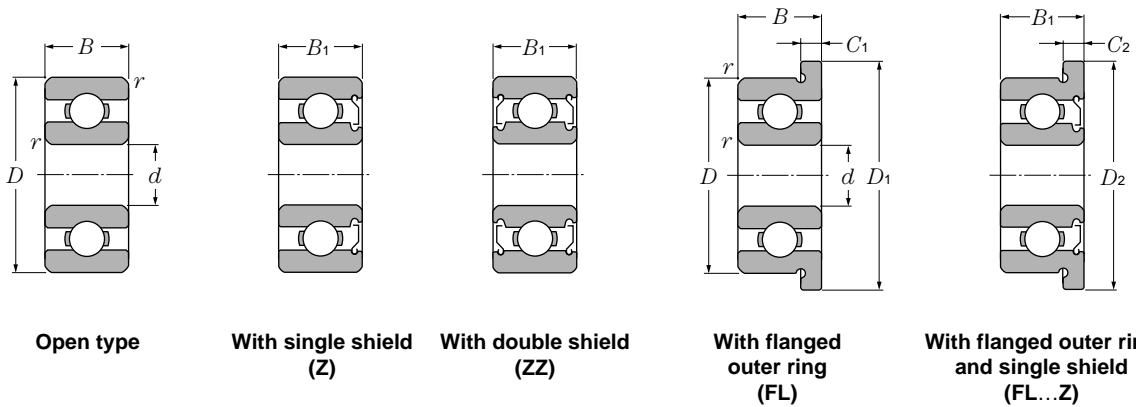


Miniature and Extra Small Ball Bearings

NTN

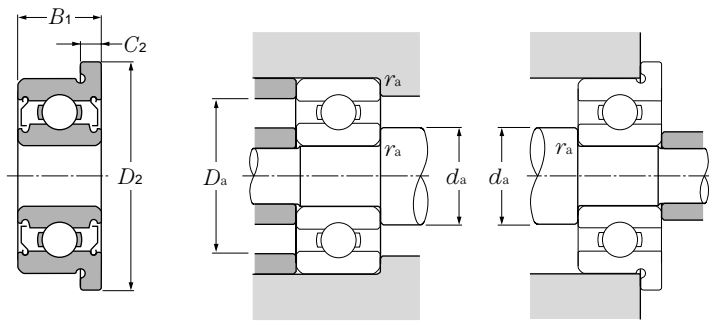
Metric system sizes



d 1.5 ~ 5mm

d	Boundary dimensions								Basic load ratings				Limiting speeds	
	D	B	B ₁	mm		C ₁	C ₂	r _{s min} ^①	dynamic	static	dynamic	static	rpm	
				D ₁	D ₂				N	C _{or}	kgf	C _{or}	grease	oil
1.5	4	1.2	2	5	5	0.4	0.6	0.15	102	29.0	10.0	3.00	88,000	100,000
	5	2	2.6	6.5	6.5	0.6	0.8	0.15	171	51.0	17.0	5.00	79,000	93,000
	6	2.5	3	7.5	7.5	0.6	0.8	0.15	274	86.0	28.0	9.00	71,000	84,000
2	4	1.2	2					0.05	104	37.0	11.0	4.00	83,000	98,000
	5	1.5	2.3	6.1	6.1	0.5	0.6	0.08	171	51.0	17.0	5.00	74,000	87,000
	5	2	2.5					0.1	171	51.0	17.0	5.00	74,000	87,000
	6	2.3	3	7.5	7.5	0.6	0.8	0.15	279	89.0	28.0	9.00	67,000	79,000
	6	2.5		7.2		0.6		0.15	279	89.0	28.0	9.00	67,000	79,000
	7	2.5						0.15	390	120	40.0	12.0	59,000	70,000
7	2.8	3.5	8.5	8.5	0.7	0.9	0.15	380	125	39.0	13.0	62,000	73,000	
2.5	5	1.5	2.3					0.08	153	59.0	16.0	6.00	70,000	82,000
	6	1.8	2.6	7.1	7.1	0.5	0.8	0.08	209	73.0	21.0	7.50	65,000	76,000
	7	3	3		8.2		0.6	0.15	284	96.0	29.0	10.0	59,000	70,000
	7	2.5	3.5	8.5	8.5	0.7	0.9	0.15	284	96.0	29.0	10.0	59,000	70,000
	8	2.5	2.8	9.2		0.6		0.15	430	152	44.0	16.0	56,000	66,000
	8	2.8	4	9.5	9.5	0.7	0.9	0.15	550	174	56.0	18.0	56,000	66,000
3	6	2	2.5	7.2	7.2	0.6	0.6	0.08	242	94.0	25.0	9.50	60,000	71,000
	7	2	3	8.1	8.1	0.5	0.8	0.1	390	130	40.0	13.0	58,000	68,000
	8	2.5		9.2		0.6		0.15	560	180	57.0	18.0	54,000	63,000
	8	3	4	9.5	9.5	0.7	0.9	0.15	560	180	57.0	18.0	54,000	63,000
	9	2.5	4	10.2	10.6	0.6	0.8	0.15	635	219	65.0	22.0	50,000	59,000
	9	3	5	10.5	10.5	0.7	1	0.15	635	219	65.0	22.0	50,000	59,000
	10	4	4	11.5	11.5	1	1	0.15	640	224	65.0	23.0	50,000	58,000
4	7	2	2.5	8.2	8.2	0.6	0.6	0.08	222	88.0	23.0	9.00	54,000	63,000
	8	2	3	9.2	9.2	0.6	0.6	0.08	395	140	40.0	14.0	52,000	61,000
	9	2.5	4	10.3	10.3	0.6	1	0.15	640	224	65.0	23.0	49,000	57,000
	10	3	4	11.2	11.6	0.6	0.8	0.15	650	235	66.0	24.0	46,000	55,000
	11	4	4	12.5	12.5	1	1	0.15	715	276	73.0	28.0	45,000	52,000
	12	4	4	13.5	13.5	1	1	0.2	970	360	99.0	36.0	43,000	51,000
	13	5	5	15	15	1	1	0.2	1,310	490	134	50.0	42,000	49,000
5	8	2	2.5	9.2	9.2	0.6	0.6	0.08	217	91.0	22.0	9.50	49,000	57,000
	9	2.5	3	10.2	10.2	0.6	0.6	0.15	500	211	51.0	21.0	46,000	55,000
	10	3	4	11.2	11.6	0.6	0.8	0.15	715	276	73.0	28.0	45,000	52,000

① Smallest allowable dimension for chamfer dimension r.



With flanged outer ring and double shield (FL...ZZ)

Equivalent bearing load dynamic

$$P_r = X F_r + Y F_a$$

$\frac{F_a}{C_{or}}$	e	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.010	0.18				2.46
0.020	0.20				2.14
0.040	0.24				1.83
0.070	0.27	1	0	0.56	1.61
0.10	0.29				1.48
0.15	0.32				1.35
0.20	0.35				1.25
0.30	0.38				1.13

static

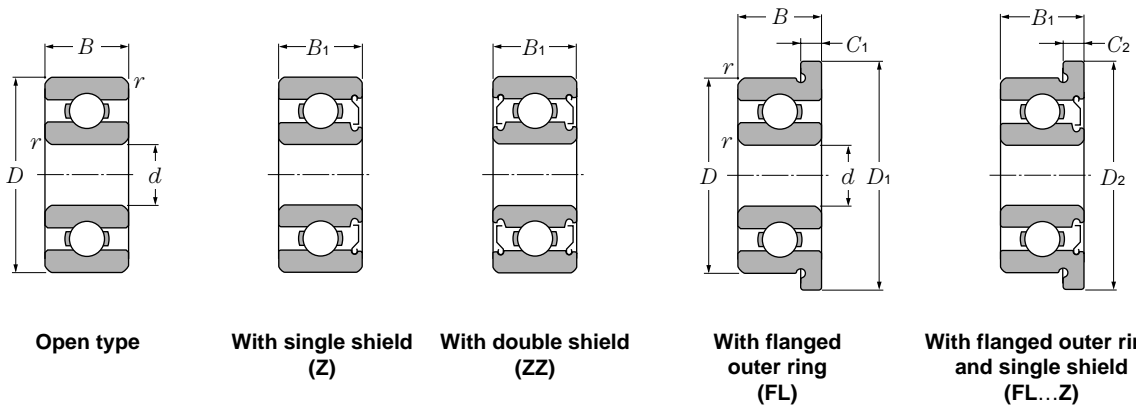
$$P_{or} = 0.6 F_r + 0.5 F_a$$

When $P_{or} < F_r$ use $P_{or} = F_r$

Bearing numbers						Abutment and fillet dimensions				Mass (approx.)	
open	with single shield	with double shield	with flanged outer ring	with flanged OR and single shield	with flanged OR and double shield	mm				g	
						d_a min	d_a max ^②	D_a max	r_{as} max	open	with flanged outer ring
68/1.5	W68/1.5SA	SSA	FL68/1.5	FLW68/1.5SA	SSA	2.3	2.4	3.2	0.05	0.07	0.09
69/1.5A	W69/1.5ASA	SSA	FL69/1.5A	FLW69/1.5ASA	SSA	2.7	2.9	3.8	0.15	0.18	0.24
60/1.5	W60/1.5ZA	ZZA	FL60/1.5	FLW60/1.5ZA	ZZA	2.7	3.0	4.8	0.15	0.35	0.42
672						2.5	2.6	3.5	0.05	0.06	
682	W682SA	SSA	FL682	FLW682SA	SSA	2.8	2.9	4.2	0.08	0.13	0.17
BC2-5	WBC2-5SA	SSA				2.8	2.9	4.2	0.10	0.16	
692	W692SA	SSA	FL692	FLW692SA	SSA	3.2	3.3	4.8	0.15	0.31	0.38
BC2-6			FLBC2-6			3.2	3.3	4.8	0.15	0.32	0.38
BC2-7A						3.2	3.6	5.8	0.15	0.44	
602	W602ZA	ZZA	FL602	FLW602ZA	ZZA	3.2	3.7	5.8	0.15	0.54	0.64
67/2.5	W67/2.5ZA	ZZA				3.1	3.3	4.4	0.08	0.11	
68/2.5	W68/2.5ZA	ZZA	FL68/2.5	FLW68/2.5ZA	ZZA	3.1	3.6	4.8	0.08	0.22	0.26
	WBC2.5-7ZA	ZZA		FLWBC2.5-7ZA	ZZA	3.7	4.0	5.8	0.15	0.6 ^③	0.67 ^③
69/2.5	W69/2.5SA	SSA	FL69/2.5	FLW69/2.5SA	SSA	3.7	4.0	5.8	0.15	0.43	0.53
BC2.5-8	WBC2.5-8ZA	ZZA	FLBC2.5-8			3.7	4.3	6.8	0.15	0.57	0.65
60/2.5	W60/2.5ZA	ZZA	FL60/2.5	FLW60/2.5ZA	ZZA	3.7	4.1	6.8	0.15	0.72	0.83
673	WA673SA	SSA	FL673	FLWA673SA	SSA	3.6	4.1	5.4	0.08	0.2	0.26
683	W683ZA	ZZA	FL683	FLW683ZA	ZZA	3.9	4.1	5.8	0.1	0.33	0.38
BC3-8			FLBC3-8			4.2	4.4	6.8	0.15	0.52	0.6
693	W693Z	ZZ	FL693	FLW693Z	ZZ	4.2	4.4	6.8	0.15	0.61	0.72
BC3-9	WBC3-9ZA	ZZA	FLBC3-9	FLAWBC3-9ZA	ZZA	4.2	5.0	7.8	0.15	0.71	0.79
603	W603ZA	ZZA	FL603	FLW603ZA	ZZA	4.2	5.0	7.8	0.15	0.92	1
623	623ZA	ZZA	FL623	FL623ZA	ZZA	4.2	5.2	8.8	0.15	1.6	1.8
674A	WA674ASA	SSA	FL674A	FLWA674ASA	SSA	4.6	5.0	6.4	0.08	0.28	0.35
BC4-8	WBC4-8Z	ZZ	FLBC4-8	FLWBC4-8Z	ZZ	4.8	5.0	6.8	0.08	0.38	0.46
684AX50	W684AX50Z	ZZ	FL684AX50	FLW684AX50Z	ZZ	5.0	5.2	7.8	0.1	0.67	0.76
BC4-10	WBC4-10Z	ZZ	FLBC4-10	FLAWBC4-10Z	ZZ	5.2	6.0	8.8	0.15	1	1.1
694	694Z	ZZ	FL694	FL694Z	ZZ	5.2	6.4	9.8	0.15	1.8	2
604	604Z	ZZ	FL604	FL604Z	ZZ	5.6	6.6	10.4	0.2	2.1	2.3
624	624Z	ZZ	FL624	FL624Z	ZZ	5.6	6.2	11.4	0.2	3.2	3.5
634	634Z	ZZ				6	7.6	14	0.3	5.1	
675	WA675Z	ZZ	FL675	FLWA675Z	ZZ	5.6	6.0	7.4	0.08	0.32	0.4
BC5-9	WBC5-9ZA	ZZA	FLBC5-9	FLWBC5-9ZA	ZZA	5.2	6.1	7.8	0.15	0.55	0.63
BC5-10	WBC5-10Z	ZZ	FLBC5-10	FLAWBC5-10Z	ZZ	6.2	6.4	8.8	0.15	0.88	0.97

② This dimension applies to sealed and shielded bearings.

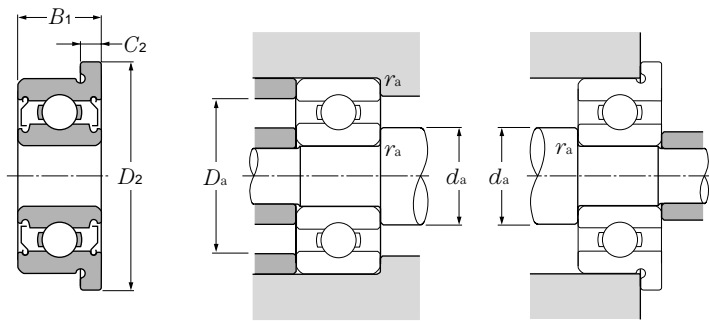
③ Values for double shielded bearings shown



d 5 ~ 9mm

d	Boundary dimensions								Basic load ratings				Limiting speeds	
	D	B	B ₁	mm		C ₁	C ₂	r _{s min} ^①	dynamic	static	dynamic	static	rpm	rpm
				D ₁	D ₂				C _r	C _{or}	C _r	C _{or}		
5	11	4	4		12.6		0.8	0.15	715	282	73.0	29.0	43,000	51,000
	11	3	5	12.5	12.5	0.8	1	0.15	715	282	73.0	29.0	43,000	51,000
	13	4	4	15	15.2	1	1	0.2	1,080	430	110	44.0	40,000	47,000
	13	5	5		15		1	0.2	1,080	430	110	44.0	40,000	47,000
	14	5	5	16	16	1	1	0.2	1,330	505	135	52.0	39,000	46,000
	16	5	5	18	18	1	1	0.3	1,760	680	179	69.0	37,000	44,000
	19	6	6					0.3	2,340	885	238	90.0	34,000	40,000
6	10	2.5	3	11.2	11.2	0.6	0.6	0.1	465	196	47.0	20.0	43,000	51,000
	12	3	4	13.2	13.6	0.6	0.8	0.15	830	365	85.0	37.0	40,000	47,000
	13	3.5	5	15	15.2	1.0	1.1	0.15	1,080	440	110	45.0	39,000	46,000
	15	5	5	17	17	1.2	1.2	0.2	1,350	530	137	54.0	37,000	44,000
	16	6	6					0.2	1,770	695	181	71.0	36,000	42,000
	17	6	6	19	19	1.2	1.2	0.3	2,190	865	224	88.0	35,000	42,000
	19	6	6	22	22	1.5	1.5	0.3	2,340	885	238	90.0	34,000	40,000
7	11	2.5	3	12.2	12.2	0.6	0.6	0.1	555	269	56.0	27.0	40,000	47,000
	13	3	4	14.2	14.6	0.6	0.8	0.15	825	375	84.0	38.0	38,000	45,000
	14	3.5	5	16	16	1	1.1	0.15	1,170	505	120	51.0	37,000	44,000
	17	5	5	19	19	1.2	1.2	0.3	1,610	715	164	73.0	35,000	41,000
	19	6	6					0.3	2,240	910	228	93.0	34,000	40,000
	22	7	7					0.3	3,350	1,400	340	142	32,000	37,000
8	12	2.5	3.5	13.2	13.6	0.6	0.8	0.1	515	252	52.0	26.0	38,000	45,000
	14	3.5	4	15.6	15.6	0.8	0.8	0.15	820	385	84.0	39.0	36,000	43,000
	16	4	5	18	18	1	1.1	0.2	1,610	715	164	73.0	35,000	41,000
	19	6	6	22	22	1.5	1.50	0.3	1,990	865	202	88.0	33,000	39,000
	22	7	7	25	25	1.5	1.50	0.3	3,350	1,400	340	142	32,000	37,000
	24	8	8					0.3	4,000	1,590	410	162	31,000	36,000
9	14	3	4.5					0.1	920	465	94.0	48.0	36,000	42,000
	17	4	5	19	19	1	1.1	0.2	1,720	820	176	83.0	33,000	39,000
	20	6	6					0.3	2,480	1,090	253	111	32,000	38,000
	24	7	7					0.3	3,400	1,450	345	148	31,000	36,000
	26	8	8					0.6	4,550	1,960	465	200	30,000	35,000

① Smallest allowable dimension for chamfer dimension r.



With flanged outer ring and double shield (FL...ZZ)

Equivalent bearing load dynamic

$$P_r = XF_r + YF_a$$

$\frac{F_a}{C_{or}}$	e	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.010	0.18				2.46
0.020	0.20				2.14
0.040	0.24				1.83
0.070	0.27	1	0	0.56	1.61
0.10	0.29				1.48
0.15	0.32				1.35
0.20	0.35				1.25
0.30	0.38				1.13

static

$$P_{or} = 0.6F_r + 0.5F_a$$

When $P_{or} < F_r$ use $P_{or} = F_r$

Bearing numbers						Abutment and fillet dimensions				Mass (approx.)	
open	with single shield	with double shield	with flanged outer ring	with flanged OR and single shield	with flanged OR and double shield	mm				open	with flanged outer ring
						d_a min	d_a max ^②	D_a max	r_{as} max		
-	WBC5-11Z	ZZ		FLWBC5-11Z	ZZ	6.2	6.8	9.8	0.2	1.8	2
685	W685Z	ZZ	FL685	FLW685Z	ZZ	6.2	6.8	9.8	0.15	1.1	1.3
695	695Z	ZZ	FL695	FL695Z	ZZ	6.6	6.9	11.4	0.2	2.4	2.7
-	WBC5-13Z	ZZ		FLWBC5-13Z	ZZ	6.6	6.9	11.4	0.2	3.4 ^③	3.7 ^③
605	605Z	ZZ	FL605	FL605Z	ZZ	6.6	7.4	12.4	0.2	3.5	3.9
625	625Z	ZZ	FL625	FL625Z	ZZ	7	7.6	14	0.3	4.8	5.2
635	635Z	ZZ				7	9.5	17	0.3	8	
676A	WA676AZ	ZZ	FL676A	FLWA676AZ	ZZ	6.6	6.7	9.2	0.1	0.65	0.74
BC6-12	WBC6-12Z	ZZ	FLBC6-12	FLAWBC6-12Z	ZZ	7.2	7.9	10.8	0.15	1.3	1.4
686	W686Z	ZZ	FL686	FLW686Z	ZZ	7.0	7.2	11.8	0.15	1.9	2.2
696	696Z	ZZ	FL696	FL696Z	ZZ	7.6	7.8	13.4	0.2	3.8	4.3
BC6-16A	BC6-16AZ	ZZ				7.6	8.0	14.4	0.2	5.2	
606	606Z	ZZ	FL606	FL606Z	ZZ	8	8.6	15	0.3	6	6.5
626	626Z	ZZ	FL626	FL626Z	ZZ	8	9.5	17	0.3	8.1	9.2
677	WA677ZA	ZZA	FL677	FLWA677ZA	ZZA	7.8	8.1	10.2	0.1	0.67	0.77
BC7-13	WBC7-13ZA	ZZA	FLBC7-13	FLAWBC7-13ZA	ZZA	8.2	8.9	11.8	0.15	1.4	1.5
687A	W687AZ	ZZ	FL687A	FLW687AZ	ZZ	8.2	8.7	12.8	0.15	2.1	2.4
697	697Z	ZZ	FL697	FL697Z	ZZ	9	10.0	15	0.3	5.2	5.7
607	607Z	ZZ				9	10.4	17	0.3	8	
627	627Z	ZZ				9	12.2	20	0.3	13	
678A	W678AZ	ZZ	FL678A	FLAW678AZ	ZZ	8.8	9.1	11.2	0.1	0.75	0.86
BC8-14	WBC8-14Z	ZZ	FLBC8-14	FLWBC8-14Z	ZZ	9.2	9.5	12.8	0.15	1.8	1.9
688A	W688AZ	ZZ	FL688A	FLW688AZ	ZZ	9.6	10.0	14.4	0.2	3.1	3.5
698	698Z	ZZ	FL698	FL698Z	ZZ	10	10.6	17	0.3	7.3	8.4
608	608Z	ZZ	FL608	FL608Z	ZZ	10	12.2	20	0.3	12	13
628	628Z	ZZ				10	12.1	22	0.3	17	
679	W679ZA	ZZA				9.8	10.4	13.2	0.1	1.4	
689	W689Z	ZZ	FL689	FLW689Z	ZZ	10.6	10.7	15.4	0.2	3.2	3.6
699	699Z	ZZ	-	-	-	11	11.6	18	0.3	8.2	
609	609Z	ZZ	-	-	-	11	13.1	22	0.3	14	
629X50	629X50Z	ZZ	-	-	-	13	13.9	22	0.3	20	

② This dimension applies to sealed and shielded bearings.

③ Values for double shielded bearings shown.