SPHERICAL PLAIN BEARINGS

Spherical plain bearings are self-aligning. They are designed to carry heavy radial loads and combinations of radial and axial loads and to adjust the inclination of the inner ring and outer ring.

They are widely used in industrial and construction machinery and equipment that is characterized by low-speed oscillation and operation.

Design and Types

The simple structure consists of an inner ring with a spherical outside surface of the same diameter mounted to a single or double-cut split outer ring with a ground, spherical bore surface. Both inner and outer rings are made of high-carbon chromium bearing steel, fully hardened to HRC55 or more, and given a precise grinding finish. All the surfaces of the inner and outer rings are given phosphate surface treatment and covered with a coating of molybdenum disulfide.

The bearing codes and the details are shown in **Table 1**. Bearing numbers are formulated as follows. (Please note that inch bearings have their own bearing number formula that differs from metric bearings.)

(Example) 20 FSF 32

- 32 — Outside Diameter (mm)
- FSF — Code
- 20 — Bore Diameter (mm)

Although the bearing table shows FSF and SF bearings with single-cut outer ring, FSBB and SBB types with a double-cut split outer ring are also available.

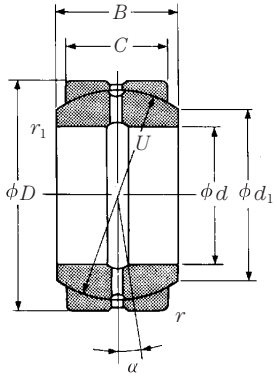
Special spherical plain bearings, e.g., thrust spherical plain bearings, extended inner ring spherical plain bearings and spherical plain bearings made of special materials are also available. Please contact NSK for further details.

Table 1 Bearing Types

Code		Details
Metric	FSF	Outer ring, single-cut
	FSFTT	Outer ring, single-cut with seal
	FSBB	Outer ring, double-cut split After the inner ring is mounted, it is fitted with a snap ring.
Inch	SF	Outer ring, single-cut
	SF ... TT	Outer ring, single-cut with seal
	SBB	Outer ring, double-cut split After the inner ring is mounted, it is fitted with a snap ring.

FSF

Bore Diameter 12 — 65 mm

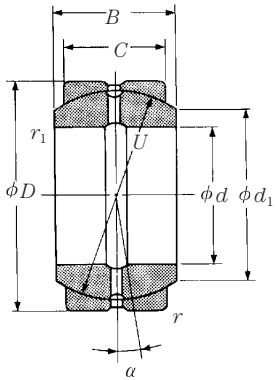


Boundary Dimensions (mm)							Load Capacities			
							Dynamic Loads (N)	{kgf}	Limiting Loads (N)	{kgf}
d	D	C	B	r min	r_1 min	U	C_d		C_s	
12	22	7	10	0.3	0.3	18	7 350	750	31 000	3 150
	22	9	11	0.3	0.3	18	7 550	770	37 000	3 750
15	26	9	12	0.3	0.3	22	11 700	1 200	46 500	4 750
	26	11	13	0.3	0.3	22	12 600	1 290	54 000	5 500
17	30	10	14	0.3	0.3	25	16 200	1 650	56 500	5 750
20	32	14	16	0.3	0.3	28	21 100	2 150	89 000	9 050
	35	12	16	0.3	0.3	29	21 900	2 240	73 500	7 500
22	37	16	19	0.3	0.3	32	28 800	2 930	114 000	11 600
25	42	16	20	0.3	0.3	35.5	35 000	3 550	114 000	11 700
	42	18	21	0.3	0.3	36	37 500	3 800	133 000	13 500
30	47	18	22	0.3	0.3	40.7	47 500	4 850	156 000	15 900
	50	23	27	0.6	0.6	45	57 500	5 850	224 000	22 800
35	55	20	25	0.6	0.3	47	64 500	6 550	199 000	20 200
	55	26	30	0.6	0.6	50	73 500	7 500	286 000	29 100
40	62	22	28	0.6	0.3	53	83 500	8 550	243 000	24 800
	62	28	33	0.6	0.6	55	95 500	9 750	325 000	33 500
45	68	25	32	0.6	0.3	60	106 000	10 800	330 000	34 000
	72	31	36	0.6	0.6	62	116 000	11 800	385 000	39 500
50	75	28	35	0.6	0.3	66	129 000	13 100	400 000	41 000
	80	36	42	0.6	0.6	72	151 000	15 400	565 000	57 500
55	90	40	47	0.6	0.6	80	185 000	18 900	670 000	68 000
60	90	36	44	1	0.3	80	197 000	20 100	615 000	62 500
	100	45	53	0.6	0.6	90	229 000	23 400	875 000	89 000
65	105	47	55	0.6	0.6	94	259 000	26 400	940 000	96 000

Bearing Numbers	Limiting Inclination Angles (°) α	Mass (kg) approx	Inner Ring Side Face Diameters (mm) d_1 approx
12FSF22	11.5	0.017	14.9
12FSF22-1	8.5	0.019	14.2
15FSF26	9.5	0.032	18.4
15FSF26-1	7	0.035	17.7
17FSF30	11	0.049	20.7
20FSF32	5.5	0.053	22.9
20FSF35	9.5	0.065	24.1
22FSF37	7	0.085	25.7
25FSF42	8	0.11	29.3
25FSF42-1	6	0.13	29.2
30FSF47	7	0.155	34.2
30FSF50	6.5	0.235	36
35FSF55	7.5	0.235	39.7
35FSF55-1	6	0.305	40
40FSF62	7.5	0.33	45
40FSF62-1	6.5	0.395	44
45FSF68	8	0.43	50.7
45FSF72	6	0.615	50.4
50FSF75	7	0.575	55.9
50FSF80	6	0.90	58.4
55FSF90	6	1.25	64.7
60FSF90	7	1.1	66.8
60FSF100	6.5	1.7	72.7
65FSF105	6	2.05	76

FSF

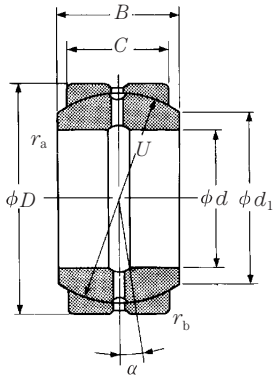
Bore Diameter 70 — 160 mm



Boundary Dimensions (mm)							Load Capacities					
							Dynamic Loads (N)	{kgf}	Limiting Loads (N)	{kgf}	Bearing Numbers	Limiting Inclination Angles (°)	Mass (kg)	Inner Ring Side Face Diameters (mm)
d	D	C	B	r min	r_1 min	U	C_d		C_s			α	approx	d_1 approx
70	105	40	49	1	0.3	92	256 000	26 100	775 000	79 500	**70FSF105**	6.5	1.55	78
	110	50	58	0.6	0.6	100	293 000	29 800	1 110 000	113 000	**70FSF110**	5.5	2.2	81
75	120	55	64	0.6	0.6	110	345 000	35 500	1 380 000	140 000	**75FSF120**	5.5	3.0	89
80	120	45	55	1	0.3	105	330 000	33 500	1 000 000	102 000	**80FSF120**	6.5	2.3	89
	130	60	70	0.6	0.6	120	410 000	42 000	1 660 000	169 000	**80FSF130**	6	4.0	97
85	135	63	74	0.6	0.6	125	455 000	46 500	1 810 000	185 000	**85FSF135**	6	4.25	101
90	130	50	60	1.1	1	115	385 000	39 000	1 220 000	125 000	**90FSF130**	6	2.7	98
	140	65	76	0.6	0.6	130	500 000	51 000	1 970 000	201 000	**90FSF140**	6	4.7	105
95	150	70	82	0.6	0.6	140	575 000	58 500	2 260 000	230 000	**95FSF150**	6	6.05	113
100	150	55	70	1.1	1	130	510 000	52 000	1 460 000	149 000	**100FSF150**	7.5	4.4	110
	160	75	88	1	1	150	640 000	65 500	2 580 000	263 000	**100FSF160**	6	7.4	121
110	160	55	70	1.1	1	140	560 000	57 000	1 660 000	169 000	**110FSF160**	7	4.8	121
	170	80	93	1	1	160	750 000	76 000	2 980 000	305 000	**110FSF170**	5.5	8.55	130
115	180	85	98	1	1	165	815 000	83 500	2 880 000	294 000	**115FSF180**	5.5	10.5	133
120	180	70	85	1.1	1	155	745 000	76 000	1 970 000	201 000	**120FSF180**	6.5	7.8	130
	190	90	105	1	1	175	925 000	94 500	3 250 000	330 000	**120FSF190**	6	12.5	140
130	200	95	110	1	1	185	1 040 000	106 000	3 600 000	370 000	**130FSF200**	5.5	14	149
140	210	70	90	2	1	180	920 000	94 000	2 610 000	266 000	**140FSF210**	7	11	156
150	220	105	120	1	1	205	1 330 000	136 000	4 300 000	440 000	**150FSF220**	5	17	166
160	230	80	105	2	1	200	1 250 000	128 000	3 250 000	330 000	**160FSF230**	8	14	170

SF

Bore Diameter 12.700 — 152.400 mm



Boundary Dimensions (mm, inch)							Load Dynamic Loads (N)	{kgf}	Capacities Limiting Loads (N)	{kgf}	Bearing Numbers	Limiting Inclination Angles (°)	Mass (kg)	Inner Ring Side Face Diameters (mm)	Fillet Radii (mm)	
d		D		C	B	U	C_d		C_s			α	approx	d_1 approx	Shaft(1) r_a max	Housing(1) r_b max
12.700	0.5000	22.225	0.8750	9.52	11.10	18.26	12 000	1 220	37 000	3 800	**5SF8**	7	0.020	14.3	—	0.6
15.875	0.6250	26.988	1.0625	11.91	13.89	22.83	18 700	1 910	58 000	5 900	**6SF10**	6.5	0.036	17.8	—	0.8
19.050	0.7500	31.750	1.2500	14.27	16.66	27.43	27 000	2 750	83 000	8 500	**7SF12**	6.5	0.057	21.4	—	0.8
22.225	0.8750	36.512	1.4375	16.66	19.43	31.95	36 500	3 750	113 000	11 600	**8SF14**	6.5	0.088	25.0	—	0.8
25.400	1.0000	41.275	1.6250	19.05	22.22	36.50	48 000	4 900	148 000	15 100	**10SF16**	6.5	0.125	28.6	—	0.8
31.750	1.2500	50.800	2.0000	23.80	27.76	45.59	74 500	7 600	231 000	23 600	**12SF20**	6.5	0.235	35.7	—	0.8
34.925	1.3750	55.562	2.1875	26.19	30.15	49.20	89 500	9 100	273 000	27 800	**13SF22**	6	0.35	38.9	—	0.8
38.100	1.5000	61.912	2.4375	28.58	33.32	54.74	108 000	11 000	335 000	34 000	**15SF24**	6.5	0.425	43.3	—	0.8
44.450	1.7500	71.438	2.8125	33.32	38.89	63.88	147 000	15 000	455 000	46 500	**17SF28**	6.5	0.65	50.0	—	0.8
50.800	2.0000	80.962	3.1875	38.10	44.45	73.02	192 000	19 600	590 000	60 500	**20SF32**	6.5	0.94	57.2	—	0.8
57.150	2.2500	90.488	3.5625	42.85	50.01	82.17	243 000	24 800	750 000	76 500	**22SF36**	6.5	1.3	65.1	—	0.8
63.500	2.5000	100.012	3.9375	47.62	55.55	91.19	300 000	30 500	925 000	94 500	**25SF40**	6.5	1.85	72.2	—	0.8
69.850	2.7500	111.125	4.3750	52.37	61.11	100.33	365 000	37 000	1 200 000	114 000	**27SF44**	6.5	2.45	79.4	0.6	0.8
76.200	3.0000	120.650	4.7500	57.15	66.68	109.52	430 000	44 000	1 330 000	136 000	**30SF48**	6	3.1	86.5	0.6	0.8
82.550	3.2500	130.175	5.1250	61.90	72.24	118.74	505 000	51 500	1 570 000	160 000	**32SF52**	6	3.9	94.1	0.6	0.8
88.900	3.5000	139.700	5.5000	66.68	77.77	128.02	585 000	60 000	1 820 000	186 000	**35SF56**	6	4.85	100.8	0.6	0.8
95.250	3.7500	149.225	5.8750	71.42	83.34	136.91	675 000	69 000	2 080 000	212 000	**37SF60**	6	5.9	108.0	0.6	0.8
101.600	4.0000	158.750	6.2500	76.20	88.90	146.05	770 000	78 500	2 370 000	242 000	**40SF64**	6	7.1	115.8	0.6	0.8
107.950	4.2500	168.275	6.6250	80.95	94.46	155.58	865 000	88 500	2 680 000	274 000	**42SF68**	6	8.45	122.9	0.8	1.1
114.300	4.5000	177.800	7.0000	85.72	100.00	164.46	970 000	99 000	2 990 000	305 000	**45SF72**	6	9.95	130.0	0.8	1.1
120.650	4.7500	187.325	7.3750	90.47	105.56	173.36	1 080 000	110 000	3 350 000	340 000	**47SF76**	6	11.5	137.4	0.8	1.1
127.000	5.0000	196.850	7.7500	95.25	111.12	182.63	1 200 000	122 000	3 700 000	380 000	**50SF80**	6	13.5	144.5	0.8	1.1
152.400	6.0000	222.250	8.7500	104.78	120.65	207.16	1 560 000	159 000	4 650 000	475 000	**60SF96**	5.5	17.5	167.4	0.8	1.1

Note (1) For bearings 5SF8 through 25SF40 inclusive, the shaft is undercut so there is no fillet radius r_a.

NEEDLE ROLLER BEARINGS FOR UNIVERSAL JOINTS

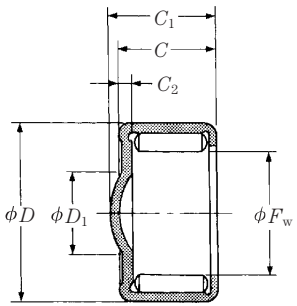
Needle roller bearings for universal joints are available as drawn cup and solid. The drawn cup needle bearing has a large load capacity in spite of its small cross-sectional height. Since the material for the drawn cup (outer ring) is a special alloy steel sheet developed by the bearing performs well regarding fatigue and shock resistance. If this drawn cup needle bearing is applied, an economical universal joint with a large torque capacity can be designed.

A method for fixing a drawn cup needle bearing to the yoke hole is the tightening method (staking method). In some cases, the method of fixation with a rose washer is adopted. In any case, mounting is carried out using dedicated assembly equipment.

As the universal joint uses solid needle bearings in many cases and has demonstrated a high shock resistance, the bearing is particularly well-suited for use in universal joints in medium and large trucks.

ZY

Inscribed Circle Diameter 10 — 21.3 mm



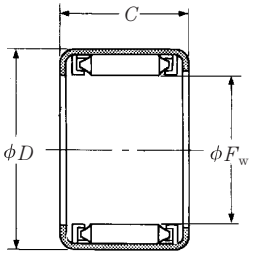
Boundary Dimensions (mm)						Basic Dynamic Load Ratings		Limiting Loads	
						(N)	{kgf}	(N)	{kgf}
F_w	D	C	C_1	C_2	D_1	C_r		P_{max}	
10	16	8.95	10.15	1.30	11	6 600	675	3 750	380
	15	9.35	9.35	1.75	6	5 850	600	3 900	395
12	18	9.95	10.50	1.30	7.5	8 300	845	5 350	550
14	20	11.85	12.09	2.25	8.1	9 850	1 000	6 800	695
16	22	12.97	13.35	2.37	8	11 900	1 210	8 850	900
18	24	13.85	14.35	2.25	9.68	13 400	1 370	10 600	1 080
21.3	29	15.80	15.80	3.00	10.68	17 900	1 820	14 000	1 430

Bearing Numbers	Mass (g) approx	Ring Gage Dimensions (mm)	Plug Gage Dimensions (mm)	
			Go End	No-Go End
ZY-108	6.9	16.016	10.014	10.036
ZY-109	6.6	15.016	10.011	10.026
ZY-1210	10	18.020	12.073	12.095
ZY-1411	12	20.020	14.009	14.035
ZY-1612	14	22.020	16.009	16.035
ZY-1813	17	24.620	18.009	18.035
ZY-2115	37	29.002	21.316	21.337

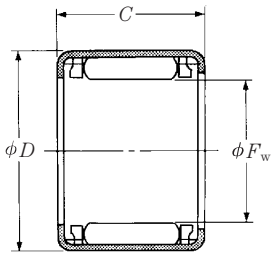
FC · FCL

RC

Shaft Diameter 4 — 30 mm



FC



RC

Boundary Dimensions (mm) F_w		D		C $^{0}_{-0.25}$		Torque Capacities (N·m)	{kgf·m}
4		8		6		0.31	0.032
6		10		12		2.45	0.250
		10		12		1.96	0.200
6.350	0.2500	11.112	0.4375	12.70	0.5000	1.96	0.200
		11.112	0.4375	12.70	0.5000	1.96	0.200
8		12		12		3.24	0.330
		14		12		4.02	0.410
9.525	0.3750	15.875	0.6250	12.70	0.5000	5.10	0.520
		15.875	0.6250	12.70	0.5000	5.10	0.520
10		14		12		4.41	0.450
		16		12		5.30	0.540
12		18		16		13.24	1.350
12.700	0.5000	19.050	0.7500	12.70	0.5000	8.34	0.850
		19.050	0.7500	12.70	0.5000	8.34	0.850
14		20		16		14.22	1.450
15.875	0.6250	22.225	0.8750	15.88	0.6250	16.18	1.650
		22.225	0.8750	15.88	0.6250	16.18	1.650
16		22		16		20.59	2.100
19.050	0.7500	25.400	1.0000	15.88	0.6250	22.06	2.250
		25.400	1.0000	15.88	0.6250	22.06	2.250
20		26		16		30.89	3.150
25		32		20		68.65	7.000
25.400	1.0000	33.338	1.3125	15.88	0.6250	46.58	4.750
		33.338	1.3125	15.88	0.6250	46.58	4.750
30		37		20		95.12	9.700

Roller Clutch Numbers: Metric Design	Inch design	Mass (g) approx	Minimum Outside Diameters of Housing (mm)	Matching Support Needle Roller Bearing Numbers: Full Complement	With Cage
FC-4K (1)	—	0.90	12	F-48	—
FC-6	—	4.1	14	F-68	FJ-69
FC-6K (1)	—	2.7	14	F-68	FJ-69
—	**RC-040708**	3.6	16	B-45	J-45
—	**RC-040708-FS** (2)	3.6	16	B-45	J-45
FCL-8K (1)	—	3.3	18	F-810	FJ-810
FC-8	—	6.8	20	FH-810	FJH-810
—	**RC-061008**	7.7	22	BH-68	JH-68
—	**RC-061008-FS** (2)	7.7	22	BH-68	JH-68
FCL-10K (1)	—	3.9	23	F-1010	FJ-1010
FC-10	—	9.1	25	FH-1010	FJH-1010
FC-12	—	12	27	FH-1212	FJH-1212
—	**RC-081208**	9.1	28	BH-88	JH-88
—	**RC-081208-FS** (2)	9.1	28	BH-88	JH-88
FC-14K (1)	—	16	29	F-1412	FJ-1412
—	**RC-101410**	14	30	BH-108	JH-108
—	**RC-101410-FS** (2)	14	30	BH-108	JH-108
FC-16	—	18	31	F-1612	FJ-1612
—	**RC-121610**	15	36	B-1210	J-1210
—	**RC-121610-FS** (2)	15	36	B-1210	J-1210
FC-20	—	21	38	F-2012	FJ-2012
FC-25	—	34	46	F-2516	FJ-2516
—	**RC-162110**	26	48	BH-168	JH-1612
—	**RC-162110-FSS** (2)	26	48	BH-168	JH-1612
FC-30	—	42	51	F-3020	FJ-3020

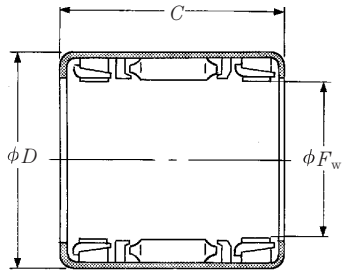
Notes (1) The suffix K indicates low-torque products.
(2) Even if the suffix FS is not marked on the product, it can be distinguished from others because its cage is always red.

Remarks For stock availability, please contact NSK.
Please consult NSK when making a selection.

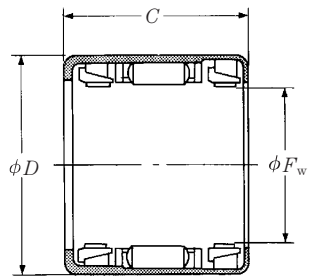
FCB · FCBN

RCB

Shaft Diameter 4 — 30 mm



FCB



RCB

Boundary Dimensions (mm, inch) F_w		D		C $^{0}_{-0.25}$		Torque Capacities (N·m)	{kgf·m}
4		10		9		0.19	0.019
6		12		10		0.56	0.057
8		14		20		4.02	0.410
9.525	0.3750	15.875	0.6250	22.22	0.8750	5.10	0.520
		15.875	0.6250	22.22	0.8750	5.10	0.520
10		16		20		5.30	0.540
12		18		26		13.24	1.350
12.700	0.5000	19.050	0.7500	22.22	0.8750	8.34	0.850
		19.050	0.7500	22.22	0.8750	8.34	0.850
15.875	0.6250	22.225	0.8750	25.40	1.0000	16.18	1.650
		22.225	0.8750	25.40	1.0000	16.18	1.650
16		22		26		20.59	2.100
19.050	0.7500	25.400	1.0000	25.40	1.0000	22.06	2.250
		25.400	1.0000	25.40	1.0000	22.06	2.250
20		26		26		30.89	3.150
25		32		30		68.65	7.000
25.400	1.0000	33.338	1.3125	27.00	—	46.58	4.750
		33.338	1.3125	27.00	—	46.58	4.750
30		37		30		95.12	9.700

Roller Clutch Numbers: Metric Design	Inch design	Basic Dynamic Load Ratings (N) C_r	{kgf}	Limiting Loads (N) P_{max}	{kgf}	Mass (g) approx	Minimum Outside Diameters of Housing (mm)
FCBN-4K (1)	—	1 190	121	540	55	2.7	16
FCBN-6K (1)	—	1 630	166	735	75	3.8	18
FCB-8	—	2 430	248	1 200	122	11	20
—	**RCB-061014**	3 700	375	2 010	205	14	22
—	**RCB-061014-FS** (2)	3 700	375	2 010	205	14	22
FCB-10	—	2 820	288	1 450	148	13	25
FCB-12	—	3 800	390	2 240	228	18	27
—	**RCB-081214**	4 400	450	2 580	263	16	28
—	**RCB-081214-FS** (2)	4 400	450	2 580	263	16	28
—	**RCB-101416**	4 900	500	3 050	310	23	30
—	**RCB-101416-FS** (2)	4 900	500	3 050	310	23	30
FCB-16	—	4 100	420	2 670	272	24	31
—	**RCB-121616**	5 550	565	3 700	375	26	36
—	**RCB-121616-FS** (2)	5 550	565	3 700	375	26	36
FCB-20	—	5 100	520	3 550	360	28	38
FCB-25	—	6 850	700	4 700	480	48	46
—	**RCB-162117**	9 750	995	6 750	690	45	48
—	**RCB-162117-FS** (2)	9 750	995	6 750	690	45	48
FCB-30	—	7 000	715	5 250	535	54	51

Notes (1) The suffix K indicates low-torque products.
(2) Even if the suffix FS is not marked on the product, it can be distinguished from others because its cage is always red.

Remarks For stock availability, please contact NSK.
Please consult NSK when making a selection.