

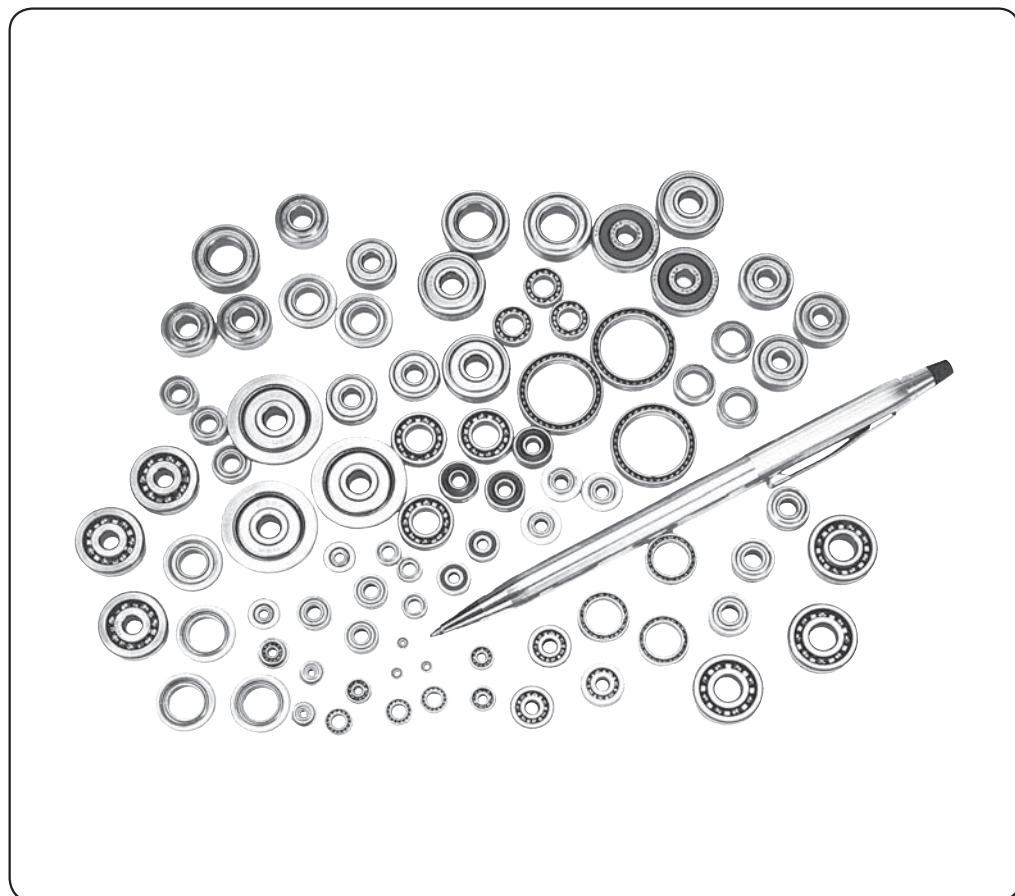
## 2. EXTRA SMALL BALL BEARINGS AND MINIATURE BALL BEARINGS

INTRODUCTION ..... C 054

### BEARING TABLES

#### EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS

Metric Series	Bore Diameter 1 – 9mm .....	C 058
With Flange	Bore Diameter 1 – 9mm .....	C 062
Inch Series	Bore Diameter 1.016 – 9.525mm .....	C 066
With Flange	Bore Diameter 1.191 – 9.525mm .....	C 068



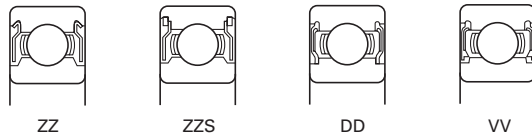
**DESIGN AND TYPES**

The size ranges of extra small and miniature ball bearings are shown in Table 1, and design/types and type designations are shown in Table 2. Types listed in the bearing tables are indicated by shading ■ in Table 2.

**Table 1 Size Ranges of Bearings** Units : mm

Series	Extra Small Ball Bearings	Miniature Ball Bearings
Metric	Outside diameter $D \geq 9$ Bore diameter $d < 10$	Outside diameter $D < 9$
Inch	Outside diameter $D \geq 9.525$ Bore diameter $d < 10$	Outside diameter $D < 9.525$

Please refer to NSK Miniature Ball Bearings (CAT. No. E126) for details.



**Table 2 Design/Types and Type Designations of Miniature and Extra Small Bearings**

Design/Types	Type Designations				Remarks	
	Metric	Inch	Special			
			Metric	Inch		
	6○○	R	MR	—	Shielded and sealed bearings are available.	
 Thin section	—	—	SMT	—		
Single-Row Deep Groove Ball Bearings	 With flange	F6○○	FR	MF	—	Shielded and sealed bearings are available.
	 Extended inner ring	—	—	—	RW	Shielded bearings are available.
	 With flange and extended inner ring	—	—	—	FRW	Shielded bearings are available.
	 For synchro motors	—	—	—	SR00X00	Shielded bearings are available.
	 Pivot Ball Bearings	—	—	BCF	—	
 Thrust Ball Bearings	—	—	F	—		

**Remark** Other bearings, such as single-row angular contact ball bearings, are available.

**TOLERANCES AND RUNNING ACCURACY**

**METRIC SERIES BEARINGS** ..... Table 7.2 (Pages A128 to A131)

The flange tolerances for metric series bearings are listed in Table 3.

**Table 3 Flange Tolerances for Metric Flanged Bearings**

(1) Tolerances of Flange Outside Diameter Units : m

Nominal Outer Ring Flange Outside Diameter $D_1$ (mm)		Deviation of a Single Outside Diameter of Outer Ring Flange $\Delta D_{1S}$			
		Position Flange		Non-Position Flange	
over	incl.	high	low	high	low
-	6	+220	-36	0	-36
6	10	+220	-36	0	-36
10	18	+270	-43	0	-43
18	30	+330	-52	0	-52

(2) Flange Width Tolerances and Running Accuracies Units : m

Nominal Outside Diameter $D$ (mm)		Deviation of a Single Outer Ring Flange Width $\Delta C_{1S}$		Variation of Outer Ring Flange Width $V C_{1S}$			Perpendicularity of Outer Ring Outside Surface With Respect to the Flange Back Face $S_{D1}$			Axial Runout of Outer Ring Flange Back Face of Assembled Bearing $S_{ea1}$			
		Normal and Classes 6,5,4,2		Normal and Class 6	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2
over	incl.	high	low	max.			max.			max.			
2.5 <sup>(1)</sup>	6	Use the $\Delta B_s$ tolerance for $d$ of the same bearing in the same class		Use the $\Delta VB_s$ tolerance for $d$ of the same bearing in the same class	5	2.5	1.5	8	4	1.5	11	7	3
6	18				5	2.5	1.5	8	4	1.5	11	7	3
18	30				5	2.5	1.5	8	4	1.5	11	7	3

Notes <sup>(1)</sup> Including 2.5 mm

**INCH SERIES BEARINGS** ..... Table 7.2 (Pages A128 to A131)

The flange tolerances for inch design flanged bearings are listed in Table 7.9(2) (Pages A146 and A147).

**INSTRUMENT BALL BEARINGS** ..... Table 7.9 (Pages A146 and A147)

**RECOMMENDED FITS**

Please refer to NSK Miniature Ball Bearings (CAT.No.E126).

**INTERNAL CLEARANCES** ..... Table 8.11 (Page A169)

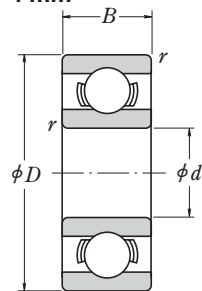
**LIMITING SPEEDS**

The limiting speeds listed in the bearing tables should be adjusted depending on bearing load conditions. In addition, higher speeds can be attained by making changes in the lubrication method, cage design, etc. Refer to Page A098 for detailed information.

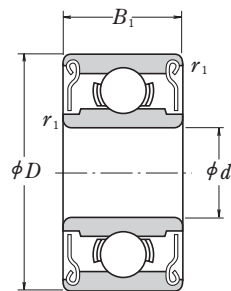
**EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS**

Metric Series

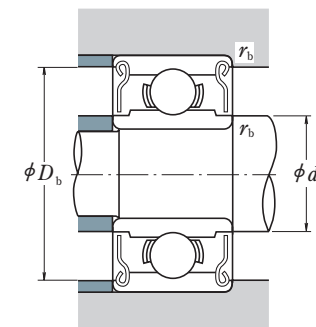
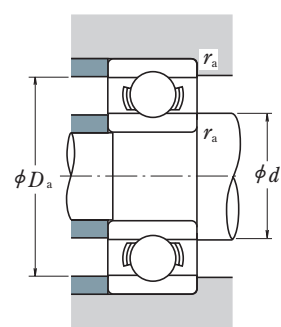
Bore Diameter 1 – 4 mm



Open



Shielded  
ZZ · ZZ1



Boundary Dimensions (mm)						Basic Load Ratings (N)		Limiting Speeds (min <sup>-1</sup> )		Bearing Designations			Abutment and Fillet Dimensions (mm)						Mass (g)		
d	D	B	B <sub>1</sub>	r <sup>(1)</sup> min.	r <sub>1</sub> <sup>(1)</sup> min.	C <sub>r</sub>	C <sub>0r</sub>	Grease Open Z · ZZ	Oil Open Z	Open	Shielded	Sealed	d <sub>a</sub> min.	d <sub>b</sub> max.	D <sub>a</sub> max.	D <sub>b</sub> min.	r <sub>a</sub> max.	r <sub>b</sub> max.	approx. Open	Shielded	
1	3	1	—	0.05	—	80	23	130 000	150 000	<b>681</b>	—	—	1.4	—	2.6	—	0.05	—	0.03	—	
	3	1.5	—	0.05	—	80	23	130 000	150 000	<b>MR 31</b>	—	—	1.4	—	2.6	—	0.05	—	0.04	—	
	4	1.6	—	0.1	—	138	35	100 000	120 000	<b>691</b>	—	—	1.8	—	3.2	—	0.1	—	0.09	—	
1.2	4	1.8	2.5	0.1	0.1	138	35	110 000	130 000	<b>MR 41 X</b>	<b>MR 41 XZZ</b>	—	2.0	1.9	3.2	3.5	0.1	0.1	0.10	0.14	
1.5	4	1.2	2	0.05	0.05	112	33	100 000	120 000	<b>681 X</b>	<b>681 XZZ</b>	—	1.9	2.1	3.6	3.6	0.05	0.05	0.07	0.11	
	5	2	2.6	0.15	0.15	237	69	85 000	100 000	<b>691 X</b>	<b>691 XZZ</b>	—	2.7	2.5	3.8	4.3	0.15	0.15	0.17	0.20	
	6	2.5	3	0.15	0.15	330	98	75 000	90 000	<b>601 X</b>	<b>601 XZZ</b>	—	2.7	3.0	4.8	5.4	0.15	0.15	0.33	0.38	
2	5	1.5	2.3	0.08	0.08	169	50	85 000	100 000	<b>682</b>	<b>682 ZZ</b>	—	2.6	2.7	4.4	4.2	0.08	0.08	0.12	0.17	
	5	2	2.5	0.1	0.1	187	58	85 000	100 000	<b>MR 52 B</b>	<b>MR 52 BZZ</b>	—	2.8	2.7	4.2	4.4	0.1	0.1	0.16	0.23	
	6	2.3	3	0.15	0.15	330	98	75 000	90 000	<b>692</b>	<b>692 ZZ</b>	—	3.2	3.0	4.8	5.4	0.15	0.15	0.28	0.38	
6	2.5	2.5	0.15	0.15	0.15	330	98	75 000	90 000	<b>MR 62</b>	<b>MR 62 ZZ</b>	—	3.2	3.0	4.8	5.2	0.15	0.15	0.30	0.29	
	7	2.5	3	0.15	0.15	385	127	63 000	75 000	<b>MR 72</b>	<b>MR 72 ZZ</b>	—	3.2	3.8	5.8	6.2	0.15	0.15	0.45	0.49	
	7	2.8	3.5	0.15	0.15	385	127	63 000	75 000	<b>602</b>	<b>602 ZZ</b>	—	3.2	3.8	5.8	6.2	0.15	0.15	0.51	0.58	
2.5	6	1.8	2.6	0.08	0.08	208	74	71 000	80 000	<b>682 X</b>	<b>682 XZZ</b>	—	3.1	3.7	5.4	5.4	0.08	0.08	0.23	0.29	
	7	2.5	3.5	0.15	0.15	385	127	63 000	75 000	<b>692 X</b>	<b>692 XZZ</b>	—	3.7	3.8	5.8	6.2	0.15	0.15	0.41	0.55	
	8	2.5	—	0.2	—	560	179	60 000	67 000	<b>MR 82 X</b>	—	—	4.1	—	6.4	—	0.2	—	0.56	—	
8	2.8	4	0.15	0.15	—	550	175	60 000	71 000	<b>602 X</b>	<b>602 XZZ</b>	—	3.7	4.1	6.8	7.0	0.15	0.15	0.63	0.83	
	3	6	2	2.5	0.1	0.1	208	74	71 000	80 000	<b>MR 63</b>	<b>MR 63 ZZ</b>	—	3.8	3.7	5.2	5.4	0.1	0.1	0.20	0.27
		7	2	3	0.1	0.1	390	130	63 000	75 000	<b>683 A</b>	<b>683 AZZ</b>	—	3.8	4.0	6.2	6.4	0.1	0.1	0.32	0.45
8		2.5	—	0.15	—	560	179	60 000	67 000	<b>MR 83</b>	—	—	4.2	—	6.8	—	0.15	—	0.54	—	
8	3	4	0.15	0.15	—	560	179	60 000	67 000	<b>693</b>	<b>693 ZZ</b>	—	4.2	4.3	6.8	7.3	0.15	0.15	0.61	0.83	
	9	2.5	4	0.2	0.15	570	187	56 000	67 000	<b>MR 93</b>	<b>MR 93 ZZ</b>	—	4.6	4.3	7.4	7.9	0.2	0.15	0.73	1.18	
	9	3	5	0.15	0.15	570	187	56 000	67 000	<b>603</b>	<b>603 ZZ</b>	—	4.2	4.3	7.8	7.9	0.15	0.15	0.87	1.45	
10	4	4	0.15	0.15	—	630	218	50 000	60 000	<b>623</b>	<b>623 ZZ</b>	—	4.2	4.3	8.8	8.0	0.15	0.15	1.65	1.66	
	13	5	5	0.2	0.2	1 300	485	40 000	48 000	<b>633</b>	<b>633 ZZ</b>	—	4.6	6.0	11.4	11.3	0.2	0.2	3.38	3.33	
	4	7	2	—	0.1	—	310	115	60 000	67 000	<b>MR 74</b>	—	—	4.8	—	6.2	—	0.1	—	0.22	—
7		—	2.5	—	0.1	255	107	60 000	71 000	—	<b>MR 74 ZZ</b>	—	—	4.8	—	6.3	—	0.1	—	0.29	—
8		2	3	0.15	0.1	395	139	56 000	67 000	<b>MR 84</b>	<b>MR 84 ZZ</b>	—	5.2	5.0	6.8	7.4	0.15	0.1	0.36	0.56	
9	2.5	4	(0.15)	(0.15)	640	225	53 000	63 000	<b>684 A</b>	<b>684 AZZ</b>	—	4.8	5.2	8.2	8.1	0.1	0.1	0.63	1.01		
10	3	4	0.2	0.15	710	270	50 000	60 000	<b>MR 104 B</b>	<b>MR 104 BZZ</b>	—	5.6	5.9	8.4	8.8	0.2	0.15	1.04	1.42		
11	4	4	0.15	0.15	960	345	48 000	56 000	<b>694</b>	<b>694 ZZ</b>	—	5.2	5.6	9.8	9.9	0.15	0.15	1.7	1.75		
12	4	4	0.2	0.2	960	345	48 000	56 000	<b>604</b>	<b>604 ZZ</b>	—	5.6	5.6	10.4	9.9	0.2	0.2	2.25	2.29		
13	5	5	0.2	0.2	1 300	485	40 000	48 000	<b>624</b>	<b>624 ZZ</b>	—	5.6	6.0	11.4	11.3	0.2	0.2	3.03	3.04		
16	5	5	0.3	0.3	1 700	670	36 000	43 000	<b>634</b>	<b>634 ZZ1</b>	—	6.0	7.5	14.0	13.8	0.3	0.3	5.24	5.21		

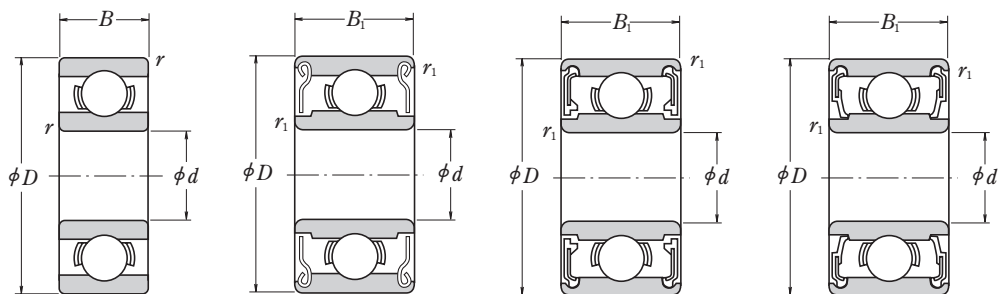
**Note** (1) Values in parentheses are not based on ISO 15.

**Remark** When using shielded bearings with a rotating outer ring, please contact NSK.

**EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS**

Metric Series

Bore Diameter 5 – 9 mm

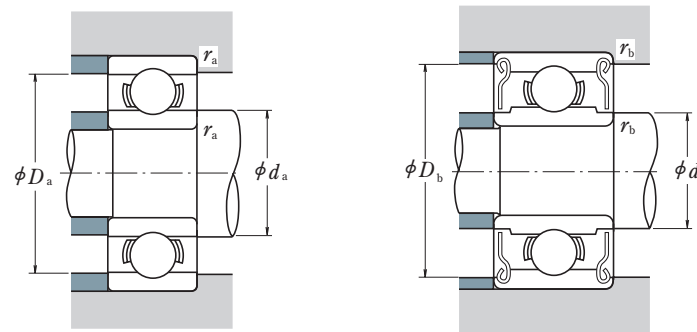


Open

Shielded  
ZZ · ZZ1

Non-Contact  
Sealed  
VV

Contact  
Sealed  
DD



Boundary Dimensions (mm)						Basic Load Ratings (N)		Limiting Speeds (min <sup>-1</sup> )			Bearing Designations			Abutment and Fillet Dimensions (mm)						Mass (g)		
d	D	B	B <sub>1</sub>	r <sup>(1)</sup> min.	r <sub>1</sub> <sup>(1)</sup> min.	C <sub>r</sub>	C <sub>0r</sub>	Open Z · ZZ V · VV	D · DD	Open Z	Open	Shielded	Sealed	d <sub>a</sub> min.	d <sub>b</sub> max.	D <sub>a</sub> max.	D <sub>b</sub> min.	r <sub>a</sub> max.	r <sub>b</sub> max.	Open	Shielded	
5	8	2	—	0.1	—	310	120	53 000	—	63 000	<b>MR 85</b>	—	—	5.8	—	7.2	—	0.1	—	0.26	—	
	8	—	2.5	—	0.1	278	131	53 000	—	63 000	—	<b>MR 85 ZZ</b>	—	5.8	—	7.4	—	0.1	—	—	0.34	
	9	2.5	3	0.15	0.15	430	168	50 000	—	60 000	<b>MR 95</b>	<b>MR 95 ZZ1</b>	—	6.2	6.0	7.8	8.2	0.15	0.15	0.50	0.58	
	10	3	4	0.15	0.15	430	168	50 000	—	60 000	<b>MR 105</b>	<b>MR 105 ZZ</b>	—	6.2	6.0	8.8	8.4	0.15	0.15	0.95	1.29	
	11	—	4	—	0.15	715	276	48 000	—	56 000	—	<b>MR 115 ZZ</b>	<b>VV</b>	—	6.3	—	9.8	—	0.15	0.15	—	1.49
	11	3	5	0.15	0.15	715	281	45 000	—	53 000	<b>685</b>	<b>685 ZZ</b>	—	6.2	6.2	9.8	9.9	0.15	0.15	1.2	1.96	
	13	4	4	0.2	0.2	1 080	430	43 000	40 000	50 000	<b>695</b>	<b>695 ZZ</b>	<b>VV DD</b>	6.6	6.6	11.4	11.2	0.2	0.2	2.45	2.5	
	14	5	5	0.2	0.2	1 330	505	40 000	38 000	50 000	<b>605</b>	<b>605 ZZ</b>	— <b>DD</b>	6.6	6.9	12.4	12.2	0.2	0.2	3.54	3.48	
	16	5	5	0.3	0.3	1 730	670	36 000	32 000	43 000	<b>625</b>	<b>625 ZZ1</b>	<b>VV DD</b>	7.0	7.5	14.0	13.8	0.3	0.3	4.95	4.86	
	19	6	6	0.3	0.3	2 340	885	32 000	30 000	40 000	<b>635</b>	<b>635 ZZ1</b>	<b>VV DD</b>	7.0	8.5	17.0	16.5	0.3	0.3	8.56	8.34	
6	10	2.5	3	0.15	0.1	495	218	45 000	—	53 000	<b>MR 106</b>	<b>MR 106 ZZ1</b>	—	7.2	7.0	8.8	9.3	0.15	0.1	0.56	0.68	
	12	3	4	0.2	0.15	715	292	43 000	40 000	50 000	<b>MR 126</b>	<b>MR 126 ZZ</b>	— <b>DD</b>	7.6	7.2	10.4	10.9	0.2	0.15	1.27	1.74	
	13	3.5	5	0.15	0.15	1 080	440	40 000	38 000	50 000	<b>686 A</b>	<b>686 AZZ</b>	<b>VV DD</b>	7.2	7.4	11.8	11.7	0.15	0.15	1.91	2.69	
	15	5	5	0.2	0.2	1 730	670	40 000	36 000	45 000	<b>696</b>	<b>696 ZZ1</b>	<b>VV DD</b>	7.6	7.9	13.4	13.3	0.2	0.2	3.88	3.72	
	17	6	6	0.3	0.3	2 260	835	38 000	34 000	45 000	<b>606</b>	<b>606 ZZ</b>	<b>VV DD</b>	8.0	8.2	15.0	14.8	0.3	0.3	5.97	6.08	
	19	6	6	0.3	0.3	2 340	885	32 000	30 000	40 000	<b>626</b>	<b>626 ZZ1</b>	<b>VV DD</b>	8.0	8.5	17.0	16.5	0.3	0.3	8.15	7.94	
	22	7	7	0.3	0.3	3 300	1 370	30 000	28 000	36 000	<b>636</b>	<b>636 ZZ</b>	<b>VV DD</b>	8.0	10.5	20.0	19.0	0.3	0.3	14	14	
	11	2.5	3	0.15	0.1	455	201	43 000	—	50 000	<b>MR 117</b>	<b>MR 117 ZZ</b>	—	8.2	8.0	9.8	10.5	0.15	0.1	0.62	0.72	
	13	3	4	0.2	0.15	540	276	40 000	—	48 000	<b>MR 137</b>	<b>MR 137 ZZ</b>	—	8.6	9.0	11.4	11.6	0.2	0.15	1.58	2.02	
	14	3.5	5	0.15	0.15	1 170	510	40 000	34 000	45 000	<b>687</b>	<b>687 ZZ1</b>	<b>VV DD</b>	8.2	8.5	12.8	12.7	0.15	0.15	2.13	2.97	
17	5	5	0.3	0.3	1 610	710	36 000	28 000	43 000	<b>697</b>	<b>697 ZZ1</b>	<b>VV DD</b>	9.0	10.2	15.0	14.8	0.3	0.3	5.26	5.12		
19	6	6	0.3	0.3	2 340	885	36 000	32 000	43 000	<b>607</b>	<b>607 ZZ1</b>	<b>VV DD</b>	9.0	9.1	17.0	16.5	0.3	0.3	7.67	7.51		
22	7	7	0.3	0.3	3 300	1 370	30 000	28 000	36 000	<b>627</b>	<b>627 ZZ</b>	<b>VV DD</b>	9.0	10.5	20.0	19.0	0.3	0.3	12.7	12.9		
26	9	9	0.3	0.3	4 550	1 970	28 000	22 000	34 000	<b>637</b>	<b>637 ZZ1</b>	<b>VV DD</b>	9.0	12.8	24.0	22.8	0.3	0.3	24	25		
8	12	2.5	3.5	0.15	0.1	545	274	40 000	—	48 000	<b>MR 128</b>	<b>MR 128 ZZ1</b>	—	9.2	9.0	10.8	11.3	0.15	0.1	0.71	0.97	
	14	3.5	4	0.2	0.15	820	385	38 000	32 000	45 000	<b>MR 148</b>	<b>MR 148 ZZ</b>	<b>VV DD</b>	9.6	9.2	12.4	12.8	0.2	0.15	1.86	2.16	
	16	4	5	0.2	0.2	1 610	710	36 000	28 000	43 000	<b>688 A</b>	<b>688 AZZ1</b>	<b>VV DD</b>	9.6	10.2	14.4	14.2	0.2	0.2	3.12	4.02	
	19	6	6	0.3	0.3	2 240	910	36 000	28 000	43 000	<b>698</b>	<b>698 ZZ</b>	<b>VV DD</b>	10.0	10.0	17.0	16.5	0.3	0.3	7.23	7.18	
	22	7	7	0.3	0.3	3 300	1 370	34 000	28 000	40 000	<b>608</b>	<b>608 ZZ</b>	<b>VV DD</b>	10.0	10.5	20.0	19.0	0.3	0.3	12.1	12.2	
	24	8	8	0.3	0.3	3 350	1 430	28 000	24 000	34 000	<b>628</b>	<b>628 ZZ</b>	<b>VV DD</b>	10.0	12.0	22.0	20.5	0.3	0.3	17.2	17.4	
	28	9	9	0.3	0.3	4 550	1 970	28 000	22 000	34 000	<b>638</b>	<b>638 ZZ1</b>	<b>VV DD</b>	10.0	12.8	26.0	22.8	0.3	0.3	28.3	28.6	
	17	4	5	0.2	0.2	1 330	665	36 000	24 000	43 000	<b>689</b>	<b>689 ZZ1</b>	<b>VV DD</b>	10.6	11.5	15.4	15.2	0.2	0.2	3.53	4.43	
	20	6	6	0.3	0.3	1 720	840	34 000	24 000	40 000	<b>699</b>	<b>699 ZZ1</b>	<b>VV DD</b>	11.0	12.0	18.0	17.2	0.3	0.3	8.45	8.33	
	24	7	7	0.3	0.3	3 350	1 430	32 000	24 000	38 000	<b>609</b>	<b>609 ZZ</b>	<b>VV DD</b>	11.0	12.0	22.8	20.5	0.3	0.3	14.5	14.7	
26	8	8	(0.6)	(0.6)	4 550	1 970	28 000	22 000	34 000	<b>629</b>	<b>629 ZZ</b>	<b>VV DD</b>	11.0	12.8	24.0	22.8	0.3	0.3	19.5	19.3		
30	10	10	0.6	0.6	5 100	2 390	24 000	—	30 000	<b>639</b>	<b>639 ZZ</b>	<b>VV</b>	13.0	16.1	26.0	25.6	0.6	0.6	36.5	36		

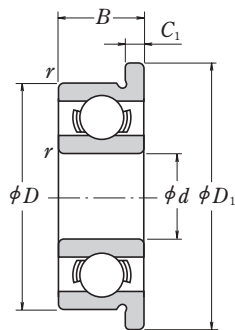
Note <sup>(1)</sup> Values in parentheses are not based on ISO 15.

Remarks 1. When using sealed or shielded bearings with a rotating outer ring, please contact NSK.

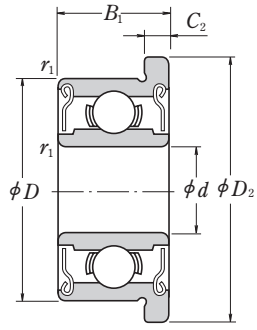
2. Bearings with snap rings are also available, please contact NSK for details.

**EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS**

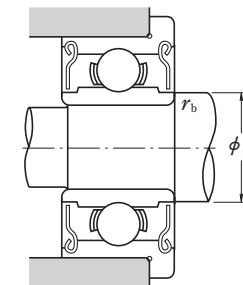
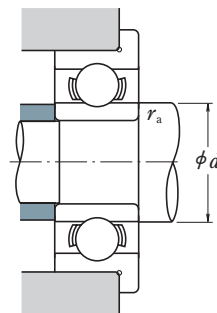
Metric Series With Flange  
Bore Diameter 1 – 4 mm



Open



Shielded  
ZZ · ZZ1



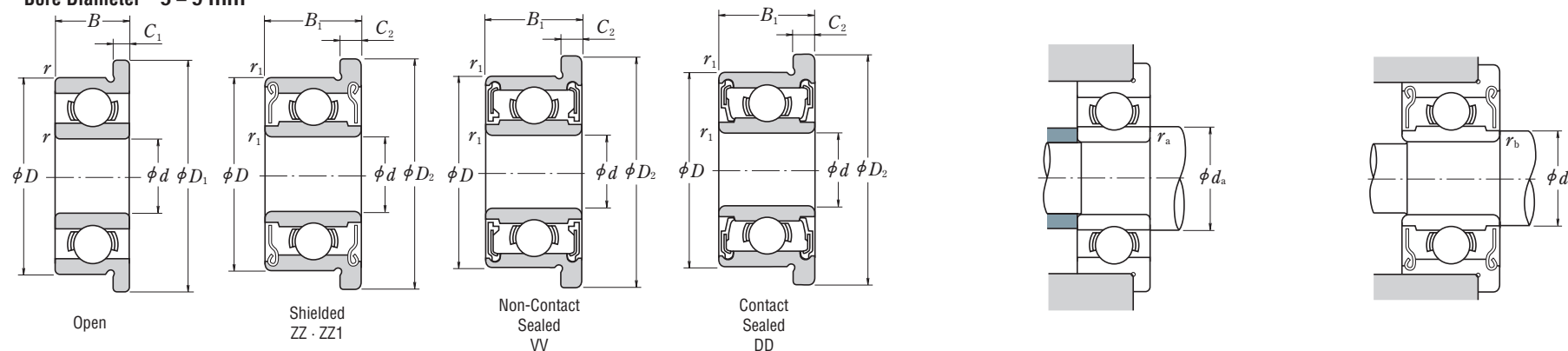
d	Boundary Dimensions (mm)										Basic Load Ratings (N)		Limiting Speeds (min <sup>-1</sup> )		Bearing Designations			Abutment and Fillet Dimensions (mm)				Mass (g)	
	D	D <sub>1</sub>	D <sub>2</sub>	B	B <sub>1</sub>	C <sub>1</sub>	C <sub>2</sub>	r <sup>(1)</sup> min.	r <sub>1</sub> <sup>(1)</sup> min.	C <sub>r</sub>	C <sub>0r</sub>	Grease Open Z · ZZ	Oil Open Z	Open	Shielded	Sealed	d <sub>a</sub> min.	d <sub>b</sub> max.	r <sub>a</sub> max.	r <sub>b</sub> max.	approx. Open	Shielded	
1	3	3.8	—	1	—	0.3	—	0.05	—	80	23	130 000	150 000	<b>F 681</b>	—	—	1.4	—	0.05	—	0.04	—	
	4	5	—	1.6	—	0.5	—	0.1	—	140	36	100 000	120 000	<b>F 691</b>	—	—	1.8	—	0.1	—	0.14	—	
1.2	4	4.8	—	1.8	—	0.4	—	0.1	—	138	35	110 000	130 000	<b>MF 41 X</b>	—	—	2.0	—	0.1	—	0.12	—	
1.5	4	5	5	1.2	2	0.4	0.6	0.05	0.05	112	33	100 000	120 000	<b>F 681 X</b>	<b>F 681 XZZ</b>	—	1.9	2.1	0.05	0.05	0.09	0.14	
	5	6.5	6.5	2	2.6	0.6	0.8	0.15	0.15	237	69	85 000	100 000	<b>F 691 X</b>	<b>F 691 XZZ</b>	—	2.7	2.5	0.15	0.15	0.23	0.28	
	6	7.5	7.5	2.5	3	0.6	0.8	0.15	0.15	330	98	75 000	90 000	<b>F 601 X</b>	<b>F 601 XZZ</b>	—	2.7	3.0	0.15	0.15	0.42	0.52	
2	5	6.1	6.1	1.5	2.3	0.5	0.6	0.08	0.08	169	50	85 000	100 000	<b>F 682</b>	<b>F 682 ZZ</b>	—	2.6	2.7	0.08	0.08	0.16	0.22	
	5	6.2	6.2	2	2.5	0.6	0.6	0.1	0.1	187	58	85 000	100 000	<b>MF 52 B</b>	<b>MF 52 BZZ</b>	—	2.8	2.7	0.1	0.1	0.21	0.27	
	6	7.5	7.5	2.3	3	0.6	0.8	0.15	0.15	330	98	75 000	90 000	<b>F 692</b>	<b>F 692 ZZ</b>	—	3.2	3.0	0.15	0.15	0.35	0.48	
2.5	6	7.2	—	2.5	—	0.6	—	0.15	—	330	98	75 000	90 000	<b>MF 62</b>	—	—	3.2	—	0.15	—	0.36	—	
	7	8.2	8.2	2.5	3	0.6	0.6	0.15	0.15	385	127	63 000	75 000	<b>MF 72</b>	<b>MF 72 ZZ</b>	—	3.2	3.8	0.15	0.15	0.52	0.56	
	7	8.5	8.5	2.8	3.5	0.7	0.9	0.15	0.15	385	127	63 000	75 000	<b>F 602</b>	<b>F 602 ZZ</b>	—	3.2	3.1	0.15	0.15	0.60	0.71	
	8	9.2	—	2.5	—	0.6	—	0.2	—	560	179	60 000	67 000	<b>F 682 X</b>	<b>F 682 XZZ</b>	—	3.1	3.7	0.08	0.08	0.25	0.36	
3	7	8.1	8.1	2	3	0.5	0.8	0.1	0.1	390	130	63 000	75 000	<b>F 692 X</b>	<b>F 692 XZZ</b>	—	3.7	3.8	0.15	0.15	0.51	0.68	
	8	9.5	9.5	2.8	4	0.7	0.9	0.15	0.15	550	175	60 000	71 000	<b>MF 82 X</b>	—	—	4.1	—	0.2	—	0.62	—	
	8	9.5	9.5	2.8	4	0.7	0.9	0.15	0.15	550	175	60 000	71 000	<b>F 602 X</b>	<b>F 602 XZZ</b>	—	3.7	3.5	0.15	0.15	0.74	0.98	
	8	9.5	9.5	3	4	0.7	0.9	0.15	0.15	560	179	60 000	67 000	<b>MF 63</b>	<b>MF 63 ZZ</b>	—	3.8	3.7	0.1	0.1	0.27	0.33	
4	7	8.2	—	2	—	0.6	—	0.1	—	310	115	60 000	67 000	<b>F 683 A</b>	<b>F 683 AZZ</b>	—	3.8	4.0	0.1	0.1	0.37	0.53	
	7	—	8.2	—	2.5	—	0.6	—	0.1	255	107	60 000	71 000	<b>MF 83</b>	—	—	4.2	—	0.15	—	0.56	—	
	8	9.2	9.2	2	3	0.6	0.6	0.15	0.1	395	139	56 000	67 000	<b>F 693</b>	<b>F 693 ZZ</b>	—	4.2	4.3	0.15	0.15	0.70	0.97	
	9	10.5	10.5	3	5	0.7	1	0.15	0.15	570	187	56 000	67 000	<b>MF 93</b>	<b>MF 93 ZZ</b>	—	4.6	4.3	0.2	0.15	0.81	1.34	
	9	10.3	10.3	2.5	4	0.6	1	(0.15)	(0.15)	640	225	53 000	63 000	<b>F 603</b>	<b>F 603 ZZ</b>	—	4.2	4.3	0.15	0.15	1.0	1.63	
	10	11.5	11.5	4	4	1	1	0.15	0.15	630	218	50 000	60 000	<b>F 623</b>	<b>F 623 ZZ</b>	—	4.2	4.3	0.15	0.15	1.85	1.86	
	13	15	15	5	5	1	1	0.2	0.2	1 300	485	36 000	43 000	<b>F 633</b>	<b>F 633 ZZ</b>	—	4.6	6.0	0.2	0.2	3.73	3.59	
4	7	—	8.2	—	2.5	—	0.6	—	0.1	255	107	60 000	71 000	<b>MF 74</b>	—	—	4.8	—	0.1	—	0.29	—	
	8	9.2	9.2	2	3	0.6	0.6	0.15	0.1	395	139	56 000	67 000	<b>MF 84</b>	<b>MF 84 ZZ</b>	—	5.2	5.0	0.15	0.1	0.44	0.63	
	9	10.3	10.3	2.5	4	0.6	1	(0.15)	(0.15)	640	225	53 000	63 000	<b>F 684</b>	<b>F 684 ZZ</b>	—	4.8	5.2	0.1	0.1	0.70	1.14	
	10	11.2	11.6	3	4	0.6	0.8	0.2	0.15	710	270	50 000	60 000	<b>MF 104 B</b>	<b>MF 104 BZZ</b>	—	5.6	5.9	0.2	0.15	1.13	1.59	
	11	12.5	12.5	4	4	1	1	0.15	0.15	960	345	48 000	56 000	<b>F 694</b>	<b>F 694 ZZ</b>	—	5.2	5.6	0.15	0.15	1.91	1.96	
	12	13.5	13.5	4	4	1	1	0.2	0.2	960	345	48 000	56 000	<b>F 604</b>	<b>F 604 ZZ</b>	—	5.6	5.6	0.2	0.2	2.53	2.53	
	13	15	15	5	5	1	1	0.2	0.2	1 300	485	40 000	48 000	<b>F 624</b>	<b>F 624 ZZ</b>	—	5.6	6.0	0.2	0.2	3.38	3.53	
	16	18	18	5	5	1	1	0.3	0.3	1 730	670	36 000	43 000	<b>F 634</b>	<b>F 634 ZZ1</b>	—	6.0	7.5	0.3	0.3	5.73	5.62	

Note (1) Values in parentheses are not based on ISO 15.

Remark When using shielded bearings with a rotating outer ring, please contact NSK.

**EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS**

Metric Series With Flange  
Bore Diameter 5 – 9 mm



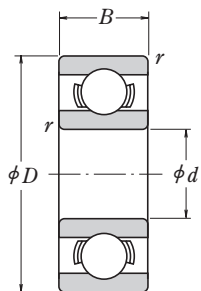
d	Boundary Dimensions (mm)									Basic Load Ratings (N)		Limiting Speeds (min <sup>-1</sup> )			Bearing Designations			Abutment and Fillet Dimensions (mm)				Mass (g)			
	D	D <sub>1</sub>	D <sub>2</sub>	B	B <sub>1</sub>	C <sub>1</sub>	C <sub>2</sub>	r	r <sub>1</sub>	C <sub>r</sub>	C <sub>0r</sub>	Grease		Oil		Open	Shielded	Sealed	d <sub>a</sub> min.	d <sub>b</sub> max.	r <sub>a</sub> max.	r <sub>b</sub> max.	approx.		
	D <sub>1</sub>	D <sub>2</sub>	B	B <sub>1</sub>	C <sub>1</sub>	C <sub>2</sub>	r	r <sub>1</sub>	Open			Z · ZZ	V · VV	D · DD	Open								Z	Open	Shielded
5	8	9.2	—	2	—	0.6	—	0.1	—	310	120	53 000	—	63 000	MF 85	—	—	—	5.8	—	0.1	—	0.33	—	
	8	—	9.2	—	2.5	—	0.6	—	0.1	278	131	53 000	—	63 000	—	MF 85 ZZ	—	—	—	5.8	—	0.1	—	—	0.41
	9	10.2	10.2	2.5	3	0.6	0.6	0.15	0.15	430	168	50 000	—	60 000	MF 95	MF 95 ZZ1	—	—	6.2	6.0	0.15	0.15	0.59	0.66	
	10	11.2	11.6	3	4	0.6	0.8	0.15	0.15	430	168	50 000	—	60 000	MF 105	MF 105 ZZ	—	—	6.2	6.0	0.15	0.15	1.05	1.46	
	11	12.5	12.5	3	5	0.8	1	0.15	0.15	715	281	45 000	—	53 000	F 685	F 685 ZZ	—	—	6.2	6.2	0.15	0.15	1.37	2.18	
	13	15	15	4	4	1	1	0.2	0.2	1 080	430	43 000	40 000	50 000	F 695	F 695 ZZ	VV	DD	6.6	6.6	0.2	0.2	2.79	2.84	
	14	16	16	5	5	1	1	0.2	0.2	1 330	505	40 000	38 000	50 000	F 605	F 605 ZZ	—	DD	6.6	6.9	0.2	0.2	3.9	3.85	
	16	18	18	5	5	1	1	0.3	0.3	1 730	670	36 000	32 000	43 000	F 625	F 625 ZZ1	VV	DD	7.0	7.5	0.3	0.3	5.37	5.27	
	19	22	22	6	6	1.5	1.5	0.3	0.3	2 340	885	32 000	30 000	40 000	F 635	F 635 ZZ1	VV	DD	7.0	8.5	0.3	0.3	9.49	9.49	
	6	10	11.2	11.2	2.5	3	0.6	0.6	0.15	0.1	495	218	45 000	—	53 000	MF 106	MF 106 ZZ1	—	—	7.2	7.0	0.15	0.1	0.65	0.77
12		13.2	13.6	3	4	0.6	0.8	0.2	0.15	715	292	43 000	40 000	50 000	MF 126	MF 126 ZZ	—	DD	7.6	7.2	0.2	0.15	1.38	1.94	
13		15	15	3.5	5	1	1.1	0.15	0.15	1 080	440	40 000	38 000	50 000	F 686 A	F 686 AZZ	VV	DD	7.2	7.4	0.15	0.15	2.25	3.04	
15		17	17	5	5	1.2	1.2	0.2	0.2	1 730	670	40 000	36 000	45 000	F 696	F 696 ZZ1	VV	DD	7.6	7.9	0.2	0.2	4.34	4.26	
17		19	19	6	6	1.2	1.2	0.3	0.3	2 260	835	38 000	34 000	45 000	F 606	F 606 ZZ	VV	DD	8.0	8.2	0.3	0.3	6.58	6.61	
19		22	22	6	6	1.5	1.5	0.3	0.3	2 340	885	32 000	30 000	40 000	F 626	F 626 ZZ1	VV	DD	8.0	8.5	0.3	0.3	9.09	9.09	
22		25	25	7	7	1.5	1.5	0.3	0.3	3 300	1 370	30 000	28 000	36 000	F 636	F 636 ZZ	VV	DD	8.0	10.5	0.3	0.3	14.6	14.7	
17		19	19	5	5	1.2	1.2	0.3	0.3	1 610	715	36 000	28 000	43 000	F 697	F 697 ZZ1	VV	DD	9.0	10.2	0.3	0.3	5.65	5.65	
19		22	22	6	6	1.5	1.5	0.3	0.3	2 340	885	36 000	32 000	43 000	F 607	F 607 ZZ1	VV	DD	9.0	9.1	0.3	0.3	8.66	8.66	
22		25	25	7	7	1.5	1.5	0.3	0.3	3 300	1 370	30 000	28 000	36 000	F 627	F 627 ZZ	VV	DD	9.0	10.5	0.3	0.3	14.2	14.2	
7	11	12.2	12.2	2.5	3	0.6	0.6	0.15	0.1	455	201	43 000	—	50 000	MF 117	MF 117 ZZ	—	—	8.2	8.0	0.15	0.1	0.72	0.82	
	13	14.2	14.6	3	4	0.6	0.8	0.2	0.15	540	276	40 000	—	48 000	MF 137	MF 137 ZZ	—	—	8.6	9.0	0.2	0.15	1.7	2.23	
	14	16	16	3.5	5	1	1.1	0.15	0.15	1 170	510	40 000	34 000	45 000	F 687	F 687 ZZ1	VV	DD	8.2	8.5	0.15	0.15	2.48	3.37	
	17	19	19	5	5	1.2	1.2	0.3	0.3	1 610	715	36 000	28 000	43 000	F 697	F 697 ZZ1	VV	DD	9.0	10.2	0.3	0.3	5.65	5.65	
	19	22	22	6	6	1.5	1.5	0.3	0.3	2 340	885	36 000	32 000	43 000	F 607	F 607 ZZ1	VV	DD	9.0	9.1	0.3	0.3	8.66	8.66	
	22	25	25	7	7	1.5	1.5	0.3	0.3	3 300	1 370	30 000	28 000	36 000	F 627	F 627 ZZ	VV	DD	9.0	10.5	0.3	0.3	14.2	14.2	
8	12	13.2	13.6	2.5	3.5	0.6	0.8	0.15	0.1	545	274	40 000	—	48 000	MF 128	MF 128 ZZ1	—	—	9.2	9.0	0.15	0.1	0.82	1.15	
	14	15.6	15.6	3.5	4	0.8	0.8	0.2	0.15	820	385	38 000	32 000	45 000	MF 148	MF 148 ZZ	VV	DD	9.6	9.2	0.2	0.15	2.09	2.39	
	16	18	18	4	5	1	1.1	0.2	0.2	1 610	710	36 000	30 000	43 000	F 688 A	F 688 AZZ	VV	DD	9.6	10.2	0.2	0.2	3.54	4.47	
	19	22	22	6	6	1.5	1.5	0.3	0.3	2 240	910	36 000	28 000	43 000	F 698	F 698 ZZ	VV	DD	10.0	10.0	0.3	0.3	8.35	8.3	
	22	25	25	7	7	1.5	1.5	0.3	0.3	3 300	1 370	34 000	28 000	40 000	F 608	F 608 ZZ	VV	DD	10.0	10.5	0.3	0.3	13.4	13.5	
	19	22	22	6	6	1.5	1.5	0.3	0.3	2 240	910	36 000	28 000	43 000	F 698	F 698 ZZ	VV	DD	10.0	10.0	0.3	0.3	8.35	8.3	
9	17	19	19	4	5	1	1.1	0.2	0.2	1 330	665	36 000	24 000	43 000	F 689	F 689 ZZ1	VV	DD	10.6	11.5	0.2	0.2	3.97	4.91	
	20	23	23	6	6	1.5	1.5	0.3	0.3	1 720	840	34 000	24 000	40 000	F 699	F 699 ZZ1	VV	DD	11.0	12.0	0.3	0.3	9.51	9.51	

**Remark** When using shielded bearings with a rotating outer ring, please contact NSK.

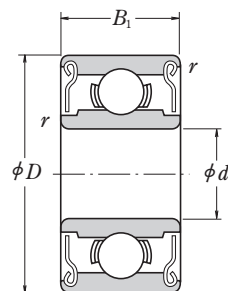
**EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS**

Inch Series

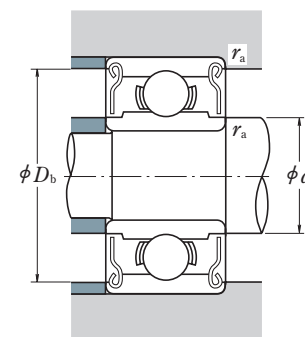
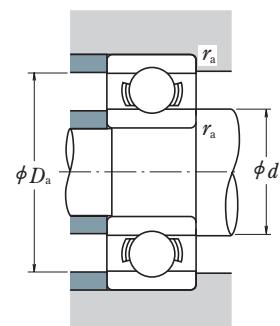
Bore Diameter 1.016 – 9.525 mm



Open



Shielded  
ZZ · ZS



d	Boundary Dimensions (mm)				Basic Load Ratings (N)		Limiting Speeds (min <sup>-1</sup> )		Bearing	Designations	Abutment and Fillet Dimensions (mm)					Mass (g)	
	D	B	B <sub>1</sub>	r min.	C <sub>r</sub>	C <sub>0r</sub>	Grease Open Z · ZZ	Oil Open Z			Open	Shielded	d <sub>a</sub> min.	d <sub>b</sub> max.	D <sub>a</sub> max.	D <sub>b</sub> min.	r <sub>a</sub> max.
<b>1.016</b>	3.175	1.191	—	0.1	80	23	130 000	150 000	<b>R 09</b>	—	1.9	—	2.3	—	0.1	0.04	—
<b>1.191</b>	3.967	1.588	2.380	0.1	138	35	110 000	130 000	<b>R 0</b>	<b>R 0 ZZ</b>	2.0	1.9	3.1	3.5	0.1	0.09	0.11
<b>1.397</b>	4.762	1.984	2.779	0.1	231	66	90 000	110 000	<b>R 1</b>	<b>R 1 ZZ</b>	2.2	2.3	3.9	4.1	0.1	0.15	0.19
<b>1.984</b>	6.350	2.380	3.571	0.1	310	108	67 000	80 000	<b>R 1-4</b>	<b>R 1-4 ZZ</b>	2.8	3.9	5.5	5.9	0.1	0.35	0.50
<b>2.380</b>	4.762	1.588	—	0.1	188	60	80 000	95 000	<b>R 133</b>	—	3.2	—	3.9	—	0.1	0.10	—
	4.762	—	2.380	0.1	143	52	80 000	95 000	<b>R 133 ZZS</b>	<b>R 133 ZZS</b>	—	3.0	—	4.2	0.1	—	0.13
	7.938	2.779	3.571	0.15	550	175	60 000	71 000	<b>R 1-5</b>	<b>R 1-5 ZZ</b>	3.6	4.1	6.7	7.0	0.15	0.60	0.72
<b>3.175</b>	6.350	2.380	2.779	0.1	283	95	67 000	80 000	<b>R 144</b>	<b>R 144 ZZ</b>	4.0	3.9	5.5	5.9	0.1	0.25	0.27
	7.938	2.779	3.571	0.1	560	179	60 000	67 000	<b>R 2-5</b>	<b>R 2-5 ZZ</b>	4.0	4.3	7.1	7.3	0.1	0.55	0.72
	9.525	2.779	3.571	0.15	640	225	53 000	63 000	<b>R 2-6</b>	<b>R 2-6 ZZS</b>	4.4	4.6	8.3	8.2	0.15	0.96	1.13
	9.525	3.967	3.967	0.3	630	218	56 000	67 000	<b>R 2</b>	<b>R 2 ZZ</b>	5.2	4.8	7.5	8.0	0.3	1.36	1.39
	12.700	4.366	4.366	0.3	640	225	53 000	63 000	<b>R 2A</b>	<b>R 2A ZZ</b>	5.2	4.6	10.7	8.2	0.3	3.3	3.23
<b>3.967</b>	7.938	2.779	3.175	0.1	360	149	53 000	63 000	<b>R 155</b>	<b>R 155 ZZS</b>	4.8	5.5	7.1	7.3	0.1	0.51	0.56
<b>4.762</b>	7.938	2.779	3.175	0.1	360	149	53 000	63 000	<b>R 156</b>	<b>R 156 ZZS</b>	5.6	5.5	7.1	7.3	0.1	0.39	0.42
	9.525	3.175	3.175	0.1	710	270	50 000	60 000	<b>R 166</b>	<b>R 166 ZZ</b>	5.6	5.9	8.7	8.8	0.1	0.81	0.85
	12.700	3.967	4.978	0.3	1 300	485	43 000	53 000	<b>R 3</b>	<b>R 3 ZZ</b>	6.8	6.5	10.7	11.2	0.3	2.21	2.79
<b>6.350</b>	9.525	3.175	3.175	0.1	420	204	48 000	56 000	<b>R 168B</b>	<b>R 168 BZZ</b>	7.2	7.0	8.7	8.9	0.1	0.58	0.62
	12.700	3.175	4.762	0.15	1 080	440	40 000	50 000	<b>R 188</b>	<b>R 188 ZZ</b>	7.6	7.4	11.5	11.6	0.15	1.53	2.21
	15.875	4.978	4.978	0.3	1 610	660	38 000	45 000	<b>R 4B</b>	<b>R 4B ZZ</b>	8.4	8.4	13.8	13.8	0.3	4.5	4.43
	19.050	5.558	7.142	0.4	2 620	1 060	36 000	43 000	<b>R 4AA</b>	<b>R 4AA ZZ</b>	9.4	9.0	16.0	16.6	0.4	7.48	9.17
<b>7.938</b>	12.700	3.967	3.967	0.15	540	276	40 000	48 000	<b>R 1810</b>	<b>R 1810 ZZ</b>	9.2	9.0	11.5	11.6	0.15	1.56	1.48
<b>9.525</b>	22.225	5.558	7.142	0.4	3 350	1 410	32 000	38 000	<b>R 6</b>	<b>R 6 ZZ</b>	12.6	11.9	19.2	20.0	0.4	9.02	11

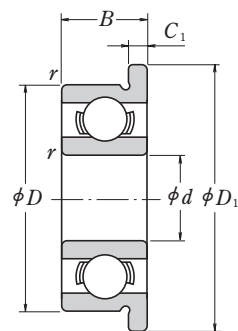
- Remarks**
1. When using shielded bearings with a rotating outer ring, please contact NSK.
  2. Bearings with double shields (ZZ, ZZS) are also available with single shields (Z, ZS).



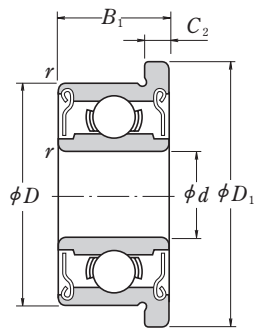
**EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS**

Inch Series With Flange

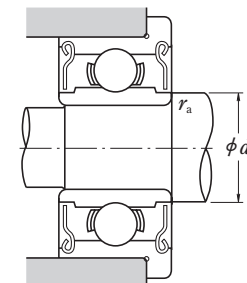
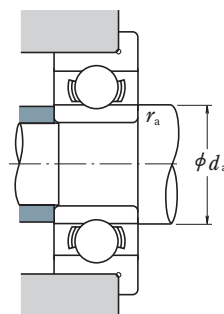
Bore Diameter 1.191 – 9.525 mm



Open



Shielded  
ZZ · ZS



d	Boundary Dimensions (mm)							Basic Load Ratings (N)		Limiting Speeds (min <sup>-1</sup> )		Bearing Designations		Abutment and Fillet Dimensions (mm)			Mass (g)	
	D	D <sub>1</sub>	B	B <sub>1</sub>	C <sub>1</sub>	C <sub>2</sub>	r <sub>min.</sub>	C <sub>r</sub>	C <sub>0r</sub>	Grease Open Z · ZZ	Oil Open Z	Open	Shielded	d <sub>a</sub> min.	d <sub>b</sub> max.	r <sub>a</sub> max.	approx. Open	approx. Shielded
1.191	3.967	5.156	1.588	2.380	0.330	0.790	0.1	138	35	110 000	130 000	FR 0	FR 0 ZZ	2.0	1.9	0.1	0.11	0.16
1.397	4.762	5.944	1.984	2.779	0.580	0.790	0.1	231	66	90 000	110 000	FR 1	FR 1 ZZ	2.2	2.3	0.1	0.20	0.25
1.984	6.350	7.518	2.380	3.571	0.580	0.790	0.1	310	108	67 000	80 000	FR 1-4	FR 1-4 ZZ	2.8	3.9	0.1	0.41	0.58
2.380	4.762	5.944	1.588	—	0.460	—	0.1	188	60	80 000	95 000	FR 133	—	3.2	—	0.1	0.13	—
	4.762	5.944	—	2.380	—	0.790	0.1	143	52	80 000	95 000	—	FR 133 ZS	—	3.0	0.1	—	0.19
	7.938	9.119	2.779	3.571	0.580	0.790	0.15	550	175	60 000	71 000	FR 1-5	FR 1-5 ZZ	3.6	4.1	0.15	0.68	0.82
3.175	6.350	7.518	2.380	2.779	0.580	0.790	0.1	283	95	67 000	80 000	FR 144	FR 144 ZZ	4.0	3.9	0.1	0.31	0.35
	7.938	9.119	2.779	3.571	0.580	0.790	0.1	560	179	60 000	67 000	FR 2-5	FR 2-5 ZZ	4.0	4.3	0.1	0.62	0.81
	9.525	10.719	2.779	3.571	0.580	0.790	0.15	640	225	53 000	63 000	FR 2-6	FR 2-6 ZZS	4.4	4.6	0.15	1.04	1.25
	9.525	11.176	3.967	3.967	0.760	0.760	0.3	630	218	56 000	67 000	FR 2	FR 2 ZZ	5.2	4.8	0.3	1.51	1.55
3.967	7.938	9.119	2.779	3.175	0.580	0.910	0.1	360	149	53 000	63 000	FR 155	FR 155 ZS	4.8	5.5	0.1	0.59	0.67
4.762	7.938	9.119	2.779	3.175	0.580	0.910	0.1	360	149	53 000	63 000	FR 156	FR 156 ZS	5.6	5.5	0.1	0.47	0.53
	9.525	10.719	3.175	3.175	0.580	0.790	0.1	710	270	50 000	60 000	FR 166	FR 166 ZZ	5.6	5.9	0.1	0.90	0.98
	12.700	14.351	4.978	4.978	1.070	1.070	0.3	1 300	485	43 000	53 000	FR 3	FR 3 ZZ	6.8	6.5	0.3	2.97	3.09
6.350	9.525	10.719	3.175	3.175	0.580	0.910	0.1	420	204	48 000	56 000	FR 168B	FR 168 BZZ	7.2	7.0	0.1	0.66	0.75
	12.700	13.894	3.175	4.762	0.580	1.140	0.15	1 080	440	40 000	50 000	FR 188	FR 188 ZZ	7.6	7.4	0.15	1.64	2.49
	15.875	17.526	4.978	4.978	1.070	1.070	0.3	1 610	660	38 000	45 000	FR 4B	FR 4B ZZ	8.4	8.4	0.3	4.78	4.78
7.938	12.700	13.894	3.967	3.967	0.790	0.790	0.15	540	276	40 000	48 000	FR 1810	FR 1810 ZZ	9.2	9.0	0.15	1.71	1.63
9.525	22.225	24.613	7.142	7.142	1.570	1.570	0.4	3 350	1 410	32 000	38 000	FR 6	FR 6 ZZ	12.6	11.9	0.4	10.1	12.1

- Remarks**
1. When using shielded bearings with a rotating outer ring, please contact NSK.
  2. Bearings with double shields (ZZ, ZS) are also available with single shields (Z, ZS).