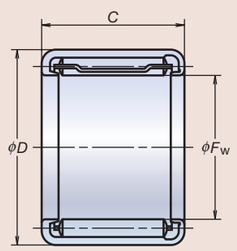

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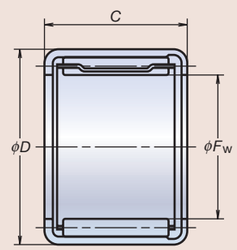

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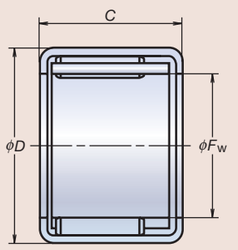


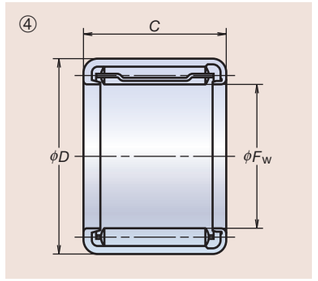
Bearing Numbers	Boundary Dimensions (mm)			Basic Dynamic Load Ratings (N)	Limiting Loads (N)	Drawing
	F_W	D	$C\ {}^{0}_{-0.25}$	C_r	P_{max}	
FJP-36	3	6.5	6	1 230	465	⑧
FJP-48	4	8	8	1 720	675	⑧
J-36	4.762	8.731	9.52	2 290	970	④
FJ-58L	5	9	8	1 550	585	⑥
FJ-59	5	9	9	1 860	745	④
FJ-69W	6	10	9	2 320	985	④
FJ-69	6	10	9	2 320	985	④
DB500603	6	11.5	10.3	2 970	1 300	⑥
J-47	6.35	11.112	11.13	3 300	1 430	④
FJ-79	7	11	9	2 550	1 110	④
J-55	7.938	12.7	7.92	2 300	905	④
J-57	7.938	12.7	11.13	3 900	1 790	④
JH-57	7.938	14.288	11.13	4 700	1 950	④
FJ-88-2	8	12	8	2 580	1 150	⑥
DB500801	8	12	9.5	2 840	1 270	④
FJ-810W	8	12	10	2 840	1 270	④
FJ-810	8	12	10	2 840	1 270	⑥
FJL-810	8	15	10	4 400	1 770	⑥
FJL-815	8	15	15	7 100	3 250	⑥
FJL-820	8	15	20	10 100	5 100	⑥
FJ-910	9	13	10	3 300	1 600	⑥
FJL-916	9	16	16	7 800	3 650	⑥
J-65A	9.525	14.288	7.92	2 630	1 080	⑥
J-65	9.525	14.288	7.92	2 620	1 080	⑥
J-68	9.525	14.288	12.7	5 250	2 640	⑥
FJ-1010W	10	14	10	3 500	1 760	④
FJ-1010WA	10	14	10	3 500	1 760	④
FJ-1010	10	14	10	3 500	1 760	④
FJ-1015L	10	14	15	5 550	3 150	⑥
FJL-1010	10	17	10	4 900	1 990	④
FJL-1012L	10	17	12	5 700	2 410	⑥
FJL-1015	10	17	15	7 850	3 650	④
FJL-1020	10	17	20	11 200	5 750	④
J-78	11.112	15.875	12.7	5 800	3 100	④

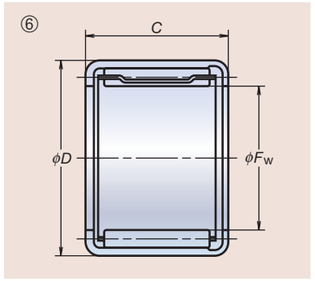
Bearing Numbers	Boundary Dimensions (mm)			Basic Dynamic Load Ratings (N)	Limiting Loads (N)	Drawing
	F_W	D	$C\ {}^{0}_{-0.25}$	C_r	P_{max}	
JH-78	11.112	17.462	12.7	7 150	3 300	④
FJ-1210	12	16	10	4 150	2 210	④
FJ-1210W	12	16	10	4 150	2 210	④
FJH-1212	12	18	12	6 450	3 050	④
FJH-1212W	12	18	12	6 450	3 050	④
FJL-1212L	12	19	12	6 650	2 950	⑥
FJL-1215	12	19	15	9 200	4 500	④
FJL-1220	12	19	20	13 000	7 050	④
FJL-1225L	12	19	25	16 600	9 550	⑥
J-85	12.7	17.462	7.92	3 150	1 440	④
JH-88	12.7	19.05	12.7	7 600	3 600	④
JH-812	12.7	19.05	19.05	12 400	6 800	④
FJ-1312	13	19	12	6 950	3 400	④
DB501303W	13	19	24	13 800	8 150	⑥
FJ-1412	14	20	12	6 500	3 250	④
FJ-1416	14	20	16	9 500	5 300	④
FJL-1416	14	22	16	11 600	5 700	④
J-98	14.288	19.05	12.7	6 250	3 550	④
JH-98	14.288	20.638	12.7	8 050	3 950	④
FJ-1510	15	21	10	5850	2 780	④
FJ-1512	15	21	12	7 650	3 900	④
FJ-1512W	15	21	12	7 650	3 900	④
FJ-1516	15	21	16	11 000	6 200	④
FJL-1510L	15	22	10	6 450	2 880	⑥
FJL-1512L	15	22	12	7 450	3 500	⑥
FJL-1515	15	22	15	10 300	5 300	④
FJL-1520	15	22	20	14 700	8 300	④
FJL-1525L	15	22	25	18 700	11 300	⑥
J-108	15.875	20.638	12.7	6 750	3 950	④
J-1010	15.875	20.638	15.88	8 850	5 600	④
JH-1010	15.875	22.225	15.88	11 600	6 400	④
JH-1016	15.875	22.225	25.4	19 900	12 800	④
FJ-1612	16	22	12	7 100	3 750	④
FJ-1616	16	22	16	10 400	6 050	④

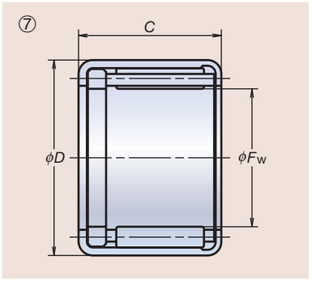
Drawn Cup Needle Roller Bearings

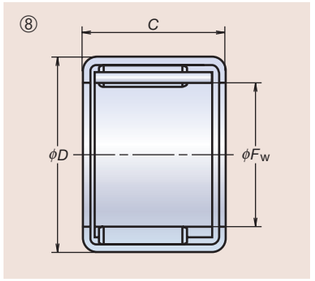
Caged

Inscribed Circle Diameter 16~28 mm









Bearing Numbers	Boundary Dimensions (mm)			Basic Dynamic Load Ratings (N)	Limiting Loads (N)	Drawing
	F_W	D	$C\ ^{0}_{-0.25}$	C_r	P_{max}	
DB501613W	16	22	20	12 500	7 700	⑥
FJL-1616L	16	24	16	13 100	6 700	⑥
FJL-1620L	16	24	20	17 100	9 500	⑥
DB501608W	16.1	21.96	13.5	6 700	3 350	⑦
DBP501702	17	20	9.7	2 730	1 720	⑧
FJ-1712	17	23	12	8 450	4 450	④
FJ-1716	17	23	16	12 100	7 100	④
FJL-1715	17	24	15	10 800	5 700	④
FJL-1720L	17	24	20	15 400	8 950	⑥
FJL-1725L	17	24	25	19 600	12 200	⑥
JH-1110	17.462	23.812	15.88	12 100	6 850	④
JH-1112	17.462	23.812	19.05	15 000	9 000	④
DB501801	18	23	9.5	5 050	2 820	⑥
DB501810W	18	23.6	13.5	8 750	5 100	⑥
FJ-1812	18	24	12	7 650	4 200	④
FJ-1816	18	24	16	11 200	6 800	④
FJL-1813	18	25	13	9 300	4 700	④
FJL-1815	18	25	15	11 400	6 100	④
FJL-1817L	18	25	17	13 300	7 500	⑥
FJL-1820	18	25	20	16 100	9 600	④
FJL-1825	18	25	25	20 500	13 100	④
J-128	19.05	25.4	12.7	10 000	5 450	④
J-1210	19.05	25.4	15.88	12 600	7 250	④
J-1212	19.05	25.4	19.05	15 600	9 600	④
FJ-2012	20	26	12	8 150	4 650	④
FJ-2016	20	26	16	11 900	7 550	④
DB502005A	20	26	18	13 800	9 200	⑥
FJ-2020W	20	26	20	15 300	10 500	④
FJ-2020	20	26	20	15 300	10 500	④
FJL-2015L	20	27	15	12 300	6 900	⑥
FJL-2020	20	27	20	17 500	10 900	④
FJL-2025L	20	27	25	22 300	14 800	⑥
FJL-2025LW	20	27	25	22 700	15 100	⑥
FJL-2030L	20	27	30	26 800	18 700	⑥

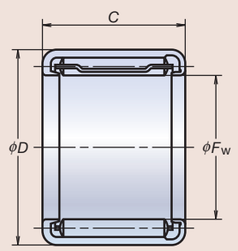
Bearing Numbers	Boundary Dimensions (mm)			Basic Dynamic Load Ratings (N)	Limiting Loads (N)	Drawing
	F_W	D	$C\ ^{0}_{-0.25}$	C_r	P_{max}	
FJL-2210L	22	29	10	7 950	4 000	⑥
FJ-2212	22	28	12	8 650	5 150	④
FJ-2212W	22	28	12	8 650	5 150	④
FJ-2216	22	28	16	12 600	8 350	④
FJ-2220	22	28	20	16 200	11 500	④
FJL-2220L	22	29	20	18 100	11 500	⑥
FJL-2225L	22	29	25	23 000	15 700	⑥
FJL-2230L	22	29	30	27 700	19 800	⑥
DB502210	22	29	30	27 100	19 400	⑥
JH-1416	22.225	30.162	25.4	25 500	16 700	④
DB502307W	23	30	16	15 000	9 050	⑥
DB502405W	24	30	20.5	15 100	11 000	⑥
FJ-2516	25	32	16	15 200	9 350	④
DB502509W	25	32	16	15 200	9 350	⑥
FJ-2520CW	25	32	20	19 800	13 100	④
FJ-2520W	25	32	20	19 800	13 100	④
FJ-2520	25	32	20	19 800	13 100	④
FJ-2526	25	32	26	26 200	18 800	④
FJL-2510	25	33	10	8 800	4 300	④
FJL-2515	25	33	15	15 400	8 800	④
FJL-2515L	25	33	15	15 400	8 800	⑥
FJL-2520	25	33	20	21 900	13 900	④
FJL-2525L	25	33	25	28 000	19 000	⑥
DB502514W	25	33	33	32 000	23 000	⑥
FJL-2530	25	33	30	33 500	24 100	④
JH-1612	25.4	33.338	19.05	20 800	13 000	④
JH-1616	25.4	33.338	25.4	27 700	18 900	④
DB502519W	25.5	30.545	13	9 850	6 900	⑥
DB502713W	27	32	16	11 200	8 300	⑥
DB502822W	28	33	13	8 250	5 600	⑥
FJ-2816	28	35	16	15 600	9 950	④
FJ-2816WA	28	35	16	15 600	9 950	④
FJ-2820	28	35	20	20 500	14 200	④
FJ-2820W	28	35	20	20 500	14 200	④

Drawn Cup Needle Roller Bearings

Caged

Inscribed Circle Diameter 28~43.7 mm

④



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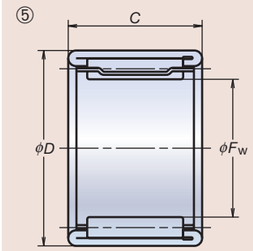

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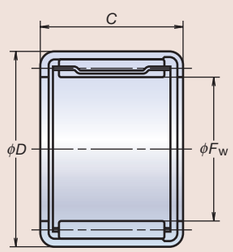

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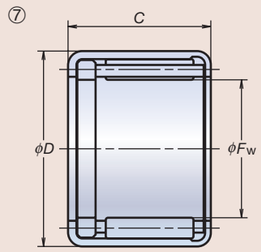


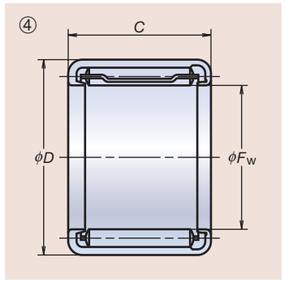
Bearing Numbers	Boundary Dimensions (mm)			Basic Dynamic Load Ratings (N)	Limiting Loads (N)	Drawing
	F_W	D	$C\ ^{0}_{-0.25}$	C_r	P_{max}	
FJ-2826	28	35	26	26 900	20 200	④
DB502821W	28	36	16	17 900	11 200	⑤
FJL-2820L	28	37	20	25 400	15 500	⑥
DB502810	28	37	20	25 400	15 500	⑥
J-188	28.575	34.925	12.7	11 700	7 250	④
J-1812	28.575	34.925	19.05	19 100	13 600	④
JH-1812	28.575	38.1	19.05	23 500	14 000	④
JH-1816	28.575	38.1	25.4	32 000	20 700	④
FJ-3020	30	37	20	19 400	13 300	④
DB503011	30	37	20	19 400	13 300	⑥
DB503015W	30	37	22	23 500	17 100	⑥
FJ-3026	30	37	26	26 000	19 500	④
FJL-3025L	30	40	25	33 500	21 600	⑥
DB503010C	30	42	20	30 000	16 700	⑥
FJ-3016L	30	37	16	15 600	10 100	⑥
FJ-3020	30	37	20	19 400	13 300	④
FJL-3015L	30	40	15	17 200	9 100	⑥
FJL-3020L	30	40	20	25 800	15 300	⑥
FJL-3030L	30	40	30	41 000	27 800	⑥
DB503012WA	30.1	35.5	12	9 500	6 450	⑥
DB503108W	31.5	36.5	12	9 500	6 950	⑥
J-2012	31.75	38.1	19.05	19 900	14 700	④
J-2016	31.75	38.1	25.4	27 400	22 100	④
DB503102A	31.75	41.275	19.05	24 200	14 900	⑥
JH-2016	31.75	41.275	25.4	34 000	23 200	④
DB503207W	32	39	20	22 300	16 600	⑥
DB503212W	32	40	16	15 600	9 550	⑥
FJL-3220	32	42	20	26 700	16 200	④
FJL-3230	32	42	30	42 500	29 400	④
DBP503203	32.5	35.5	15	6 350	6 200	⑧
DB503307W	33	38	12	10 100	7 650	⑥
DB503303C	33	39	26	22 800	19 700	⑥
DB503305	33	41.4	20	22 300	14 800	⑥
J-228	34.925	41.275	12.7	12 400	8 150	④

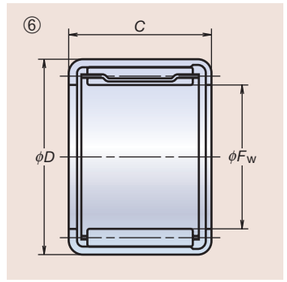
Bearing Numbers	Boundary Dimensions (mm)			Basic Dynamic Load Ratings (N)	Limiting Loads (N)	Drawing
	F_W	D	$C\ ^{0}_{-0.25}$	C_r	P_{max}	
DB503522W	35	40.5	26	23 500	21 500	⑥
FJ-3512	35	42	12	12 000	7 550	④
FJ-3520C	35	42	20	23 600	17 900	④
DB503501AW-1	35	42	24	27 200	22 800	④
DB503505	35	42	26	31 500	25 800	④
FJ-3526	35	42	26	31 500	25 800	④
FJ-3526-OH	35	42	26	31 500	25 800	④
FJL-3512	35	45	12	13 200	6 650	④
FJL-3515	35	45	15	18 200	10 100	④
FJ-3516	35	42	16	18 100	12 800	④
FJ-3520	35	42	20	23 600	17 900	④
DB503523W	35	45	16	23 000	13 600	⑤
DB503508A	35	45	18	25 700	15 700	⑥
DB503504C	35	45	18	25 700	15 700	⑥
FJL-3520L	35	45	20	27 400	17 000	⑥
FJL-3525L	35	45	25	36 000	24 000	⑥
FJL-3530L	35	45	30	43 500	31 000	⑥
DB503705W	37.2	43.2	15.3	15 600	12 100	⑥
DB503801	38.1	52.388	25.4	48 000	28 300	⑥
J-2412	38.1	47.625	19.05	28 500	19 000	④
J-2420	38.1	47.625	31.75	49 500	39 000	④
DB503901	39	45	12	6 500	4 200	⑥
DB503903W	39	45	12	10 800	8 200	⑥
DB504003WA	40	47	12	12 400	8 100	⑥
FJ-4020W	40	47	20	23 500	18 500	④
FJL-4015L	40	50	15	19 900	11 600	⑥
FJ-4016	40	47	16	18 600	13 600	④
FJ-4020	40	47	20	23 500	18 500	④
FJ-4026	40	47	26	31 500	26 900	④
FJL-4020L	40	50	20	29 900	19 600	⑥
FJL-4025L	40	50	25	39 000	27 600	⑥
FJL-4030L	40	50	30	47 500	35 500	⑥
DB504105W	41.5	47.5	14.5	16 200	12 900	⑥
DB504304W	43.7	50.7	13.5	12 500	8 450	⑦

Drawn Cup Needle Roller Bearings

Caged

Inscribed Circle Diameter
44.45~82 mm

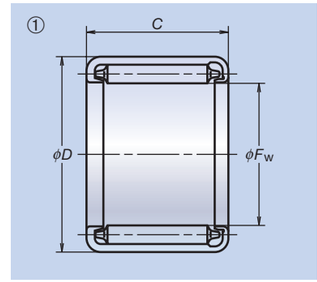


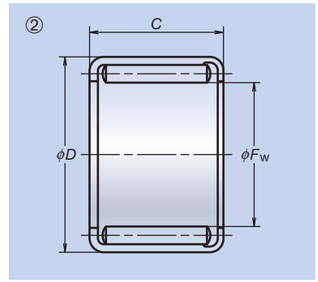


Bearing Numbers	Boundary Dimensions (mm)			Basic Dynamic Load Ratings (N)	Limiting Loads (N)	Drawing
	F_W	D	$C\ ^{0}_{-0.25}$	C_r	P_{max}	
J-2816	44.45	53.975	25.4	40 000	31 000	④
J-2824	44.45	53.975	38.1	60 000	52 000	④
FJ-4516	45	52	16	19 900	15 400	④
FJ-4520	45	52	20	25 500	21 200	④
FJ-4526	45	52	26	34 000	30 500	④
FJL-4520L	45	55	20	31 000	21 300	⑥
FJL-4525L	45	55	25	405 000	30 000	⑥
FJL-4530L	45	55	30	49 500	38 500	⑥
DB504510	45	55	30	49 500	38 500	⑥
DB504606WA	46.5	51.5	9.5	8 000	6 300	⑥
DB504901W	49	55	14	13 200	10 500	⑥
DB505007	50	58	16	22 500	17 200	⑥
FJ-5020L	50	58	20	28 900	23 100	⑥
FJL-5012L	50	62	12	21 200	11 600	⑥
FJL-5020L	50	62	20	27 000	23 700	⑥
FJL-5030L	50	62	30	59 500	43 500	⑥
J-3216	50.8	60.325	25.4	42 500	34 500	④
DB505102A	51	57	12	12 600	10 000	⑥
DB505501	55	61	12	9 900	8 050	⑥
DB505501A	55	61	12	9 900	8 050	⑥
FJ-5520	55	63	20	30 000	25 100	④
FJ-5524	55	63	24	37 500	33 500	④
DB505504W	55	63	24	37 000	33 500	⑥
FJL-5530L	55	67	30	62 500	47 500	⑥
FJL-5540L	55	67	40	81 500	67 000	⑥
DB505505W	55.5	63.5	14.5	21 800	17 100	⑥
DB505701	57.15	76.2	32	94 000	61 000	⑥
DB505803W	58	66	30	47 000	46 500	⑥
DB508201	82	88	12	9 400	9 400	⑥

Full Complement

Inscribed Circle Diameter 4~17 mm



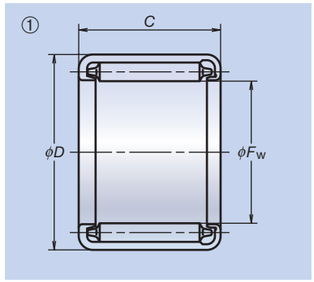


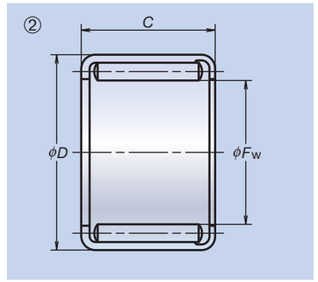
Bearing Numbers	Boundary Dimensions (mm)			Basic Dynamic Load Ratings (N)	Limiting Loads (N)	Drawing
	F_W	D	$C\ ^{0}_{-0.25}$	C_r	P_{max}	
DD500401	4	8	6	2 240	1 150	②
F-48	4	8	8	2 470	1 300	①
F-58	5	9	8	2 790	1 520	①
F-59	5	9	9	3 250	1 860	①
F-68	6	10	8	3 150	1 780	①
F-69	6	10	9	3 700	2 170	①
DD500701	7	11	7.5	4 100	2 480	②
F-79	7	11	9	4 100	2 480	①
F-88	8	12	8	3 850	2 280	①
F-810	8	12	10	5 000	3 200	①
F-812	8	12	12	6 200	4 200	①
F-910	9	13	10	5 400	3 650	①
F-1010	10	14	10	5 800	4 050	①
F-1010-B	10	14	10	5 800	4 050	①
F-1010-1	10	16	10	6 650	3 700	①
F-1210	12	16	10	6 450	4 700	①
F-1212	12	16	12	7 950	6 200	①
FH-1212	12	18	12	9 000	5 700	①
F-1312	13	19	12	9 550	6 100	①
NF-1416	14	19	16	12 900	10 400	①
NF-1420	14	19	20	16 100	13 800	①
F-1412	14	20	12	9 450	6 350	①
F-1413	14	20	13	10 400	7 200	①
F-1416	14	20	16	13 300	9 850	①
F-1512	15	21	12	10 300	6 900	①
F-1510	15	21	10	8 050	5 000	①
F-1514	15	21	14	12 400	8 800	①
F-1516	15	21	16	14 500	10 700	①
DC501601	16	22	12	10 200	7 100	①
DD501602	16	22	19	18 900	15 700	②
F-1612	16	22	12	10 200	7 100	①
F-1616	16	22	16	14 400	11 100	①
F-1720	17	23	20	20 200	10 300	①
F-1712	17	23	12	11 300	7 750	①

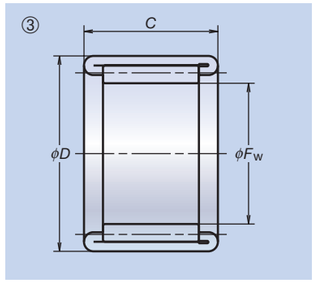
Drawn Cup Needle Roller Bearings

Full Complement

Inscribed Circle Diameter 17~45 mm







Bearing Numbers	Boundary Dimensions (mm)			Basic Dynamic Load Ratings (N)	Limiting Loads (N)	Drawing
	F_W	D	$C\ ^{0}_{-0.25}$	C_r	P_{max}	
F-1716	17	23	16	15 800	12 000	①
F-1812	18	24	12	10 900	7 900	①
F-1816	18	24	16	15 300	12 300	①
F-1816-OH	18	24	16	15 300	12 300	①
DD501803	18.75	32	6.35	10 600	4 800	②
DD501808	18.75	32	9.35	16 900	8 800	②
DD501904	19	26	15	14 800	10 800	③
F-2012	20	26	12	11 500	8 700	①
F-2016	20	26	16	16 200	13 500	①
DD502002	20	26	16	18 000	15 500	②
F-2020	20	26	20	20 500	18 300	①
DD502004A	20	26	20	22 300	20 400	②
DC502008	20	27	22	24 700	20 400	①
F-2210	22	28	10	9 400	6 850	①
F-2212	22	28	12	12 100	9 500	①
F-2216	22	28	16	17 100	14 800	①
DD502201A	22	28	16	19 000	16 900	②
F-2220	22	28	20	21 600	20 000	①
NFH-222A1	24	31	25	31 500	28 700	①
NFH-222A	24	31	25	31 500	28 700	①
F-2516	25	32	16	20 200	16 200	①
F-2520	25	32	20	25 900	22 200	①
F-2526	25	32	26	34 000	31 500	①
F-2816	28	35	16	21 300	17 900	①
F-2820	28	35	20	27 300	24 600	①
DC502807	28	35	26	35 500	34 500	①
F-2826	28	35	26	35 500	34 500	①
F-3014	30	37	14	18 900	15 500	①
F-3020	30	37	20	28 400	26 200	①
F-3026	30	37	26	37 000	37 000	①
F-3026-OH	30	37	26	37 000	37 000	①
F-3026R	30	37	26	37 000	37 000	①
DD503201	32.6	41	7	10 600	6 750	②
F-3512	35	42	12	16 900	14 000	①

Bearing Numbers	Boundary Dimensions (mm)			Basic Dynamic Load Ratings (N)	Limiting Loads (N)	Drawing
	F_W	D	$C\ ^{0}_{-0.25}$	C_r	P_{max}	
F-3516	35	42	16	24 000	22 000	①
F-3520	35	42	20	31 000	30 000	①
DC503504	35	42	20	10 6000	86 500	①
FY-3520	35	42	20	34 500	35 000	②
F-3526	35	42	26	40 000	42 500	①
F-4016	40	47	16	25 700	24 900	①
F-4020	40	47	20	32 500	34 000	①
F-4026	40	47	26	43 000	48 000	①
F-4516	45	52	16	27 300	27 800	①
F-4520	45	52	20	35 000	38 500	①
F-4526	45	52	26	45 500	54 000	①