SMB BEARINGS




Specialising in miniature, thin-section and corrosion-resistant bearings

www.smbbearings.com

About Us

Originally founded in 1985, SMB Bearings are a specialised worldwide supplier of miniature bearings, thin-section bearings, corrosion resistant bearings and bearing relubrication services.

We have a superior level of product knowledge and a high level of service and responsiveness that comes with being a small and specialised company. We are dedicated to providing bearing and lubrication solutions for all types of customer, from the individual to the large corporation.

EZO Agents

We are authorised distributors for Sapporo Precision of Japan who manufacture EZO brand miniature bearings, thin section bearings and stainless steel bearings.

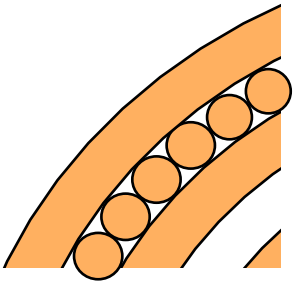
Sapporo Precision are leading specialists in their field with a deserved reputation for quality and reliability across the world. The EZO brand guarantees you a high precision product every time thanks to advanced production techniques and the highest levels of quality control.

Specialists

As specialists, we have a high level of expertise which allows us to give you better service and greater technical support. Most of our miniature bearings, stainless steel bearings and thin section bearings are supplied through either the high-precision EZO brand or the standard grade SMB China brand for less demanding applications.

Relubrication

During the early years of SMB Bearings, we noticed that customers were asking for small quantities of ball bearings with non-standard lubricants but did not want long delivery times or minimum order quantities. In response, we set up a bearing relubrication facility so that we can relubricate our bearings or our customers' bearings with a large range of oils, greases or dry lubricants.



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SMB Numbering System

1	2	3	4	5	6	7	8	9	10	11
S		6800	Si3N4	TW	ZZ	W7	P6	C3	EMQ	PS2
	R	4		J	2RS		P5	MC3		SRL

1. BEARING MATERIAL

No prefix	Chrome steel
AC	Acetal resin (POM)
CB	Chrome steel + ceramic balls
CCSI	Full ceramic - silicon nitride
CCZR	Full ceramic - Zirconia
PK	PEEK
PTFE	PTFE
PP	Polypropylene
S	440 stainless steel
S316	316 stainless steel
S316CB	316 stainless + ceramic balls
SCB	440 stainless + ceramic balls

2. SERIES

No prefix	Metric series, 1600 series
F	Flanged metric series, Thrust series, Taper OD series
FR	Flanged inch series
FRW	Flanged extended inner series
MF	Flanged metric miniature series
MR	Metric miniature series
R	Inch series
RW	Extended inner series

3. BASIC REFERENCE

See the following product tables for details of the different SMB bearing types and SMB bearing references

4. BALL MATERIAL

No suffix	Same material as bearing rings
316	316 stainless steel
GL	Glass
PK	PEEK
PP	Polypropylene
PTFE	PTFE
Si3N4	Silicon nitride
ZrO2	Zirconia

5. RETAINER TYPE

No suffix	Standard for bearing type
316	316 stainless steel
F/B	Full complement (no retainer)
PE	Polyethylene crown
PK	PEEK crown
PP	Polypropylene crown
PTFE	PTFE
RJ	Riveted steel cage
TP	Phenolic crown
TW	High speed nylon crown

6. CLOSURE TYPE

No suffix	Open bearing
2RS	Contact rubber seals
2RSV	Contact Viton seals
2RU	Non contact rubber seals
2PES	Low friction polyethylene seals
2PKS	Low friction PEEK seals
TTS	Contact teflon seals
ZZ	Metal shields

7. MODIFIED DIMENSION

A	Non-standard OD
B	Non-standard bore
W	Non-standard width

8. TOLERANCE GRADE

See the Engineering Data section for tolerance tables and more details on ISO tolerances.

9. RADIAL PLAY

... or 'internal clearance'. See the Engineering Data section for more details and radial play tables.

10. NOISE RATING

EMQ	Low noise electric motor quality
EMQ2	Lower noise electric motor quality

Further details can be found in 'Engineering Data'

11. LUBRICANT

See 'Engineering Data' for lubricant tables.

Product Tables

The tables in the following pages show dimensions and performance data for the SMB range of radial and thrust ball bearings. Technical drawings are available to download from our website.

For a cross-reference of different manufacturer's part numbers and SMB references, please see our BEARING INTERCHANGE on the 'Search' page at www.smbbearings.com

Metric Miniature Series

Chrome steel miniature bearings for radial loads and moderate thrust loads in both directions.

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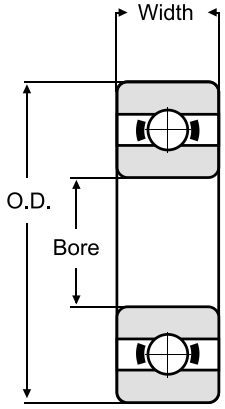

CHROME STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Open Bearing		Shielded and Sealed Bearing			Max Load (kgf)		Rpm ** (x1000)
		Width	SMB Reference	Width	SMB Shielded Reference	SMB Sealed Reference *	Dyn	Stat	
1.5	4	1.2	681X	2.0	681XZZ		11	3	120
	5	2.0	691X	2.6	691XZZ		24	7	100
	6	2.5	601X	3.0	601XZZ		33	10	90
2	5	1.5	682	2.3	682ZZ		17	5	100
	5	2.0	MR52	2.5	MR52ZZ		17	5	100
	6			2.3	692ZZW23		33	10	75
	6	2.3	692	3.0	692ZZ		33	10	90
	6	2.5	MR62	2.5	MR62ZZ		33	10	90
	7	2.5	MR72	3.0	MR72ZZ		38	13	75
	7	2.8	602	3.5	602ZZ		38	13	71
2.5	6	1.8	682X	2.6	682XZZ		21	7	80
	7	2.5	692X	3.5	692XZZ		39	13	75
	8			2.8	602XZZW28		55	18	59
	8	2.8	602X	4.0	602XZZ		55	18	69
3	6	2.0	MR63	2.5	MR63ZZ		21	7	80
	7	2.0	683	3.0	683ZZ		31	11	75
	8	2.5	MR83	3.0	MR83ZZ		40	14	67
	8	3.0	693	4.0	693ZZ		55	18	67
	9	2.5	MR93	4.0	MR93ZZ		58	19	67
	9	3.0	603	5.0	603ZZ		58	19	67
	10	4.0	623	4.0	623ZZ	623-2RS	63	22	60
	13	5.0	633	5.0	633ZZ	633-2RS	130	49	45
3.5	9			4.0	684ZZB35		61	21	55

** Some sizes available with non-contact seals or teflon seals*

*** Rpm may be lower for ZZ and 2RS types.*

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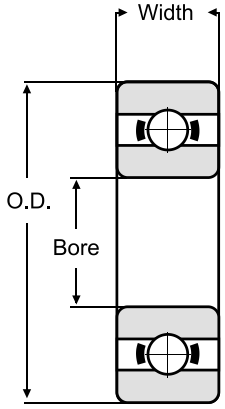

CHROME STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Open Bearing		Shielded and Sealed Bearing			Max Load (kgf)		Rpm ** (x1000)
		Width	SMB Reference	Width	SMB Shielded Reference	SMB Sealed Reference *	Dyn	Stat	
4	7	2.0	MR74	2.5	MR74ZZ		31	11	67
	8	2.0	MR84	3.0	MR84ZZ	MR84-2RS	39	14	67
	9			3.5	684ZZW35		65	22	55
	9	2.5	684	4.0	684ZZ	684-2RS	65	22	62
	10	3.0	MR104	4.0	MR104ZZ		71	27	54
	11	4.0	694	4.0	694ZZ	694-2RS	95	34	54
	12	4.0	604	4.0	604ZZ	604-2RS	95	34	54
	13	5.0	624	5.0	624ZZ	624-2RS	130	49	50
	16	5.0	634	5.0	634ZZ	634-2RS	134	52	41
5	8	2.0	MR85	2.5	MR85ZZ	MR85-2RS	29	11	63
	9	2.5	MR95	3.0	MR95ZZ	MR95-2RS	42	16	60
	10	3.0	MR105	4.0	MR105ZZ	MR105-2RS	42	16	60
	11			4.0	MR115ZZ	MR115-2RS	71	28	53
	11	3.0	685	5.0	685ZZ	685-2RS	71	28	53
	13	4.0	695	4.0	695ZZ	695-2RS	102	41	48
	13			5.0	695ZZW5		102	41	42
	14	5.0	605	5.0	605ZZ	605-2RS	129	48	48
	16	5.0	625	5.0	625ZZ	625-2RS	168	64	43
	19	6.0	635	6.0	635ZZ	635-2RS	234	90	38

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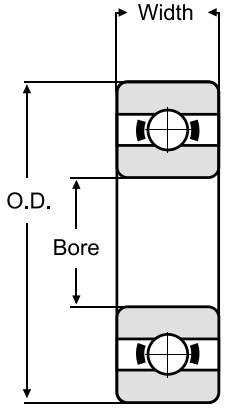

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Bore	O.D.	Open Bearing		Shielded and Sealed Bearing			Max Load (kgf)		Rpm ** (x1000)
		Width	SMB Reference	Width	SMB Shielded Reference	SMB Sealed Reference *	Dyn	Stat	
6	10	2.5	MR106	3.0	MR106ZZ	MR106-2RS	48	20	52
	12	3.0	MR126	4.0	MR126ZZ	MR126-2RS	69	27	49
	13			4.5	686ZZW45	686-2RSW45	102	41	42
	13	3.5	686	5.0	686ZZ	686-2RS	102	41	49
	15	5.0	696	5.0	696ZZ	696-2RS	134	52	45
	16			5.0	696AZZ	696A-2RS	134	52	40
	17	6.0	606	6.0	606ZZ	606-2RS	226	84	45
	19			5.15		626-2RSW515	233	89	32
	19	6.0	626	6.0	626ZZ	626-2RS	233	89	40
	19			8.0	626ZZW8		233	89	32
	22	7.0	636	7.0	636ZZ	636-2RS	333	140	35
7	11	2.5	MR117	3.0	MR117ZZ		45	20	50
	13	3.0	MR137	4.0	MR137ZZ		54	27	48
	14	4.0	687W4				117	51	50
	14	3.5	687	5.0	687ZZ	687-2RS	117	51	50
	17	5.0	697	5.0	697ZZ	697-2RS	160	71	43
	19	6.0	607	6.0	607ZZ	607-2RS	228	87	43
	22	7.0	627	7.0	627ZZ	627-2RS	328	137	36
	26	9.0	637	9.0	637ZZ	637-2RS	456	198	32

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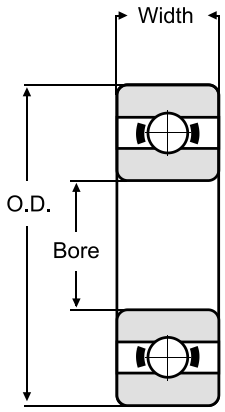

CHROME STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Open Bearing		Shielded and Sealed Bearing			Max Load (kgf)		Rpm ** (x1000)
		Width	SMB Reference	Width	SMB Shielded Reference	SMB Sealed Reference *	Dyn	Stat	
8	12	2.5	MR128	3.5	MR128ZZ	MR128-2RS	54	27	48
	14	3.5	MR148	4.0	MR148ZZ	MR148-2RS	81	38	45
	16			4.0	688ZZW4	688-2RSW4	125	59	36
	16	4.0	688	5.0	688ZZ	688-2RS	125	59	43
	16			6.0	688ZZW6	688-2RSW6	125	59	36
	19	6.0	698	6.0	698ZZ	698-2RS	221	89	43
	22	6.0	608W6				327	136	39
	22	7.0	608	7.0	608ZZ	608-2RS	327	136	39
	22			10.3	608ZZW103	608-2RSW103	327	136	34
	22			11.0		608-2RSW11	327	136	23
	24	8.0	628	8.0	628ZZ	628-2RS	330	138	34
	28	9.0	638	9.0	638ZZ	638-2RS	451	197	32
9	14	3.0	679	4.5	679ZZ		91	47	42
	17	4.0	689	5.0	689ZZ	689-2RS	132	67	43
	17			6.0	689ZZW6	689-2RSW6	132	67	36
	20	6.0	699	6.0	699ZZ	699-2RS	246	108	40
	24	7.0	609	7.0	609ZZ	609-2RS	329	140	38
	26	8.0	629	8.0	629ZZ	629-2RS	457	198	34
	30	10.0	639	10.0	639ZZ		465	208	30

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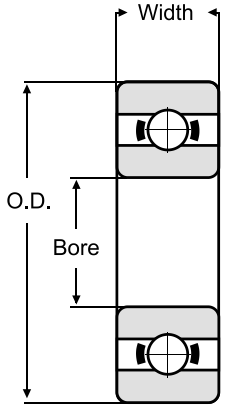

STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Open Bearing		Shielded and Sealed Bearing			Max Load (kgf)		Rpm ** (x1000)
		Width	SMB Reference	Width	SMB Shielded Reference	SMB Sealed Reference *	Dyn	Stat	
0.6	2.5	1.0	S68/0.6				5	1	160
1	3	1.0	S681				8	2	150
	3	1.5	SMR31				8	2	150
	4	1.6	S691				11	3	120
1.2	4	1.8	SMR41X	2.5	SMR41XZZ		9	2	130
1.5	4	1.2	S681X	2.0	S681XZZ		9	2	115
	5	2.0	S691X	2.6	S691XZZ		19	6	100
	6	2.5	S601X	3.0	S601XZZ		28	8	90
2	4	1.2	S672	2.0	S672ZZ		10	3	104
	5	1.5	S682	2.3	S682ZZ		15	4	100
	5	2.0	SMR52	2.5	SMR52ZZ		15	4	100
	6			2.3	S692ZZW23		27	8	75
	6	2.3	S692	3.0	S692ZZ		27	8	90
	6	2.5	SMR62	2.5	SMR62ZZ		27	8	90
	7	2.5	SMR72	3.0	SMR72ZZ		32	10	75
	7	2.8	S602	3.5	S602ZZ		32	10	71
2.5	6	1.8	S682X	2.6	S682XZZ		18	6	80
	7	2.5	S692X	3.5	S692XZZ		33	11	75
	8	2.5	SMR82X				48	14	69
	8			2.8	S602XZZW28		48	14	59
	8	2.8	S602X	4.0	S602XZZ		48	14	69

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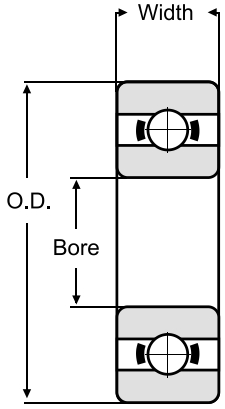

STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Open Bearing		Shielded and Sealed Bearing			Max Load (kgf)		Rpm ** (x1000)
		Width	SMB Reference	Width	SMB Shielded Reference	SMB Sealed Reference *	Dyn	Stat	
	6	2.0	SMR63	2.5	SMR63ZZ		18	6	80
	6			3.0	SMR63ZZW3		18	6	71
	7	2.0	S683	3.0	S683ZZ		26	9	75
	8	2.5	SMR83	3.0	SMR83ZZ		34	11	67
3	8	3.0	S693	4.0	S693ZZ		46	14	67
	9	2.5	SMR93	4.0	SMR93ZZ		48	15	67
	9	3.0	S603	5.0	S603ZZ		48	15	67
	10	4.0	S623	4.0	S623ZZ	S623-2RS	52	18	60
	13	5.0	S633	5.0	S633ZZ	S633-2RS	110	42	45
	7	2.0	SMR74	2.5	SMR74ZZ		25	9	67
	8	2.0	SMR84	3.0	SMR84ZZ		31	11	67
	9			3.5	S684ZZW35		52	18	55
	9	2.5	S684	4.0	S684ZZ	S684-2RS	52	18	62
4	10	3.0	SMR104	4.0	SMR104ZZ		60	23	54
	11	4.0	S694	4.0	S694ZZ	S694-2RS	81	29	54
	12	4.0	S604	4.0	S604ZZ	S604-2RS	81	29	54
	13	5.0	S624	5.0	S624ZZ	S624-2RS	108	40	50
	16	5.0	S634	5.0	S634ZZ	S634-2RS	111	42	41

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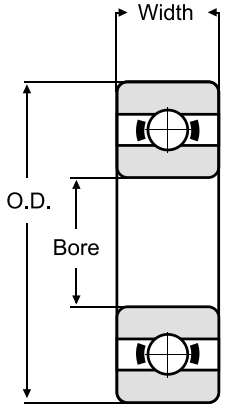

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Bore	O.D.	Open Bearing		Shielded and Sealed Bearing			Max Load (kgf)		Rpm ** (x1000)
		Width	SMB Reference	Width	SMB Shielded Reference	SMB Sealed Reference *	Dyn	Stat	
	8	2.0	SMR85	2.5	SMR85ZZ		23	8	63
	8			3.0	SMR85ZZW3		23	8	53
	9	2.5	SMR95	3.0	SMR95ZZ		36	13	60
	10	3.0	SMR105	4.0	SMR105ZZ	SMR105-2RS	36	13	60
	11			4.0	SMR115ZZ	SMR115-2RS	61	23	45
5	11	3.0	S685	5.0	S685ZZ	S685-2RS	61	23	53
	13	4.0	S695	4.0	S695ZZ	S695-2RS	87	33	48
	13			5.0	S695ZZW5	S695-2RSW5	87	33	42
	14	5.0	S605	5.0	S605ZZ	S605-2RS	110	41	48
	16	5.0	S625	5.0	S625ZZ	S625-2RS	142	54	43
	19	6.0	S635	6.0	S635ZZ	S635-2RS	198	72	38
	10	2.5	SMR106	3.0	SMR106ZZ	SMR106-2RS	41	16	52
	12	3.0	SMR126	4.0	SMR126ZZ	SMR126-2RS	59	23	49
	13			4.5	S686ZZW45	S686-2RSW45	87	33	42
	13	3.5	S686	5.0	S686ZZ	S686-2RS	87	33	49
6	15	5.0	S696	5.0	S696ZZ	S696-2RS	114	42	45
	16			5.0	S696AZZ	S696A-2RS	114	42	40
	17	6.0	S606	6.0	S606ZZ	S606-2RS	192	67	45
	19	6.0	S626	6.0	S626ZZ	S626-2RS	197	71	40
	22	7.0	S636	7.0	S636ZZ	S636-2RS	279	111	35

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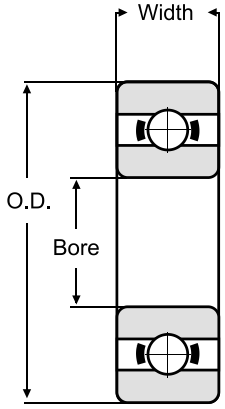


STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Open Bearing		Shielded and Sealed Bearing			Max Load (kgf)		Rpm ** (x1000)
		Width	SMB Reference	Width	SMB Shielded Reference	SMB Sealed Reference *	Dyn	Stat	
7	11	2.5	SMR117	3.0	SMR117ZZ		37	16	50
	13	3.0	SMR137	4.0	SMR137ZZ		46	21	48
	14	3.5	S687	5.0	S687ZZ	S687-2RS	98	41	50
	17	5.0	S697	5.0	S697ZZ	S697-2RS	136	57	43
	19	6.0	S607	6.0	S607ZZ	S607-2RS	193	69	43
	22	7.0	S627	7.0	S627ZZ	S627-2RS	278	109	36
8	12	2.5	SMR128	3.5	SMR128ZZ		46	21	48
	14	3.5	SMR148	4.0	SMR148ZZ		68	30	45
	16			4.0	S688ZZW4	S688-2RSW4	105	47	36
	16	4.0	S688	5.0	S688ZZ	S688-2RS	105	47	43
	16			6.0	S688ZZW6	S688-2RSW6	105	47	36
	19	6.0	S698	6.0	S698ZZ	S698-2RS	188	71	43
	22	7.0	S608	7.0	S608ZZ	S608-2RS	278	109	39
	24	8.0	S628	8.0	S628ZZ	S628-2RS	281	111	34
9	14	3.0	S679	4.5	S679ZZ		79	38	42
	17	4.0	S689	5.0	S689ZZ	S689-2RS	112	54	43
	17			6.0	S689ZZW6	S689-2RSW6	112	54	36
	20	6.0	S699	6.0	S699ZZ	S699-2RS	209	84	40
	24	7.0	S609	7.0	S609ZZ	S609-2RS	288	115	38
	26	8.0	S629	8.0	S629ZZ	S629-2RS	388	158	34

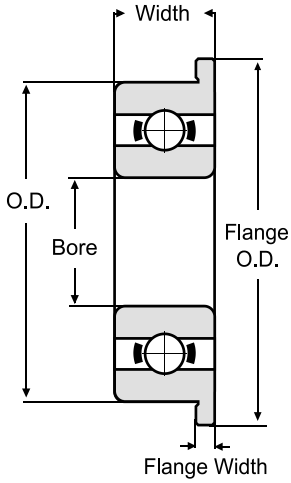
** Some sizes available with non-contact seals or teflon seals*

*** Rpm may be lower for ZZ and 2RS types.*

Metric Flanged Miniature Series

Chrome steel flanged miniature bearings for radial loads and moderate thrust loads in both directions.

The flange allows easier location in a housing. The smaller sizes are sometimes referred to as instrument bearings or micro bearings. These bearings are supplied in SAE52100 chrome steel. For load and speed ratings, please see the non-flanged type.



CHROME STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Flange O.D.	Open Bearing			Shielded and Sealed Bearing			
			Width	Flange Width	SMB Reference	Width	Flange Width	SMB Shielded Reference	SMB Sealed Reference **
2	5	6.1	1.5	0.5	F682	2.3	0.6	F682ZZ	
	5	6.2	2.0	0.6	MF52	2.5	0.6	MF52ZZ	
	6	7.5	2.3	0.6	F692	3.0	0.8	F692ZZ	
	6	7.5				2.3	0.6	F692ZZW23	
	6	7.2	2.5	0.6	MF62	2.5	0.6	MF62ZZ	
	7	8.2	2.5	0.6	MF72	3.0	0.6	MF72ZZ	
	7	8.5	2.8	0.7	F602	3.5	0.9	F602ZZ	
2.5	6	7.1	1.8	0.5	F682X	2.6	0.8	F682XZZ	
	7	8.5	2.5	0.7	F692X	3.5	0.9	F692XZZ	
	8	9.2	2.5	0.6	MF82X				
	8	9.5	2.8	0.7	F602X	4.0	0.9	F602XZZ	
3	6	7.2	2.0	0.6	MF63	2.5	0.6	MF63ZZ	
	7	8.1	2.0	0.5	F683	3.0	0.8	F683ZZ	
	8	9.2	2.5	0.6	MF83				
	8	9.5	3.0	0.7	F693	4.0	0.9	F693ZZ	
	9	*10.2	2.5	0.6	MF93	4.0	0.8	MF93ZZ	
	9	10.5	3.0	0.7	F603	5.0	1.0	F603ZZ	
	10	11.5	4.0	1.0	F623	4.0	1.0	F623ZZ	

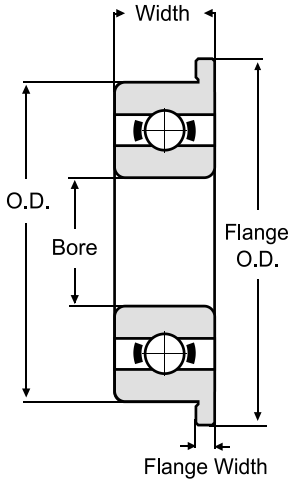
** Flange diameter 0.4 mm greater for shielded bearing.*

***Some sizes available with non-contact seals or teflon seals*

Metric Flanged Miniature Series

Chrome steel flanged miniature bearings for radial loads and moderate thrust loads in both directions.

The flange allows easier location in a housing. The smaller sizes are sometimes referred to as instrument bearings or micro bearings. These bearings are supplied in SAE52100 chrome steel. For load and speed ratings, please see the non-flanged type.



CHROME STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Flange O.D.	Open Bearing			Shielded and Sealed Bearing			
			Width	Flange Width	SMB Reference	Width	Flange Width	SMB Shielded Reference	SMB Sealed Reference **
4	7	8.2	2.0	0.6	MF74	2.5	0.6	MF74ZZ	
	8	9.2	2.0	0.6	MF84	3.0	0.6	MF84ZZ	
	9	10.3				3.5	1.0	F684ZZW35	
	9	10.3	2.5	0.6	F684	4.0	1.0	F684ZZ	F684-2RS
	10	*11.2	3.0	0.6	MF104	4.0	0.8	MF104ZZ	
	11	12.5	4.0	1.0	F694	4.0	1.0	F694ZZ	F694-2RS
	12	13.5	4.0	1.0	F604	4.0	1.0	F604ZZ	F604-2RS
	13	15.0	5.0	1.0	F624	5.0	1.0	F624ZZ	F624-2RS
	16	18.0	5.0	1.0	F634	5.0	1.0	F634ZZ	F634-2RS
5	8	9.2	2.0	0.6	MF85	2.5	0.6	MF85ZZ	
	9	10.2	2.5	0.6	MF95	3.0	0.6	MF95ZZ	
	10	*11.2	3.0	0.6	MF105	4.0	0.8	MF105ZZ	MF105-2RS
	11	12.6				4.0	0.8	MF115ZZ	MF115-2RS
	11	12.5	3.0	0.8	F685	5.0	1.0	F685ZZ	F685-2RS
	13	15.0	4.0	1.0	F695	4.0	1.0	F695ZZ	F695-2RS
	13	15.0				5.0	1.0	F695ZZW5	
	14	16.0	5.0	1.0	F605	5.0	1.0	F605ZZ	F605-2RS
	16	18.0	5.0	1.0	F625	5.0	1.0	F625ZZ	F625-2RS
	19	22.0	6.0	1.5	F635	6.0	1.5	F635ZZ	F635-2RS

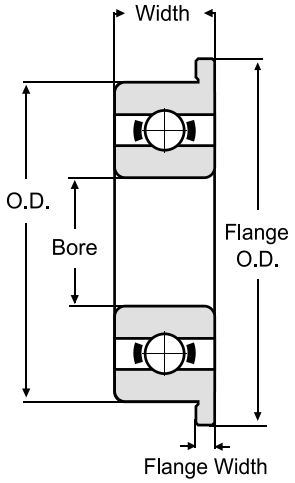
** Flange diameter 0.4 mm greater for shielded bearing.*

***Some sizes available with non-contact seals or teflon seals*

Metric Flanged Miniature Series

Chrome steel flanged miniature bearings for radial loads and moderate thrust loads in both directions.

The flange allows easier location in a housing. The smaller sizes are sometimes referred to as instrument bearings or micro bearings. These bearings are supplied in SAE52100 chrome steel. For load and speed ratings, please see the non-flanged type.



CHROME STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Flange O.D.	Open Bearing			Shielded and Sealed Bearing			
			Width	Flange Width	SMB Reference	Width	Flange Width	SMB Shielded Reference	SMB Sealed Reference **
	10	11.2	2.5	0.6	MF106	3.0	0.6	MF106ZZ	MF106-2RS
	12	*13.2	3.0	0.6	MF126	4.0	0.8	MF126ZZ	MF126-2RS
	13	15.0				4.5	1.1	F686ZZW45	F686-2RSW45
6	13	15.0	3.5	1.0	F686	5.0	1.1	F686ZZ	F686-2RS
	15	17.0	5.0	1.2	F696	5.0	1.2	F696ZZ	F696-2RS
	17	19.0	6.0	1.2	F606	6.0	1.2	F606ZZ	F606-2RS
	19	22.0	6.0	1.5	F626	6.0	1.5	F626ZZ	F626-2RS
	11	12.2	2.5	0.6	MF117	3.0	0.6	MF117ZZ	
	13	*14.2	3.0	0.6	MF137	4.0	0.8	MF137ZZ	
	14	16.0	3.5	1.0	F687	5.0	1.1	F687ZZ	F687-2RS
7	17	19.0	5.0	1.2	F697	5.0	1.2	F697ZZ	F697-2RS
	19	22.0	6.0	1.5	F607	6.0	1.5	F607ZZ	F607-2RS
	22	25.0	7.0	1.5	F627	7.0	1.5	F627ZZ	F627-2RS
	12	*13.2	2.5	0.6	MF128	3.5	0.8	MF128ZZ	
	14	15.6	3.5	0.8	MF148	4.0	0.8	MF148ZZ	
	16	18.0	4.0	1.0	F688	5.0	1.1	F688ZZ	F688-2RS
8	16	18.0				6.0	1.1	F688ZZW6	F688-2RSW6
	19	22.0	6.0	1.5	F698	6.0	1.5	F698ZZ	F698-2RS
	22	25.0	7.0	1.5	F608	7.0	1.5	F608ZZ	F608-2RS
	17	19.0	4.0	1.0	F689	5.0	1.1	F689ZZ	F689-2RS
9	17	19.0				6.0	1.1	F689ZZW6	F689-2RSW6
	20	23.0	6.0	1.5	F699	6.0	1.5	F699ZZ	F699-2RS

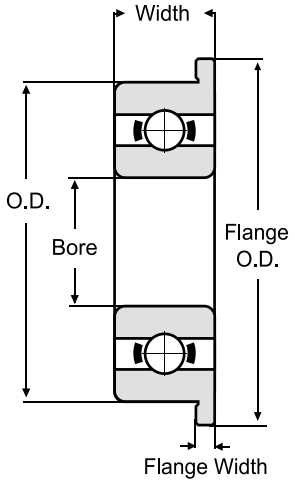
** Flange diameter 0.4 mm greater for shielded bearing.*

***Some sizes available with non-contact seals or teflon seals*

Metric Stainless Steel Flanged Miniature Series

Corrosion resistant flanged miniature bearings for radial loads and moderate thrust loads in both directions.

The flange allows easier location in a housing. The smaller sizes are sometimes referred to as instrument bearings or micro bearings. These bearings are supplied in AISI440C or KS440 (ACD34/X65Cr13) stainless steel. For load and speed ratings, please see the non-flanged type.



STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Flange O.D.	Open Bearing			Shielded and Sealed Bearing			
			Width	Flange Width	SMB Reference	Width	Flange Width	SMB Shielded Reference	SMB Sealed Reference **
1	3	3.8	1.0	0.3	SF681				
	4	5.0	1.6	0.5	SF691				
1.5	4	5.0	1.2	0.4	SF681X	2.0	0.6	SF681XZZ	
	5	6.5	2.0	0.6	SF691X	2.6	0.8	SF691XZZ	
	6	7.5	2.5	0.6	SF601X	3.0	0.8	SF601XZZ	
2	5	6.1	1.5	0.5	SF682	2.3	0.6	SF682ZZ	
	5	6.2	2.0	0.6	SMF52	2.5	0.6	SMF52ZZ	
	6	7.5				2.3	0.6	SF692ZZW23	
	6	7.5	2.3	0.6	SF692	3.0	0.8	SF692ZZ	
	7	8.5	2.8	0.7	SF602	3.5	0.9	SF602ZZ	
2.5	6	7.1	1.8	0.5	SF682X	2.6	0.8	SF682XZZ	
	7	8.5	2.5	0.7	SF692X	3.5	0.9	SF692XZZ	
	8	9.5	2.8	0.7	SF602X	4.0	0.9	SF602XZZ	
3	6	7.2	2.0	0.6	SMF63	2.5	0.6	SMF63ZZ	
	7	8.1	2.0	0.5	SF683	3.0	0.8	SF683ZZ	
	8	9.2	2.5	0.6	SMF83	3.0	0.7	SMF83ZZ	
	8	9.5	3.0	0.7	SF693	4.0	0.9	SF693ZZ	
	9	*10.2	2.5	0.6	SMF93	4.0	0.8	SMF93ZZ	
	9	10.5	3.0	0.7	SF603	5.0	1.0	SF603ZZ	
	10	11.5	4.0	1.0	SF623	4.0	1.0	SF623ZZ	SF623-2RS

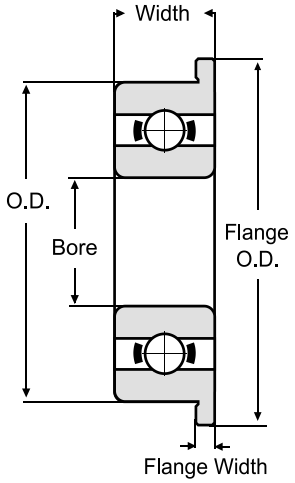
** Flange diameter 0.4 mm greater for shielded bearing.*

***Some sizes available with non-contact seals or teflon seals*

Metric Stainless Steel Flanged Miniature Series

Corrosion resistant flanged miniature bearings for radial loads and moderate thrust loads in both directions.

The flange allows easier location in a housing. The smaller sizes are sometimes referred to as instrument bearings or micro bearings. These bearings are supplied in AISI440C or KS440 (ACD34/X65Cr13) stainless steel. For load and speed ratings, please see the non-flanged type.



STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Flange O.D.	Open Bearing			Shielded and Sealed Bearing			
			Width	Flange Width	SMB Reference	Width	Flange Width	SMB Shielded Reference	SMB Sealed Reference **J8
	7	8.2	2.0	0.6	SMF74	2.5	0.6	SMF74ZZ	
	8	9.2	2.0	0.6	SMF84	3.0	0.6	SMF84ZZ	
	9	10.3				3.5	1.0	SF684ZZW35	
	9	10.3	2.5	0.6	SF684	4.0	1.0	SF684ZZ	SF684-2RS
4	10	*11.2	3.0	0.6	SMF104	4.0	0.8	SMF104ZZ	
	11	12.5	4.0	1.0	SF694	4.0	1.0	SF694ZZ	SF694-2RS
	12	13.5	4.0	1.0	SF604	4.0	1.0	SF604ZZ	SF604-2RS
	13	15.0	5.0	1.0	SF624	5.0	1.0	SF624ZZ	SF624-2RS
	16	18.0	5.0	1.0	SF634	5.0	1.0	SF634ZZ	SF634-2RS
	8	9.2	2.0	0.6	SMF85	2.5	0.6	SMF85ZZ	
	9	10.2	2.5	0.6	SMF95	3.0	0.6	SMF95ZZ	
	10	*11.2	3.0	0.6	SMF105	4.0	0.8	SMF105ZZ	SMF105-2RS
	11	12.6				4.0	0.8	SMF115ZZ	SMF115-2RS
5	11	12.5	3.0	0.8	SF685	5.0	1.0	SF685ZZ	SF685-2RS
	13	15.0	4.0	1.0	SF695	4.0	1.0	SF695ZZ	SF695-2RS
	14	16.0	5.0	1.0	SF605	5.0	1.0	SF605ZZ	SF605-2RS
	16	18.0	5.0	1.0	SF625	5.0	1.0	SF625ZZ	SF625-2RS
	19	22.0	6.0	1.5	SF635	6.0	1.5	SF635ZZ	SF635-2RS

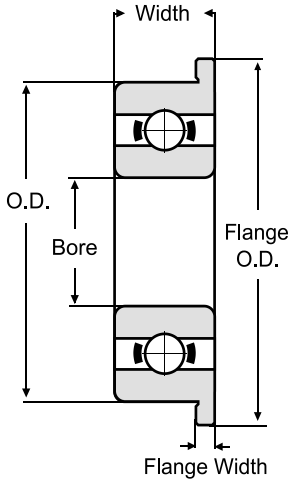
** Flange diameter 0.4 mm greater for shielded bearing.*

***Some sizes available with non-contact seals or teflon seals*

Metric Stainless Steel Flanged Miniature Series

Corrosion resistant flanged miniature bearings for radial loads and moderate thrust loads in both directions.

The flange allows easier location in a housing. The smaller sizes are sometimes referred to as instrument bearings or micro bearings. These bearings are supplied in AISI440C or KS440 (ACD34/X65Cr13) stainless steel. For load and speed ratings, please see the non-flanged type.



STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Flange O.D.	Open Bearing			Shielded and Sealed Bearing			
			Width	Flange Width	SMB Reference	Width	Flange Width	SMB Shielded Reference	SMB Sealed Reference **J8
	10	11.2	2.5	0.6	SMF106	3.0	0.6	SMF106ZZ	SMF106-2RS
	12	*13.2	3.0	0.6	SMF126	4.0	0.8	SMF126ZZ	SMF126-2RS
	13	15.0				4.5	1.1	SF686ZZW45	SF686-2RSW45
6	13	15.0	3.5	1.0	SF686	5.0	1.1	SF686ZZ	SF686-2RS
	15	17.0	5.0	1.2	SF696	5.0	1.2	SF696ZZ	SF696-2RS
	17	19.0	6.0	1.2	SF606	6.0	1.2	SF606ZZ	SF606-2RS
	19	22.0	6.0	1.5	SF626	6.0	1.5	SF626ZZ	SF626-2RS
	11	12.2	2.5	0.6	SMF117	3.0	0.6	SMF117ZZ	
	13	*14.2	3.0	0.6	SMF137	4.0	0.8	SMF137ZZ	
7	14	16.0	3.5	1.0	SF687	5.0	1.1	SF687ZZ	SF687-2RS
	17	19.0	5.0	1.2	SF697	5.0	1.2	SF697ZZ	SF697-2RS
	19	22.0	6.0	1.5	SF607	6.0	1.5	SF607ZZ	SF607-2RS
	12	*13.2	2.5	0.6	SMF128	3.5	0.8	SMF128ZZ	
	14	15.6	3.5	0.8	SMF148	4.0	0.8	SMF148ZZ	
	16	18.0	4.0	1.0	SF688	5.0	1.1	SF688ZZ	SF688-2RS
8	16	18.0				6.0	1.1	SF688ZZW6	SF688-2RSW6
	19	22.0	6.0	1.5	SF698	6.0	1.5	SF698ZZ	SF698-2RS
	22	25.0	7.0	1.5	SF608	7.0	1.5	SF608ZZ	SF608-2RS
	17	19.0	4.0	1.0	SF689	5.0	1.1	SF689ZZ	SF689-2RS
9	17	19.0				6.0	1.1	SF689ZZW6	SF689-2RSW6
	20	23.0	6.0	1.5	SF699	6.0	1.5	SF699ZZ	SF699-2RS

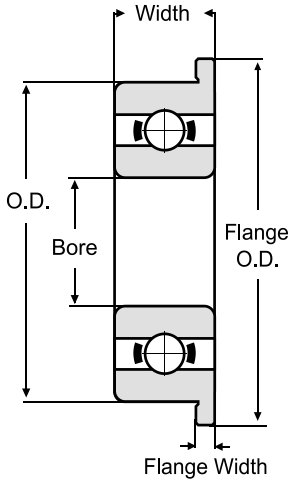
** Flange diameter 0.4 mm greater for shielded bearing.*

***Some sizes available with non-contact seals or teflon seals*

Metric Thin-Section Series

Chrome steel thin section bearings for radial loads and moderate thrust loads in both directions.

Thin section bearings are used in instrumentation or as robotics bearings, aerospace bearings, medical equipment bearings, camera and optical equipment bearings and any industrial application where space is at a premium or weight reduction is required. These bearings are supplied in SAE52100 chrome steel.



CHROME STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Shielded Bearing	Sealed Bearing *	Max Load (kgf)		Rpm ** (x1000)
			SMB Reference	SMB Reference	SMB Reference	Dyn	Stat	
10	15	3	6700			85	43	17
	15	4		6700ZZ	6700-2RS	85	43	15
	19	5	6800	6800ZZ	6800-2RS	172	84	43
	19	6		6800ZZW6	6800-2RSW6	172	84	37
	19	7		6800ZZW7	6800-2RSW7	172	84	37
	22	6	6900	6900ZZ	6900-2RS	269	127	41
12	18	4	6701	6701ZZ	6701-2RS	93	53	15
	21	5	6801	6801ZZ	6801-2RS	191	104	39
	21	7		6801ZZW7	6801-2RSW7	191	104	32
	24	6	6901	6901ZZ	6901-2RS	288	146	36
13	24	6	6901-TW13			288	146	57
14	25	6	6901A-TW14			280	140	57
15	20	3.5	ET2015			94	58	13
	21	3.5	ET2115			94	58	13
	21	4	6702	6702ZZ	6702-2RS	94	58	13
	24	5	6802	6802ZZ	6802-2RS	207	125	33
	24	7		6802ZZW7	6802-2RSW7	207	125	28
	28	7	6902	6902ZZ	6902-2RS	428	223	28
16	22	4	ET2216			97	62	11
17	23	4	6703	6703ZZ	6703-2RS	100	65	11
	26	5	6803	6803ZZ	6803-2RS	219	144	30
	26	7		6803ZZW7	6803-2RSW7	219	144	26
	30	7	6903	6903ZZ	6903-2RS	453	256	25
	32	8	6903A	6903AZZ		453	256	25

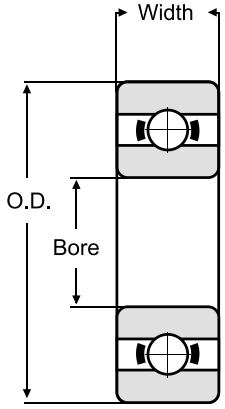
** Some sizes available with non-contact seals or teflon seals*

*** Rpm may be lower for ZZ and 2RS types.*

Metric Thin-Section Series

Chrome steel thin section bearings for radial loads and moderate thrust loads in both directions.

Thin section bearings are used in instrumentation or as robotics bearings, aerospace bearings, medical equipment bearings, camera and optical equipment bearings and any industrial application where space is at a premium or weight reduction is required. These bearings are supplied in SAE52100 chrome steel.



CHROME STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Shielded Bearing	Sealed Bearing *	Max Load (kgf)		Rpm ** (x1000)
			SMB Reference	SMB Reference	SMB Reference	Dyn	Stat	
20	25	4	ET2520	ET2520ZZ		101	69	10
	27	4	6704	6704ZZ	6704-2RS	104	72	10
	32	7	6804	6804ZZ	6804-2RS	398	244	24
	32	10	6804W10	6804ZZW10	6804-2RSW10	398	244	24
	37	9	6904	6904ZZ	6904-2RS	628	364	22
25	32	4	6705	6705ZZ	6705-2RS	109	84	8
	37	7	6805	6805ZZ	6805-2RS	426	289	20
	37	10	6805W10	6805ZZW10	6805-2RSW10	426	289	20
	42	9	6905	6905ZZ	6905-2RS	689	447	18
30	37	4	6706	6706ZZ	6706-2RS	113	95	7
	42	7	6806	6806ZZ	6806-2RS	455	339	18
	42	10	6806W10	6806ZZW10	6806-2RSW10	455	339	18
	47	9	6906	6906ZZ	6906-2RS	721	499	17
35	44	5	6707	6707ZZ	6707-2RS	182	163	6
	47	7	6807	6807ZZ	6807-2RS	469	381	16
	55	10	6907	6907ZZ	6907-2RS	1090	781	14
40	50	6	6708		6708-2RS	249	221	5
	52	7	6808	6808ZZ	6808-2RS	492	416	14
	62	12	6908	6908ZZ	6908-2RS	1358	992	13
45	55	6	6709		6709-2RS	258	239	5
	58	7	6809	6809ZZ	6809-2RS	618	538	12
	68	12	6909	6909ZZ	6909-2RS	1380	1082	11

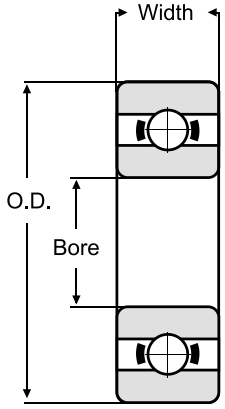
** Some sizes available with non-contact seals or teflon seals*

*** Rpm may be lower for ZZ and 2RS types.*

Metric Thin-Section Series

Chrome steel thin section bearings for radial loads and moderate thrust loads in both directions.

Thin section bearings are used in instrumentation or as robotics bearings, aerospace bearings, medical equipment bearings, camera and optical equipment bearings and any industrial application where space is at a premium or weight reduction is required. These bearings are supplied in SAE52100 chrome steel.



CHROME STEEL ***Dimensions in mm unless otherwise specified***

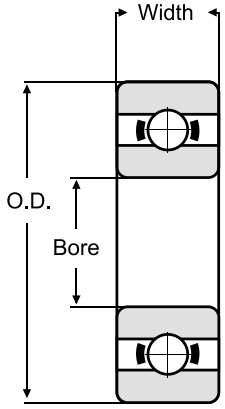
Bore	O.D.	Width	Open Bearing	Shielded Bearing	Sealed Bearing *	Max Load (kgf)		Rpm ** (x1000)
			SMB Reference	SMB Reference	SMB Reference	Dyn	Stat	
50	62	6	6710		6710-2RS	267	264	4
	65	7	6810	6810ZZ	6810-2RS	647	576	11
	72	12	6910	6910ZZ	6910-2RS	1410	1103	10
55	72	9	6811	6811ZZ	6811-2RS	880	810	10
	80	13	6911	6911ZZ	6911-2RS	1660	1410	10
60	78	10	6812	6812ZZ	6812-2RS	1150	1060	9
	85	13	6912	6912ZZ	6912-2RS	2020	1730	9
65	85	10	6813	6813ZZ	6813-2RS	1190	1150	9
	90	13	6913	6913ZZ	6913-2RS	1740	1610	8
70	90	10	6814	6814ZZ	6814-2RS	1210	1190	8
	100	16	6914	6914ZZ	6914-2RS	2370	2120	8
75	95	10	6815	6815ZZ	6815-2RS	1290	1250	8
	100	16	6915	6915ZZ	6915-2RS	2440	2260	7
80	100	10	6816	6816ZZ	6816-2RS	1330	1270	7
	110	16	6916	6916ZZ	6916-2RS	2500	2400	7
85	110	13	6817	6817ZZ	6817-2RS	1900	1870	7
	120	18	6917	6917ZZ	6917-2RS	3190	2960	6
90	115	13	6818	6818ZZ	6818-2RS	1970	1900	6
	125	18	6918	6918ZZ	6918-2RS	3280	3160	6

* *Some sizes available with non contact seals.*
** *Rpm may be lower for ZZ and 2RS types*

Metric Stainless Steel Thin-Section Series

Corrosion resistant thin section bearings for radial loads and moderate thrust loads in both directions.

Thin section bearings are used in instrumentation or as robotics bearings, aerospace bearings, medical equipment bearings, camera and optical equipment bearings and any industrial application where space is at a premium or weight reduction is required. These bearings are supplied in AISI440C or KS440 stainless steel.



STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

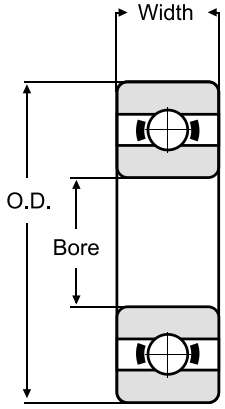
Bore	O.D.	Width	Open Bearing	Shielded Bearing	Sealed Bearing *	Max Load (kgf)		Rpm ** (x1000)
			SMB Reference	SMB Reference	SMB Reference	Dyn	Stat	
10	15	3	S6700			71	34	17
	15	4		S6700ZZ	S6700-2RS	71	34	17
	19	5	S6800	S6800ZZ	S6800-2RS	147	67	43
	19	6		S6800ZZW6		147	67	37
	19	7		S6800ZZW7	S6800-2RSW7	147	67	37
	22	6	S6900	S6900ZZ	S6900-2RS	229	102	41
12	18	4	S6701	S6701ZZ	S6701-2RS	76	43	15
	21	5	S6801	S6801ZZ	S6801-2RS	160	87	39
	21	7		S6801ZZW7	S6801-2RSW7	160	87	32
	24	6	S6901	S6901ZZ	S6901-2RS	245	117	36
15	21	4	S6702	S6702ZZ	S6702-2RS	79	48	13
	24	5	S6802	S6802ZZ	S6802-2RS	176	101	33
	24	7		S6802ZZW7	S6802-2RSW7	176	101	28
	28	7	S6902	S6902ZZ	S6902-2RS	364	178	28
17	23	4	S6703	S6703ZZ	S6703-2RS	85	52	11
	26	5	S6803	S6803ZZ	S6803-2RS	186	115	30
	26	7		S6803ZZW7	S6803-2RSW7	186	115	26
	30	7	S6903	S6903ZZ	S6903-2RS	385	205	25
20	25	4	SET2520	SET2520ZZ		82	52	10
	27	4	S6704	S6704ZZ	S6704-2RS	88	57	10
	32	7	S6804	S6804ZZ	S6804-2RS	338	195	24
	37	9	S6904	S6904ZZ	S6904-2RS	533	291	22

** Some sizes available with non-contact seals or teflon seals*
*** Rpm may be lower for ZZ and 2RS types.*

Metric Stainless Steel Thin-Section Series

Corrosion resistant thin section bearings for radial loads and moderate thrust loads in both directions.

Thin section bearings are used in instrumentation or as robotics bearings, aerospace bearings, medical equipment bearings, camera and optical equipment bearings and any industrial application where space is at a premium or weight reduction is required. These bearings are supplied in AISI440C or KS440 stainless steel.



STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

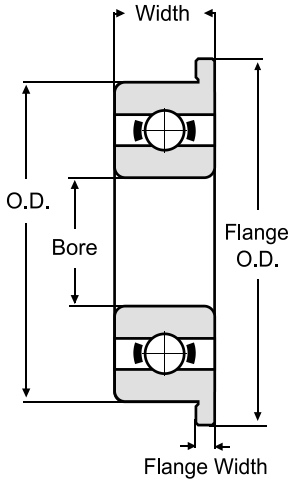
Bore	O.D.	Width	Open Bearing	Shielded Bearing	Sealed Bearing *	Max Load (kgf)		Rpm ** (x1000)
			SMB Reference	SMB Reference	SMB Reference	Dyn	Stat	
25	32	4	S6705		S6705-2RS	93	67	8
	37	7	S6805	S6805ZZ	S6805-2RS	362	231	20
	42	9	S6905	S6905ZZ	S6905-2RS	586	358	18
30	37	4	S6706		S6706-2RS	96	76	7
	42	7	S6806	S6806ZZ	S6806-2RS	387	231	18
	47	9	S6906	S6906ZZ	S6906-2RS	613	399	17
35	44	5	S6707		S6707-2RS	159	131	6
	47	7	S6807	S6807ZZ	S6807-2RS	399	305	16
	55	10	S6907	S6907ZZ	S6907-2RS	926	624	14
40	50	6	S6708		S6708-2RS	212	177	5
	52	7	S6808	S6808ZZ	S6808-2RS	418	332	14
	62	12	S6908	S6908ZZ	S6908-2RS	1154	794	13
45	58	7	S6809	S6809ZZ	S6809-2RS	524	431	12
	68	12	S6909	S6909ZZ	S6909-2RS	1173	866	11
50	65	7	S6810	S6810ZZ	S6810-2RS	550	461	11
	72	12	S6910	S6910ZZ	S6910-2RS	1199	882	10

* *Some sizes available with non contact seals.*
** *Rpm may be lower for ZZ and 2RS types*

Metric Flanged Thin-Section Series

Flanged thin section bearings for radial loads and moderate thrust loads in both directions.

Thin section bearings are used in instrumentation or as robotics bearings, aerospace bearings, medical equipment bearings, camera and optical equipment bearings and any industrial application where space is at a premium or weight reduction is required. These bearings are supplied in SAE52100 chrome steel. For load and speed ratings, please see the non-flanged type.



CHROME STEEL ***Dimensions in mm unless otherwise specified***

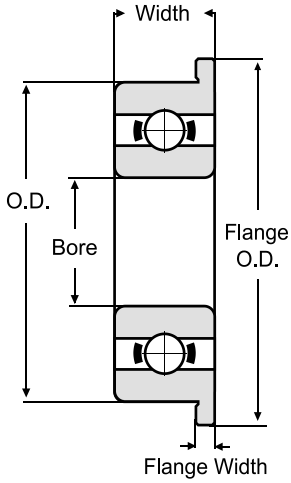
Bore	O.D.	Flange O.D.	Width	Flange Width	Open Bearing	Shielded Bearing	Sealed Bearing
					SMB Reference	SMB Reference	SMB Reference *
10	15	16.5	3	0.8	F6700		
	15	16.5	4	0.8		F6700ZZ	F6700-2RS
	19	21.0	5	1.0	F6800	F6800ZZ	F6800-2RS
	19	21.0	7	1.5		F6800ZZW7	F6800-2RSW7
	22	25.0	6	1.5	F6900	F6900ZZ	F6900-2RS
12	18	19.5	4	0.8	F6701	F6701ZZ	F6701-2RS
	21	23.0	5	1.1	F6801	F6801ZZ	F6801-2RS
	21	23.0	7	1.5		F6801ZZW7	F6801-2RSW7
	24	26.5	6	1.5	F6901	F6901ZZ	F6901-2RS
15	21	22.5	4	0.8	F6702	F6702ZZ	F6702-2RS
	24	26.0	5	1.1	F6802	F6802ZZ	F6802-2RS
	24	26.0	7	1.5		F6802ZZW7	F6802-2RSW7
	28	30.5	7	1.5	F6902	F6902ZZ	F6902-2RS
17	23	24.5	4	0.8	F6703	F6703ZZ	F6703-2RS
	26	28.0	5	1.1	F6803	F6803ZZ	F6803-2RS
	26	28.0	7	1.5		F6803ZZW7	F6803-2RSW7
	30	32.5	7	1.5	F6903	F6903ZZ	F6903-2RS
20	27	28.5	4	0.8	F6704	F6704ZZ	F6704-2RS
	32	35.0	7	1.5	F6804	F6804ZZ	F6804-2RS
	37	40.0	9	2.0	F6904	F6904ZZ	F6904-2RS
25	32	34.0	4	1.0	F6705	F6705ZZ	F6705-2RS
	37	40.0	7	1.5	F6805	F6805ZZ	F6805-2RS
	42	45.0	9	2.0	F6905	F6905ZZ	F6905-2RS

* *Some sizes available with non contact seals or teflon seals.*

Metric Flanged Thin-Section Series

Flanged thin section bearings for radial loads and moderate thrust loads in both directions.

Thin section bearings are used in instrumentation or as robotics bearings, aerospace bearings, medical equipment bearings, camera and optical equipment bearings and any industrial application where space is at a premium or weight reduction is required. These bearings are supplied in SAE52100 chrome steel. For load and speed ratings, please see the non-flanged type.



CHROME STEEL ***Dimensions in mm unless otherwise specified***

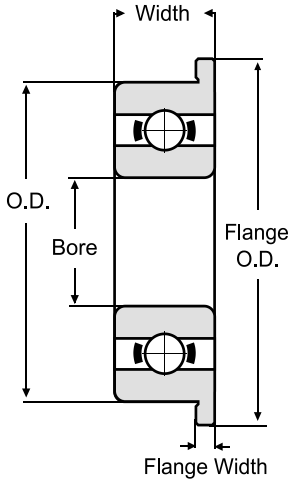
Bore	O.D.	Flange O.D.	Width	Flange Width	Open Bearing	Shielded Bearing	Sealed Bearing
					SMB Reference	SMB Reference	SMB Reference *
30	37	39.0	4	1.0	F6706	F6706ZZ	F6706-2RS
	42	45.0	7	1.5	F6806	F6806ZZ	F6806-2RS
	47	50.0	9	2.0	F6906	F6906ZZ	F6906-2RS

* ***Some sizes available with non contact seals or teflon seals.***

Metric Stainless Steel Flanged Thin-Section Series

Flanged thin section bearings for radial loads and moderate thrust loads in both directions.

Thin section bearings are used in instrumentation or as robotics bearings, aerospace bearings, medical equipment bearings, camera and optical equipment bearings and any industrial application where space is at a premium or weight reduction is required. These bearings are supplied in AISI440C or KS440 stainless steel. For load and speed ratings, please see the non-flanged type.



STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

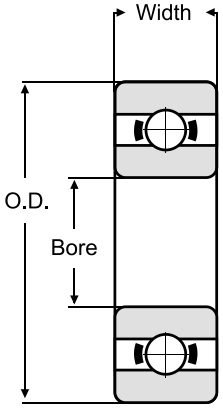
Bore	O.D.	Flange O.D.	Width	Flange Width	Open Bearing	Shielded Bearing	Sealed Bearing
					SMB Reference	SMB Reference	SMB Reference *
	15	16.5	3	0.8	SF6700		
	15	16.5	4	0.8		SF6700ZZ	SF6700-2RS
10	19	21.0	5	1.0	SF6800	SF6800ZZ	SF6800-2RS
	19	21.0	7	1.5		SF6800ZZW7	SF6800-2RSW7
	22	25.0	6	1.5	SF6900	SF6900ZZ	SF6900-2RS
	18	19.5	4	0.8	SF6701	SF6701ZZ	
12	21	23.0	5	1.1	SF6801	SF6801ZZ	SF6801-2RS
	24	26.5	6	1.5	SF6901	SF6901ZZ	SF6901-2RS
	21	22.5	4	0.8	SF6702	SF6702ZZ	
15	24	26.0	5	1.1	SF6802	SF6802ZZ	SF6802-2RS
	28	30.5	7	1.5	SF6902	SF6902ZZ	SF6902-2RS

* *Some sizes available with non contact seals or teflon seals.*

Popular Metric Series

Chrome steel ball bearings in popular metric sizes for radial loads and moderate thrust loads in both directions.

These are deep groove radial ball bearings in the most popular sizes, hence the term "popular metric bearings". These bearings are supplied in SAE52100 chrome steel.6202-16



CHROME STEEL *Dimensions in mm unless otherwise specified*

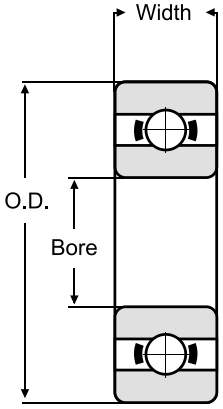
Bore	O.D.	Width	Open Bearing	Shielded Bearing	Sealed Bearing *	Max Load (kgf)		Rpm **(x1000)
			SMB Reference	SMB Reference	SMB Reference	Dyn	Stat	
10	26	8	6000	6000ZZ	6000-2RS	464	200	36
	28	8	16100	16100ZZ	16100-2RS	489	214	32
	30	9	6200	6200ZZ	6200-2RS	521	245	29
	35	11	6300	6300ZZ	6300-2RS	825	351	27
12	28	7	16001	16001ZZ	16001-2RS	521	244	31
	28	8	6001	6001ZZ	6001-2RS	521	244	32
	30	8	16101	16101ZZ	16101-2RS	693	312	29
	32	10	6201	6201ZZ	6201-2RS	693	312	27
	37	12	6301	6301ZZ	6301-2RS	989	428	25
12.7	28	8	6001-1/2	6001ZZ-1/2	6001-2RS-1/2	521	244	32
	32	10	6201-1/2	6201ZZ-1/2	6201-2RS-1/2	693	312	27
	35	11	6202-1/2	6202ZZ-1/2	6202-2RS-1/2	779	382	24
	40	12	6203-1/2	6203ZZ-1/2	6203-2RS-1/2	976	491	21
13	32	10	6201 -13	6201ZZ-13	6201-2RS-13	693	312	27
15	32	8	16002	16002ZZ	16002-2RS	570	290	26
	32	9	6002	6002ZZ	6002-2RS	570	290	27
	35	11	6202	6202ZZ	6202-2RS	779	382	24
	42	13	6302	6302ZZ	6302-2RS	1166	558	20
15.875	35	11	6202-5/8	6202ZZ-5/8	6202-2RS-5/8	779	382	24
	40	12	6203-5/8	6203ZZ-5/8	6203-2RS-5/8	976	491	21
16	35	11	6202 -16	6202ZZ-16	6202-2RS-16	611	335	25
	40	12	6203 -16	6203ZZ-16	6203-2RS-16	976	491	21

* *Some sizes available with non contact seals.*
** *Rpm may be lower for ZZ and 2RS types*

Popular Metric Series

Chrome steel ball bearings in popular metric sizes for radial loads and moderate thrust loads in both directions.

These are deep groove radial ball bearings in the most popular sizes, hence the term "popular metric bearings". These bearings are supplied in SAE52100 chrome steel.



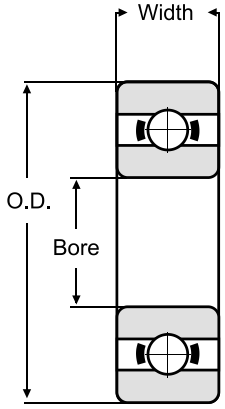
CHROME STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Shielded Bearing	Sealed Bearing *	Max Load (kgf)		Rpm ** (x1000)
			SMB Reference	SMB Reference	SMB Reference	Dyn	Stat	
17	35	8	16003	16003ZZ	16003-2RS	573	321	24
	35	10	6003	6003ZZ	6003-2RS	611	335	25
	40	12	6203	6203ZZ	6203-2RS	976	491	21
	47	14	6303	6303ZZ	6303-2RS	1386	680	18
19.05	40	12	6203-3/4	6203ZZ-3/4	6203-2RS-3/4	859	433	21
	47	14	6204-3/4	6204ZZ-3/4	6204-2RS-3/4	1310	684	17
20	42	8	16004	16004ZZ	16004-2RS	898	481	21
	42	12	6004	6004ZZ	6004-2RS	956	517	21
	47	14	6204	6204ZZ	6204-2RS	1310	684	17
	52	15	6304	6304ZZ	6304-2RS	1619	805	17
22.225	47	14	6204-7/8	6204ZZ-7/8	6204-2RS-7/8	1164	611	17
25	47	8	16005	16005ZZ	16005-2RS	933	549	18
	47	12	6005	6005ZZ	6005-2RS	1026	597	18
	52	15	6205	6205ZZ	6205-2RS	1429	804	15
	62	17	6305	6305ZZ	6305-2RS	2100	1156	13
25.4	52	15	6205 -1	6205ZZ-1	6205-2RS-1	1429	804	15
30	55	9	16006	16006ZZ	16006-2RS	963	558	12
	55	13	6006	6006ZZ	6006-2RS	1349	843	15
	62	16	6206	6206ZZ	6206-2RS	1984	1158	13
	72	19	6306	6306ZZ	6306-2RS	2717	1541	12

* *Some sizes available with non contact seals.*
** *Rpm may be lower for ZZ and 2RS types*

Popular Metric Stainless Steel Series

Corrosion resistant ball bearings in popular metric sizes for radial loads and moderate thrust loads in both directions.



These stainless steel bearings are made from 440C or KS440 stainless steel. They can be re-lubricated with food grade lubricants or high temperature lubricants for up to 300C. Many of the EZO sealed bearings also have the TW high speed synthetic retainer. Some sizes can be supplied with Viton seals or with passivated stainless steel for increased corrosion resistance.

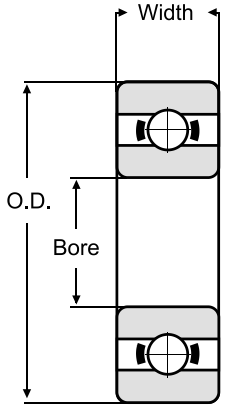
STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Shielded Bearing	Sealed Bearing *	Max Load (kgf)		Rpm * (x1000)
			SMB Reference	SMB Reference	SMB Reference	Dyn	Stat	
10	26	8	S6000	S6000ZZ	S6000-2RS	386	157	36
	30	9	S6200	S6200ZZ	S6200-2RS	434	192	29
	35	11	S6300	S6300ZZ	S6300-2RS	687	275	27
12	28	8	S6001	S6001ZZ	S6001-2RS	434	191	32
	32	10	S6201	S6201ZZ	S6201-2RS	577	245	27
	37	12	S6301	S6301ZZ	S6301-2RS	824	336	25
15	32	9	S6002	S6002ZZ	S6002-2RS	475	227	27
	35	11	S6202	S6202ZZ	S6202-2RS	649	300	24
	42	13	S6302	S6302ZZ	S6302-2RS	971	437	20
17	35	10	S6003	S6003ZZ	S6003-2RS	509	263	25
	40	12	S6203	S6203ZZ	S6203-2RS	813	385	21
	47	14	S6303	S6303ZZ	S6303-2RS	1155	533	18
20	42	12	S6004	S6004ZZ	S6004-2RS	796	405	21
	47	14	S6204	S6204ZZ	S6204-2RS	1091	536	17
	52	15	S6304	S6304ZZ	S6304-2RS	1349	631	17
25	47	12	S6005	S6005ZZ	S6005-2RS	855	469	18
	52	15	S6205	S6205ZZ	S6205-2RS	1190	630	15
	62	17	S6305	S6305ZZ	S6305-2RS	1749	906	13
30	55	13	S6006	S6006ZZ	S6006-2RS	1124	661	15
	62	16	S6206	S6206ZZ	S6206-2RS	1653	908	13
	72	19	S6306	S6306ZZ	S6306-2RS	2263	1208	12
35	62	14	S6007	S6007ZZ	S6007-2RS	1356	825	13
	72	17	S6207	S6207ZZ	S6207-2RS	2181	1236	11

** Rpm may be lower for ZZ and 2RS types*

Popular Metric Stainless Steel Series

Corrosion resistant ball bearings in popular metric sizes for radial loads and moderate thrust loads in both directions.



These stainless steel bearings are made from 440C or KS440 stainless steel. They can be re-lubricated with food grade lubricants or high temperature lubricants for up to 300C. Many of the EZO sealed bearings also have the TW high speed synthetic retainer. Some sizes can be supplied with Viton seals or with passivated stainless steel for increased corrosion resistance.

STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

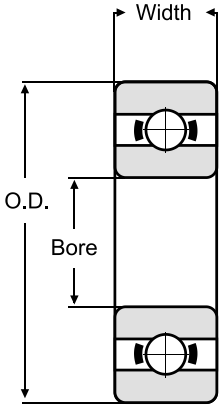
Bore	O.D.	Width	Open Bearing	Shielded Bearing	Sealed Bearing *	Max Load (kgf)		Rpm ** (x1000)
			SMB Reference	SMB Reference	SMB Reference	Dyn	Stat	
40	68	15	S6008	S6008ZZ	S6008-2RS	1425	922	12
	80	18	S6208	S6208ZZ	S6208-2RS	2473	1433	10
45	75	16	S6009	S6009ZZ	S6009-2RS	1515	966	11
	85	19	S6209	S6209ZZ	S6209-2RS	2779	1630	9
50	80	16	S6010	S6010ZZ	S6010-2RS	1851	1326	10
	90	20	S6210	S6210ZZ	S6210-2RS	2980	1861	8

** Rpm may be lower for ZZ and 2RS types*

Electric Motor Series (CN)

Chrome steel electric motor ball bearings in popular metric sizes for radial loads and moderate thrust loads in both directions.

The electric motor ball bearings in the table below are rated EMQ2 (ZV3) for very low noise or low vibration applications. Various radial play groups can be supplied but the most commonly stocked are CN (standard) radial play as listed below and C3 (loose) radial play. These bearings are supplied in SAE52100 chrome steel.



CHROME STEEL ***Dimensions in mm unless otherwise specified***

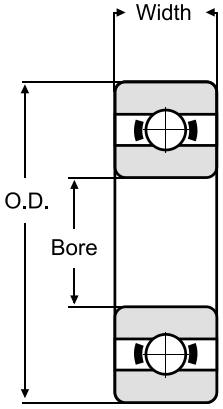
Bore	O.D.	Width	Shielded Bearing	Sealed Bearing	Max Load (kgf)		Rpm * (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
10	26	8	6000ZZP6EMQ2	6000-2RSP6EMQ2	464	200	31
	30	9	6200ZZP6EMQ2	6200-2RSP6EMQ2	521	245	24
	35	11	6300ZZP6EMQ2	6300-2RSP6EMQ2	825	351	22
12	28	8	6001ZZP6EMQ2	6001-2RSP6EMQ2	521	244	27
	32	10	6201ZZP6EMQ2	6201-2RSP6EMQ2	693	312	22
	37	12	6301ZZP6EMQ2	6301-2RSP6EMQ2	989	428	20
15	32	9	6002ZZP6EMQ2	6002-2RSP6EMQ2	570	290	23
	35	11	6202ZZP6EMQ2	6202-2RSP6EMQ2	779	382	20
	42	13	6302ZZP6EMQ2	6302-2RSP6EMQ2	1166	558	17
17	35	10	6003ZZP6EMQ2	6003-2RSP6EMQ2	611	335	21
	40	12	6203ZZP6EMQ2	6203-2RSP6EMQ2	976	491	17
	47	14	6303ZZP6EMQ2	6303-2RSP6EMQ2	1386	680	15
20	42	12	6004ZZP6EMQ2	6004-2RSP6EMQ2	956	517	17
	47	14	6204ZZP6EMQ2	6204-2RSP6EMQ2	1310	684	15
	52	15	6304ZZP6EMQ2	6304-2RSP6EMQ2	1619	805	14
25	47	12	6005ZZP6EMQ2	6005-2RSP6EMQ2	1026	597	15
	52	15	6205ZZP6EMQ2	6205-2RSP6EMQ2	1429	804	13
	62	17	6305ZZP6EMQ2	6305-2RSP6EMQ2	2100	1156	11
30	55	13	6006ZZP6EMQ2	6006-2RSP6EMQ2	1349	843	13
	62	16	6206ZZP6EMQ2	6206-2RSP6EMQ2	1984	1158	11
	72	19	6306ZZP6EMQ2	6306-2RSP6EMQ2	2717	1541	10

** Rpm may be lower for 2RS types*

Electric Motor Series (C3)

Chrome steel electric motor ball bearings in popular metric sizes for radial loads and moderate thrust loads in both directions.

The electric motor ball bearings in the table below are rated EMQ2 (ZV3) for very low noise or low vibration applications. Various radial play groups can be supplied but the most commonly stocked are CN (standard) radial play and C3 (loose) radial play as listed below. These bearings are supplied in SAE52100 chrome steel.



CHROME STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Shielded Bearing	Sealed Bearing	Max Load (kgf)		Rpm * (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
10	26	8	6000ZZP6C3EMQ2	6000-2RSP6C3EMQ2	464	200	31
	30	9	6200ZZP6C3EMQ2	6200-2RSP6C3EMQ2	521	245	24
	35	11	6300ZZP6C3EMQ2	6300-2RSP6C3EMQ2	825	351	22
12	28	8	6001ZZP6C3EMQ2	6001-2RSP6C3EMQ2	521	244	27
	32	10	6201ZZP6C3EMQ2	6201-2RSP6C3EMQ2	693	312	22
	37	12	6301ZZP6C3EMQ2	6301-2RSP6C3EMQ2	989	428	20
15	32	9	6002ZZP6C3EMQ2	6002-2RSP6C3EMQ2	570	290	23
	35	11	6202ZZP6C3EMQ2	6202-2RSP6C3EMQ2	779	382	20
	42	13	6302ZZP6C3EMQ2	6302-2RSP6C3EMQ2	1166	558	17
17	35	10	6003ZZP6C3EMQ2	6003-2RSP6C3EMQ2	611	335	21
	40	12	6203ZZP6C3EMQ2	6203-2RSP6C3EMQ2	976	491	17
	47	14	6303ZZP6C3EMQ2	6303-2RSP6C3EMQ2	1386	680	15
20	42	12	6004ZZP6C3EMQ2	6004-2RSP6C3EMQ2	956	517	17
	47	14	6204ZZP6C3EMQ2	6204-2RSP6C3EMQ2	1310	684	15
	52	15	6304ZZP6C3EMQ2	6304-2RSP6C3EMQ2	1619	805	14
25	47	12	6005ZZP6C3EMQ2	6005-2RSP6C3EMQ2	1026	598	15
	52	15	6205ZZP6C3EMQ2	6205-2RSP6C3EMQ2	1429	804	13
	62	17	6305ZZP6C3EMQ2	6305-2RSP6C3EMQ2	2100	1156	11
30	55	13	6006ZZP6C3EMQ2	6006-2RSP6C3EMQ2	1349	843	13
	62	16	6206ZZP6C3EMQ2	6206-2RSP6C3EMQ2	1984	1158	11
	72	19	6306ZZP6C3EMQ2	6306-2RSP6C3EMQ2	2717	1541	10

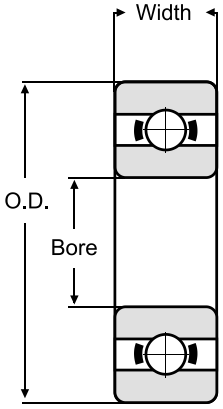
** Rpm may be lower for 2RS types*

Metric Plastic Series

Semi-precision plastic bearings for radial loads and moderate thrust loads in both directions.

These bearings have acetal rings and nylon cages. For greater chemical resistance or high temperatures, many sizes can be supplied in polypropylene or PEEK.

Plastic bearings are only suitable for low loads and low speeds. Normal inner and outer ring tolerances on these bearings are +/- 0.1mm. For chemical compatibility and temperature limits, please refer to Engineering Data.



ACETAL RESIN *Dimensions in mm unless otherwise specified*

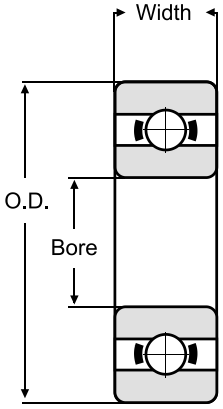
Bore	O.D.	Width	316 Stainless Balls	Glass Balls	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
3	8	3	AC693-316	AC693-GL	3	2	3.0
	9	3	AC603-316	AC603-GL	4	3	3.0
	10	4	AC623-316	AC623-GL	7	5	3.0
	13	5	AC633-316	AC633-GL	9	7	3.0
4	9	2.5	AC684-316	AC684-GL	4	3	3.0
	11	4	AC694-316	AC694-GL	6	4	3.0
	12	4	AC604-316	AC604-GL	6	4	3.0
	13	5	AC624-316	AC624-GL	7	5	3.0
	16	5	AC634-316	AC634-GL	10	7	3.0
5	11	3.5	AC685-316	AC685-GL	5	3	3.0
	13	4	AC695-316	AC695-GL	7	5	3.0
	14	5	AC605-316	AC605-GL	7	5	3.0
	16	5	AC625-316	AC625-GL	9	7	2.6
	19	6	AC635-316	AC635-GL	12	9	2.6
6	13	3.5	AC686-316	AC686-GL	7	5	2.6
	15	5	AC696-316	AC696-GL	8	6	2.6
	17	6	AC606-316	AC606-GL	9	7	2.6
	19	6	AC626-316	AC626-GL	9	7	2.6
	22	7	AC636-316	AC636-GL	13	10	2.6
7	14	3.5	AC687-316	AC687-GL	7	5	2.6
	17	5	AC697-316	AC697-GL	8	6	2.6
	19	6	AC607-316	AC607-GL	9	7	2.6
	22	7	AC627-316	AC627-GL	12	9	2.4
	26	9	AC637-316	AC637-GL	14	11	2.4

Metric Plastic Series

Semi-precision plastic bearings for radial loads and moderate thrust loads in both directions.

These bearings have acetal rings and nylon cages. For greater chemical resistance or high temperatures, many sizes can be supplied in polypropylene or PEEK.

Plastic bearings are only suitable for low loads and low speeds. Normal inner and outer ring tolerances on these bearings are +/- 0.1mm. For chemical compatibility and temperature limits, please refer to Engineering Data.



ACETAL RESIN *Dimensions in mm unless otherwise specified*

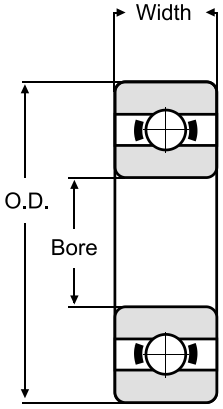
Bore	O.D.	Width	316 Stainless Balls	Glass Balls	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
8	16	4	AC688-316	AC688GL	7	5	2.6
	19	6	AC698-316	AC698-GL	8	6	2.6
	22	7	AC608-316	AC608-GL	12	9	2.6
	24	8	AC628-316	AC628-GL	12	9	2.4
	28	9	AC638-316	AC638-GL	15	12	2.4
9	17	4	AC689-316	AC689-GL	7	5	2.6
	20	6	AC699-316	AC699-GL	8	6	2.6
	24	7	AC609-316	AC609-GL	12	9	2.6
	26	8	AC629-316	AC629-GL	14	11	2.4
	30	10	AC639-316	AC639-GL	15	12	2.4
10	19	5	AC6800-316	AC6800-GL	10	8	2.0
	22	6	AC6900-316	AC6900-GL	11	9	2.0
	26	8	AC6000-316	AC6000-GL	14	11	2.0
	30	9	AC6200-316	AC6200-GL	16	13	1.9
	35	11	AC6300-316	AC6300-GL	19	16	1.6
12	21	5	AC6801-316	AC6801-GL	11	8	1.8
	24	6	AC6901-316	AC6901-GL	12	10	1.8
	28	7	AC16001-316	AC16001-GL	16	13	1.8
	28	8	AC6001-316	AC6001-GL	16	13	1.8
	32	10	AC6201-316	AC6201-GL	20	16	1.7
	37	12	AC6301-316	AC6301-GL	23	19	1.5

Metric Plastic Series

Semi-precision plastic bearings for radial loads and moderate thrust loads in both directions.

These bearings have acetal rings and nylon cages. For greater chemical resistance or high temperatures, many sizes can be supplied in polypropylene or PEEK.

Plastic bearings are only suitable for low loads and low speeds. Normal inner and outer ring tolerances on these bearings are +/- 0.1mm. For chemical compatibility and temperature limits, please refer to Engineering Data.



ACETAL RESIN *Dimensions in mm unless otherwise specified*

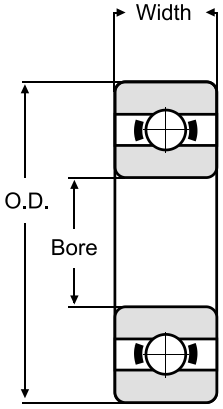
Bore	O.D.	Width	316 Stainless Balls	Glass Balls	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
15	24	5	AC6802-316	AC6802-GL	12	9	1.6
	28	7	AC6902-316	AC6902-GL	14	11	1.6
	32	8	AC16002-316	AC16002-GL	18	15	1.6
	32	9	AC6002-316	AC6002-GL	18	15	1.6
	35	11	AC6202-316	AC6202-GL	23	19	1.5
	42	13	AC6302-316	AC6302-GL	29	24	1.4
17	26	5	AC6803-316	AC6803-GL	14	11	1.5
	30	7	AC6903-316	AC6903-GL	15	12	1.5
	35	8	AC16003-316	AC16003-GL	20	16	1.5
	35	10	AC6003-316	AC6003-GL	20	16	1.5
	40	12	AC6203-316	AC6203-GL	24	19	1.4
	47	14	AC6303-316	AC6303-GL	34	27	1.3
20	32	7	AC6804-316	AC6804-GL	16	13	1.2
	37	9	AC6904-316	AC6904-GL	18	14	1.2
	42	8	AC16004-316	AC16004-GL	24	19	1.2
	42	12	AC6004-316	AC6004-GL	24	19	1.2
	47	14	AC6204-316	AC6204-GL	32	26	1.1
	52	15	AC6304-316	AC6304-GL	38	29	1
25	37	7	AC6805-316	AC6805-GL	18	15	1.2
	42	9	AC6905-316	AC6905-GL	20	16	1.2
	47	8	AC16005-316	AC16005-GL	29	22	1.2
	47	12	AC6005-316	AC6005-GL	29	22	1.2
	52	15	AC6205-316	AC6205-GL	37	29	1.1
	62	17	AC6305-316	AC6305-GL	43	33	1

Metric Plastic Series

Semi-precision plastic bearings for radial loads and moderate thrust loads in both directions.

These bearings have acetal rings and nylon cages. For greater chemical resistance or high temperatures, many sizes can be supplied in polypropylene or PEEK.

Plastic bearings are only suitable for low loads and low speeds. Normal inner and outer ring tolerances on these bearings are +/- 0.1mm. For chemical compatibility and temperature limits, please refer to Engineering Data.



ACETAL RESIN *Dimensions in mm unless otherwise specified*

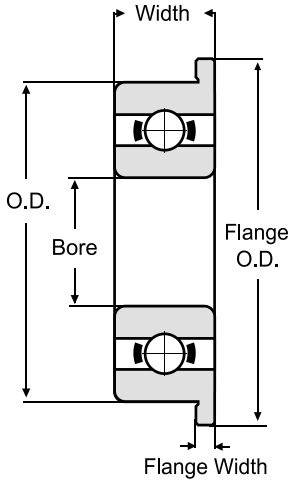
Bore	O.D.	Width	316 Stainless Balls	Glass Balls	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
30	42	7	AC6806-316	AC6806-GL	21	17	1.2
	47	9	AC6906-316	AC6906-GL	23	19	1.2
	55	9	AC16006-316	AC16006-GL	31	26	1.2
	55	13	AC6006-316	AC6006-GL	31	26	1.2
	62	16	AC6206-316	AC6206-GL	39	33	1.1
	72	19	AC6306-316	AC6306-GL	46	35	1.0
35	47	7	AC6807-316	AC6807-GL	24	20	1.1
	55	10	AC6907-316	AC6907-GL	26	22	1.1
	62	14	AC6007-316	AC6007-GL	37	30	1.0
	72	17	AC6207-316	AC6207-GL	43	36	1.0
40	52	7	AC6808-316	AC6808-GL	27	22	1.1
	62	12	AC6908-316	AC6908-GL	29	25	1.1
	68	15	AC6008-316	AC6008-GL	40	33	1.0
	80	18	AC6208-316	AC6208-GL	47	40	1.0

Metric Plastic Flanged Series

Semi-precision flanged plastic bearings for radial loads and moderate thrust loads in both directions.

These bearings have acetal rings and nylon cages. For greater chemical resistance or high temperatures, many sizes can be supplied in polypropylene or PEEK.

Plastic bearings are only suitable for low loads and low speeds. Normal inner and outer ring tolerances on these bearings are +/- 0.1mm. For chemical compatibility and temperature limits, please see our Engineering Data section.



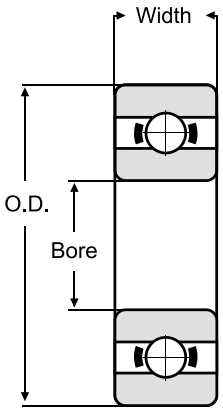
ACETAL RESIN *Dimensions in mm unless otherwise specified*

Bore	O.D.	Width	Flange O.D.	316 Stainless Balls	Glass Balls	Max Load (kgf)		Rpm (x1000)
				SMB Reference	SMB Reference	Dyn	Stat	
4	13	5	15	ACF624-316	ACF624-GL	7	5	2.0
	16	5	18	ACF634-316	ACF634-GL	10	7	2.0
5	16	5	18	ACF625-316	ACF625-GL	9	7	2.6
	19	6	22	ACF635-316	ACF635-GL	12	9	2.6
6	19	6	22	ACF626-316	ACF626-GL	9	7	2.6
7	19	6	22	ACF607-316	ACF607-GL	9	7	2.6
	22	7	25	ACF627-316	ACF627-GL	12	9	2.4
8	16	4	18	ACF688-316	ACF688-GL	7	5	2.6
	22	7	25	ACF608-316	ACF608-GL	12	9	2.6

Metric Ceramic Series - ZrO2

Ceramic zirconia bearings for radial loads and moderate thrust loads in both directions.

These bearings are supplied with zirconia rings and balls. Both types are available as full complement or with cages made from PEEK, PTFE or 316 stainless steel. Please see our Engineering Data section for more information on the bearing materials.



The bearings listed below are open but can also be supplied with PEEK seals. Some sizes are also available with a flange on the outer ring. Ceramic bearings are generally used in specialist applications.

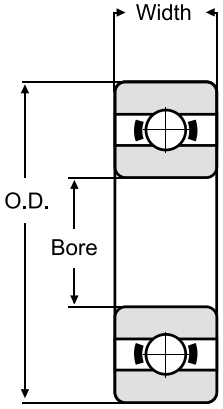
ZIRCONIA ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
3	8	3	CCZR-693		40	13	13.0
	8	4		CCZR-693-2PKS	40	13	13.0
	9	3	CCZR-603	CCZR-603- PKS	43	14	13.0
	10	4	CCZR-623	CCZR-623- PKS	44	15	12.0
4	9	2.5	CCZR-684		38	12	12.0
	9	4		CCZR-684- PKS	38	12	12.0
	11	4	CCZR-694	CCZR-694- PKS	72	26	11.0
	12	4	CCZR-604	CCZR-604- PKS	72	25	11.0
	13	5	CCZR-624	CCZR-624- PKS	95	34	10.0
	16	5	CCZR-634	CCZR-634- PKS	100	39	8.0
5	11	3	CCZR-685		53	21	11.0
	11	5		CCZR-685- PKS	53	21	11.0
	13	4	CCZR-695	CCZR-695- PKS	76	30	10.0
	14	5	CCZR-605	CCZR-605- PKS	95	36	10.0
	16	5	CCZR-625	CCZR-625- PKS	121	48	9.0
	19	6	CCZR-635	CCZR-635- PKS	177	67	8.0
6	13	3.5	CCZR-686		76	33	10.0
	13	5		CCZR-686- PKS	76	33	10.0
	15	5	CCZR-696	CCZR-696- PKS	101	39	9.0
	17	6	CCZR-606	CCZR-606- PKS	169	63	9.0
	19	6	CCZR-626	CCZR-626- PKS	175	77	8.0
	22	7	CCZR-636	CCZR-636- PKS	149	105	7.0

Metric Ceramic Series - ZrO2

Ceramic zirconia bearings for radial loads and moderate thrust loads in both directions.

These bearings are supplied with zirconia rings and balls. Both types are available as full complement or with cages made from PEEK, PTFE or 316 stainless steel. Please see our Engineering Data section for more information on the bearing materials.



The bearings listed below are open but can also be supplied with PEEK seals. Some sizes are also available with a flange on the outer ring. Ceramic bearings are generally used in specialist applications.

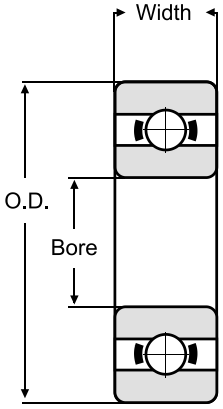
ZIRCONIA ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
7	14	3.5	CCZR-687		90	38	10.0
	14	5		CCZR-687- PKS	90	38	10.0
	17	5	CCZR-697	CCZR-697- PKS	120	55	9.0
	19	6	CCZR-607	CCZR-607- PKS	177	67	9.0
	22	7	CCZR-627	CCZR-627- PKS	254	106	7.0
	26	9	CCZR-637	CCZR-637- PKS	351	174	6.5
8	16	4	CCZR-688		80	38	11.0
	16	5		CCZR-688-2PKS	80	38	11.0
	19	6	CCZR-698	CCZR-698-2PKS	142	60	11.0
	22	7	CCZR-608	CCZR-608-2PKS	216	88	10.0
	24	8	CCZR-628	CCZR-628-2PKS	223	91	8.5
	28	9	CCZR-638	CCZR-638-2PKS	287	126	8.0
9	17	4	CCZR-689		85	43	11.0
	17	5		CCZR-689-2PKS	85	43	11.0
	20	6	CCZR-699	CCZR-699-2PKS	157	70	10.0
	24	7	CCZR-609	CCZR-609-2PKS	217	76	10.0
	26	8	CCZR-629	CCZR-629-2PKS	292	128	9.0
	30	10	CCZR-639	CCZR-639-2PKS	299	130	7.2
10	15	3	CCZR-6700		52	28	5.6
	15	4		CCZR-6700-2PKS	52	28	5.6
	19	5	CCZR-6800	CCZR-6800-2PKS	118	53	11.0
	22	6	CCZR-6900	CCZR-6900-2PKS	172	81	10.2
	26	8	CCZR-6000	CCZR-6000-2PKS	297	127	8.5
	30	9	CCZR-6200	CCZR-6200-2PKS	334	155	7.2
	35	11	CCZR-6300	CCZR-6300-2PKS	529	224	6.8

Metric Ceramic Series - ZrO2

Ceramic zirconia bearings for radial loads and moderate thrust loads in both directions.

These bearings are supplied with zirconia rings and balls. Both types are available as full complement or with cages made from PEEK, PTFE or 316 stainless steel. Please see our Engineering Data section for more information on the bearing materials.



The bearings listed below are open but can also be supplied with PEEK seals. Some sizes are also available with a flange on the outer ring. Ceramic bearings are generally used in specialist applications.

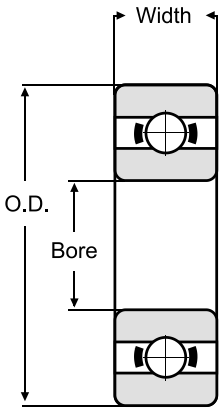
ZIRCONIA ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
12	18	4	CCZR-6701	CCZR-6701-2PKS	69	39	3.0
	21	5	CCZR-6801	CCZR-6801-2PKS	143	76	8.0
	24	6	CCZR-6901	CCZR-6901-2PKS	215	110	7.2
	28	8	CCZR-6001	CCZR-6001-2PKS	391	183	6.4
	32	10	CCZR-6201	CCZR-6201-2PKS	519	249	5.4
	37	12	CCZR-6301	CCZR-6301-2PKS	742	321	5.0
15	21	4	CCZR-6702	CCZR-6702-2PKS	71	44	2.6
	24	5	CCZR-6802	CCZR-6802-2PKS	153	94	6.6
	28	7	CCZR-6902	CCZR-6902-2PKS	321	167	6.2
	32	9	CCZR-6002	CCZR-6002-2PKS	446	216	5.5
	35	11	CCZR-6202	CCZR-6202-2PKS	583	287	4.8
	42	13	CCZR-6302	CCZR-6302-2PKS	874	419	4.0
17	23	4	CCZR-6703	CCZR-6703-2PKS	75	49	2.1
	26	5	CCZR-6803	CCZR-6803-2PKS	164	108	6.0
	30	7	CCZR-6903	CCZR-6903-2PKS	340	192	5.6
	35	10	CCZR-6003	CCZR-6003-2PKS	458	251	5.0
	40	12	CCZR-6203	CCZR-6203-2PKS	732	368	4.2
	47	14	CCZR-6303	CCZR-6303-2PKS	1039	510	3.6
20	27	4	CCZR-6704	CCZR-6704-2PKS	77	54	2.0
	32	7	CCZR-6804	CCZR-6804-2PKS	299	183	4.8
	37	9	CCZR-6904	CCZR-6904-2PKS	464	273	4.6
	42	12	CCZR-6004	CCZR-6004-2PKS	717	388	4.2
	47	14	CCZR-6204	CCZR-6204-2PKS	982	513	3.4
	52	15	CCZR-6304	CCZR-6304-2PKS	1214	604	2.8

Metric Ceramic Series - ZrO2

Ceramic zirconia bearings for radial loads and moderate thrust loads in both directions.

These bearings are supplied with zirconia rings and balls. Both types are available as full complement or with cages made from PEEK, PTFE or 316 stainless steel. Please see our Engineering Data section for more information on the bearing materials.



The bearings listed below are open but can also be supplied with PEEK seals. Some sizes are also available with a flange on the outer ring. Ceramic bearings are generally used in specialist applications.

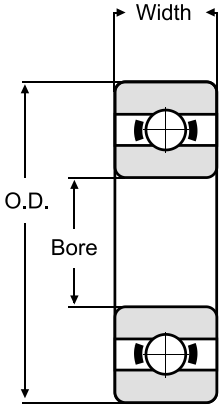
ZIRCONIA ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
25	32	4	CCZR-6705	CCZR-6705-2PKS	79	61	1.6
	37	7	CCZR-6805	CCZR-6805-2PKS	320	217	4.0
	42	9	CCZR-6905	CCZR-6905-2PKS	517	335	3.6
	47	12	CCZR-6005	CCZR-6005-2PKS	770	448	3.4
	52	15	CCZR-6205	CCZR-6205-2PKS	1072	603	3.0
	62	17	CCZR-6305	CCZR-6305-2PKS	1575	867	2.6
30	37	4	CCZR-6706	CCZR-6706-2PKS	85	71	1.4
	42	7	CCZR-6806	CCZR-6806-2PKS	341	254	3.6
	47	9	CCZR-6906	CCZR-6906-2PKS	540	374	3.4
	55	13	CCZR-6006	CCZR-6006-2PKS	1011	632	3.0
	62	16	CCZR-6206	CCZR-6206-2PKS	1488	869	2.6
	72	19	CCZR-6306	CCZR-6306-2PKS	2037	1155	2.4
35	44	5	CCZR-6707	CCZR-6707-2PKS	137	122	1.2
	47	7	CCZR-6807	CCZR-6807-2PKS	352	286	3.2
	55	10	CCZR-6907	CCZR-6907-2PKS	818	586	2.8
	62	14	CCZR-6007	CCZR-6007-2PKS	1219	788	2.6
	72	17	CCZR-6207	CCZR-6207-2PKS	1963	1182	2.2
	80	21	CCZR-6307	CCZR-6307-2PKS	2520	1478	2.1
40	50	6	CCZR-6708	CCZR-6708-2PKS	187	166	1.0
	52	7	CCZR-6808	CCZR-6808-2PKS	369	312	2.8
	62	12	CCZR-6908	CCZR-6908-2PKS	982	744	2.6
	68	15	CCZR-6008	CCZR-6008-2PKS	1283	882	2.4
	80	18	CCZR-6208	CCZR-6208-2PKS	2226	1371	2.0
	90	23	CCZR-6308	CCZR-6308-2PKS	3090	1842	1.9

Metric Ceramic Series - ZrO2

Ceramic zirconia bearings for radial loads and moderate thrust loads in both directions.

These bearings are supplied with zirconia rings and balls. Both types are available as full complement or with cages made from PEEK, PTFE or 316 stainless steel. Please see our Engineering Data section for more information on the bearing materials.

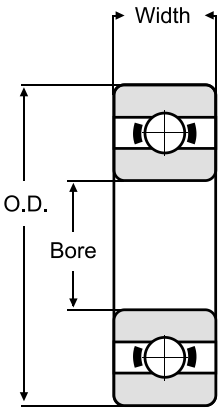


The bearings listed below are open but can also be supplied with PEEK seals. Some sizes are also available with a flange on the outer ring. Ceramic bearings are generally used in specialist applications.

ZIRCONIA ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
45	55	6	CCZR-6709	CCZR-6709-2PKS	193	179	1.0
	58	7	CCZR-6809	CCZR-6809-2PKS	464	403	2.4
	68	12	CCZR-6909	CCZR-6909-2PKS	1035	811	2.2
	75	16	CCZR-6009	CCZR-6009-2PKS	1357	922	2.0
	85	19	CCZR-6209	CCZR-6209-2PKS	2084	1222	1.8
	100	25	CCZR-6309	CCZR-6309-2PKS	3996	2454	1.7
50	62	6	CCZR-6710	CCZR-6710-2PKS	202	190	0.9
	65	7	CCZR-6810	CCZR-6810-2PKS	472	420	2.2
	72	12	CCZR-6910	CCZR-6910-2PKS	1058	827	2.0
	80	16	CCZR-6010	CCZR-6010-2PKS	1388	995	1.8
	90	20	CCZR-6210	CCZR-6210-2PKS	2235	1395	1.6
	110	27	CCZR-6310	CCZR-6310-2PKS	4680	2965	1.5

Metric Ceramic Series - Si3N4



Ceramic silicon nitride bearings for radial loads and moderate thrust loads in both directions.

These bearings are supplied with silicon nitride rings and balls. Both types are available as full complement or with cages made from PEEK, PTFE or 316 stainless steel. Please see our Engineering Data section for more information on the bearing materials.

The bearings listed below are open but can also be supplied with PEEK seals. Some sizes are also available with a flange on the outer ring. Ceramic bearings are generally used in specialist applications.

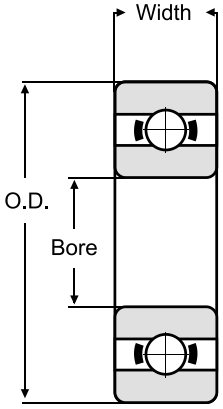
SILICON NITRIDE ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
3	8	3	CCSI-693		34	11	16.0
	8	4		CCSI-693-2PKS	34	11	16.0
	9	3	CCSI-603	CCSI-603-2PKS	37	12	16.0
	10	4	CCSI-623	CCSI-623-2PKS	37	13	15.0
4	9	2.5	CCSI-684		41	14	16.0
	9	4		CCSI-684-2PKS	41	14	16.0
	11	4	CCSI-694	CCSI-694-2PKS	62	21	14.0
	12	4	CCSI-604	CCSI-604-2PKS	61	21	14.0
	13	5	CCSI-624	CCSI-624-2PKS	81	29	12.0
	16	5	CCSI-634	CCSI-634-2PKS	85	33	10.0
5	11	3	CCSI-685	CCSI-685-2PKS	45	18	14.0
	11	5	CCSI-685	CCSI-685-2PKS	45	18	14.0
	13	4	CCSI-695	CCSI-695-2PKS	65	26	12.5
	14	5	CCSI-605	CCSI-605-2PKS	81	30	12.5
	16	5	CCSI-625	CCSI-625-2PKS	103	41	11.0
	19	6	CCSI-635	CCSI-635-2PKS	151	57	10.0
6	13	3.5	CCSI-686		65	28	12.0
	13	5		CCSI-686-2PKS	65	28	12.0
	15	5	CCSI-696	CCSI-696-2PKS	86	33	11.0
	17	6	CCSI-606	CCSI-606-2PKS	144	54	11.0
	19	6	CCSI-626	CCSI-626-2PKS	149	67	10.0
	22	7	CCSI-636	CCSI-636-2PKS	128	89	8.5

Metric Ceramic Series - Si3N4

Ceramic silicon nitride bearings for radial loads and moderate thrust loads in both directions.

These bearings are supplied with silicon nitride rings and balls. Both types are available as full complement or with cages made from PEEK, PTFE or 316 stainless steel. Please see our Engineering Data section for more information on the bearing materials.

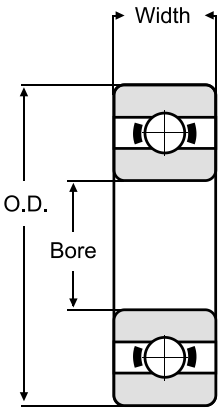


The bearings listed below are open but can also be supplied with PEEK seals. Some sizes are also available with a flange on the outer ring. Ceramic bearings are generally used in specialist applications.

SILICON NITRIDE ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
7	14	3.5	CCSI-687		77	32	12.0
	14	5		CCSI-687-2PKS	77	32	12.0
	17	5	CCSI-697	CCSI-697-2PKS	102	47	11.0
	19	6	CCSI-607	CCSI-607-2PKS	150	57	11.0
	22	7	CCSI-627	CCSI-627-2PKS	217	90	8.5
	26	9	CCSI-637	CCSI-637-2PKS	297	149	8.0
8	16	4	CCSI-688		80	38	11.0
	16	5		CCSI-688-2PKS	80	38	11.0
	19	6	CCSI-698	CCSI-698-2PKS	142	60	11.0
	22	7	CCSI-608	CCSI-608-2PKS	216	88	10.0
	24	8	CCSI-628	CCSI-628-2PKS	223	91	8.5
	28	9	CCSI-638	CCSI-638-2PKS	287	126	8.0
9	17	4	CCSI-689		85	43	11.0
	17	5		CCSI-689-2PKS	85	43	11.0
	20	6	CCSI-699	CCSI-699-2PKS	157	70	10.0
	24	7	CCSI-609	CCSI-609-2PKS	217	76	10.0
	26	8	CCSI-629	CCSI-629-2PKS	292	128	9.0
	30	10	CCSI-639	CCSI-639-2PKS	299	130	7.2
10	15	3	CCSI-6700		52	28	5.6
	15	4		CCSI-6700-2PKS	52	28	5.6
	19	5	CCSI-6800	CCSI-6800-2PKS	118	53	11.0
	22	6	CCSI-6900	CCSI-6900-2PKS	172	81	10.2
	26	8	CCSI-6000	CCSI-6000-2PKS	297	127	8.5
	30	9	CCSI-6200	CCSI-6200-2PKS	334	155	7.2
	35	11	CCSI-6300	CCSI-6300-2PKS	529	224	6.8

Metric Ceramic Series - Si3N4



Ceramic silicon nitride bearings for radial loads and moderate thrust loads in both directions.

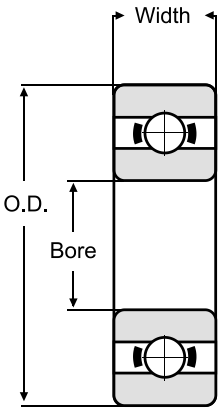
These bearings are supplied with silicon nitride rings and balls. Both types are available as full complement or with cages made from PEEK, PTFE or 316 stainless steel. Please see our Engineering Data section for more information on the bearing materials.

The bearings listed below are open but can also be supplied with PEEK seals. Some sizes are also available with a flange on the outer ring. Ceramic bearings are generally used in specialist applications.

SILICON NITRIDE ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
12	18	4	CCSI-6701	CCSI-6701-2PKS	59	33	3.8
	21	5	CCSI-6801	CCSI-6801-2PKS	122	65	10.0
	24	6	CCSI-6901	CCSI-6901-2PKS	183	94	9.0
	28	8	CCSI-6001	CCSI-6001-2PKS	333	156	8.0
	32	10	CCSI-6201	CCSI-6201-2PKS	443	213	6.8
	37	12	CCSI-6301	CCSI-6301-2PKS	632	273	6.2
15	21	4	CCSI-6702	CCSI-6702-2PKS	61	38	3.2
	24	5	CCSI-6802	CCSI-6802-2PKS	131	79	8.2
	28	7	CCSI-6902	CCSI-6902-2PKS	273	143	7.6
	32	9	CCSI-6002	CCSI-6002-2PKS	380	183	6.8
	35	11	CCSI-6202	CCSI-6202-2PKS	496	245	6.0
	42	13	CCSI-6302	CCSI-6302-2PKS	749	356	5.0
17	23	4	CCSI-6703	CCSI-6703-2PKS	64	41	2.6
	26	5	CCSI-6803	CCSI-6803-2PKS	140	92	7.5
	30	7	CCSI-6903	CCSI-6903-2PKS	289	163	7.0
	35	10	CCSI-6003	CCSI-6003-2PKS	390	214	6.2
	40	12	CCSI-6203	CCSI-6203-2PKS	634	314	5.2
	47	14	CCSI-6303	CCSI-6303-2PKS	889	435	4.5
20	27	4	CCSI-6704	CCSI-6704-2PKS	66	47	2.5
	32	7	CCSI-6804	CCSI-6804-2PKS	254	146	6.0
	37	9	CCSI-6904	CCSI-6904-2PKS	395	231	5.7
	42	12	CCSI-6004	CCSI-6004-2PKS	611	329	5.2
	47	14	CCSI-6204	CCSI-6204-2PKS	834	438	4.2
	52	15	CCSI-6304	CCSI-6304-2PKS	1034	514	3.6

Metric Ceramic Series - Si3N4



Ceramic silicon nitride bearings for radial loads and moderate thrust loads in both directions.

These bearings are supplied with silicon nitride rings and balls. Both types are available as full complement or with cages made from PEEK, PTFE or 316 stainless steel. Please see our Engineering Data section for more information on the bearing materials.

The bearings listed below are open but can also be supplied with PEEK seals. Some sizes are also available with a flange on the outer ring. Ceramic bearings are generally used in specialist applications.

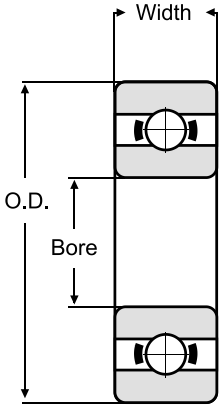
SILICON NITRIDE ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
12	18	4	CCSI-6701	CCSI-6701-2PKS	59	33	3.8
	21	5	CCSI-6801	CCSI-6801-2PKS	122	65	10.0
	24	6	CCSI-6901	CCSI-6901-2PKS	183	94	9.0
	28	8	CCSI-6001	CCSI-6001-2PKS	333	156	8.0
	32	10	CCSI-6201	CCSI-6201-2PKS	443	213	6.8
	37	12	CCSI-6301	CCSI-6301-2PKS	632	273	6.2
15	21	4	CCSI-6702	CCSI-6702-2PKS	61	38	3.2
	24	5	CCSI-6802	CCSI-6802-2PKS	131	79	8.2
	28	7	CCSI-6902	CCSI-6902-2PKS	273	143	7.6
	32	9	CCSI-6002	CCSI-6002-2PKS	380	183	6.8
	35	11	CCSI-6202	CCSI-6202-2PKS	496	245	6.0
	42	13	CCSI-6302	CCSI-6302-2PKS	749	356	5.0
17	23	4	CCSI-6703	CCSI-6703-2PKS	64	41	2.6
	26	5	CCSI-6803	CCSI-6803-2PKS	140	92	7.5
	30	7	CCSI-6903	CCSI-6903-2PKS	289	163	7.0
	35	10	CCSI-6003	CCSI-6003-2PKS	390	214	6.2
	40	12	CCSI-6203	CCSI-6203-2PKS	634	314	5.2
	47	14	CCSI-6303	CCSI-6303-2PKS	889	435	4.5
20	27	4	CCSI-6704	CCSI-6704-2PKS	66	47	2.5
	32	7	CCSI-6804	CCSI-6804-2PKS	254	146	6.0
	37	9	CCSI-6904	CCSI-6904-2PKS	395	231	5.7
	42	12	CCSI-6004	CCSI-6004-2PKS	611	329	5.2
	47	14	CCSI-6204	CCSI-6204-2PKS	834	438	4.2
	52	15	CCSI-6304	CCSI-6304-2PKS	1034	514	3.6

Metric Ceramic Series - Si3N4

Ceramic silicon nitride bearings for radial loads and moderate thrust loads in both directions.

These bearings are supplied with silicon nitride rings and balls. Both types are available as full complement or with cages made from PEEK, PTFE or 316 stainless steel. Please see our Engineering Data section for more information on the bearing materials.



The bearings listed below are open but can also be supplied with PEEK seals. Some sizes are also available with a flange on the outer ring. Ceramic bearings are generally used in specialist applications.

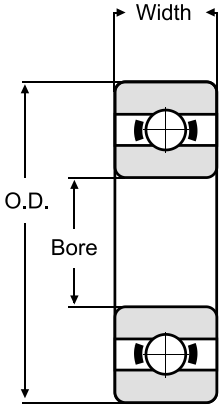
SILICON NITRIDE ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
25	32	4	CCSI-6705	CCSI-6705-2PKS	67	51	2.0
	37	7	CCSI-6805	CCSI-6805-2PKS	272	186	5.0
	42	9	CCSI-6905	CCSI-6905-2PKS	446	287	4.5
	47	12	CCSI-6005	CCSI-6005-2PKS	659	382	4.3
	52	15	CCSI-6205	CCSI-6205-2PKS	918	513	3.6
	62	17	CCSI-6305	CCSI-6305-2PKS	1348	739	3.2
30	37	4	CCSI-6706	CCSI-6706-2PKS	72	61	1.8
	42	7	CCSI-6806	CCSI-6806-2PKS	291	214	4.5
	47	9	CCSI-6906	CCSI-6906-2PKS	463	319	4.0
	55	13	CCSI-6006	CCSI-6006-2PKS	857	539	3.6
	62	16	CCSI-6206	CCSI-6206-2PKS	1264	736	3.2
	72	19	CCSI-6306	CCSI-6306-2PKS	1728	974	3.0
35	44	5	CCSI-6707	CCSI-6707-2PKS	118	104	1.5
	47	7	CCSI-6807	CCSI-6807-2PKS	298	244	4.0
	55	10	CCSI-6907	CCSI-6907-2PKS	698	593	3.5
	62	14	CCSI-6007	CCSI-6007-2PKS	1038	671	3.2
	72	17	CCSI-6207	CCSI-6207-2PKS	1681	1009	2.8
	80	21	CCSI-6307	CCSI-6307-2PKS	2170	1248	2.7
40	50	6	CCSI-6708	CCSI-6708-2PKS	161	142	1.3
	52	7	CCSI-6808	CCSI-6808-2PKS	315	267	3.5
	62	12	CCSI-6908	CCSI-6908-2PKS	831	638	3.2
	68	15	CCSI-6008	CCSI-6008-2PKS	1096	748	3.0
	80	18	CCSI-6208	CCSI-6208-2PKS	1893	1167	2.5
	90	23	CCSI-6308	CCSI-6308-2PKS	2666	1560	2.4

Metric Ceramic Series - Si3N4

Ceramic silicon nitride bearings for radial loads and moderate thrust loads in both directions.

These bearings are supplied with silicon nitride rings and balls. Both types are available as full complement or with cages made from PEEK, PTFE or 316 stainless steel. Please see our Engineering Data section for more information on the bearing materials.



The bearings listed below are open but can also be supplied with PEEK seals. Some sizes are also available with a flange on the outer ring. Ceramic bearings are generally used in specialist applications.

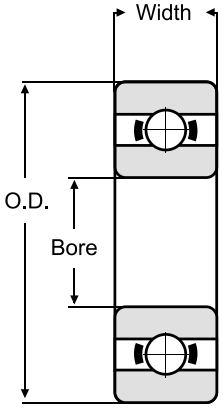
SILICON NITRIDE ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
45	55	6	CCSI-6709	CCSI-6709-2PKS	165	153	1.3
	58	7	CCSI-6809	CCSI-6809-2PKS	395	342	3.0
	68	12	CCSI-6909	CCSI-6909-2PKS	884	692	2.7
	75	16	CCSI-6009	CCSI-6009-2PKS	1151	787	2.4
	85	19	CCSI-6209	CCSI-6209-2PKS	1772	1039	2.2
	100	25	CCSI-6309	CCSI-6309-2PKS	2950	1800	2.1
50	62	6	CCSI-6710	CCSI-6710-2PKS	173	161	1.1
	65	7	CCSI-6810	CCSI-6810-2PKS	407	463	2.8
	72	12	CCSI-6910	CCSI-6910-2PKS	906	703	2.5
	80	16	CCSI-6010	CCSI-6010-2PKS	1181	846	2.2
	90	20	CCSI-6210	CCSI-6210-2PKS	1905	1187	2.0
	110	27	CCSI-6310	CCSI-6310-2PKS	3450	2150	1.9

316 Stainless Steel Series

316 grade highly corrosion resistant ball bearings for radial loads and moderate thrust loads in both directions.

These semi-precision marine grade stainless steel bearings are made from 316 grade stainless steel which is highly resistant to seawater and many chemicals. They can be supplied with 316 stainless steel or ceramic balls. Cages and seals are normally PE (polyethylene) but can be offered in PEEK. Some designations are suitable for very high temperatures and cryogenic applications. These bearings are only suitable for low loads and speeds. Please refer to Engineering Data for more information.

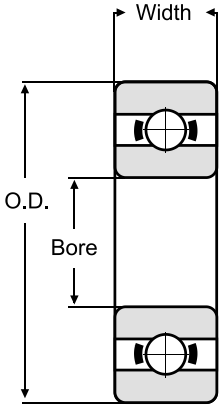


STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm * (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
6	17	6	S316-606	S316-606-2PES	27	14	2.7
	19	6	S316-626	S316-626-2PES	28	14	2.4
7	19	6	S316-607	S316-607-2PES	29	15	2.6
	22	7	S316-627	S316-627-2PES	40	22	2.2
8	22	7	S316-608	S316-608-2PES	40	22	2.4
	24	8	S316-628	S316-628-2PES	41	23	2.1
9	24	7	S316-609	S316-609-2PES	41	23	2.3
	26	8	S316-629	S316-629-2PES	56	32	2.0
10	26	8	S316-6000	S316-6000-2PES	56	32	2.2
	30	9	S316-6200	S316-6200-2PES	62	39	1.7
	35	11	S316-6300	S316-6300-2PES	99	56	1.6
12	28	8	S316-6001	S316-6001-2PES	62	39	1.9
	32	10	S316-6201	S316-6201-2PES	83	49	1.6
	37	12	S316-6301	S316-6301-2PES	119	68	1.5
15	32	9	S316-6002	S316-6002-2PES	68	46	1.6
	35	11	S316-6202	S316-6202-2PES	93	61	1.4
	42	13	S316-6302	S316-6302-2PES	140	89	1.4
17	35	10	S316-6003	S316-6003-2PES	73	54	1.4
	40	12	S316-6203	S316-6203-2PES	117	79	1.3
	47	14	S316-6303	S316-6303-2PES	166	109	1.1
20	42	12	S316-6004	S316-6004-2PES	115	83	1.3
	47	14	S316-6204	S316-6204-2PES	157	109	1.1
	52	15	S316-6304	S316-6304-2PES	194	129	1.0

316 Stainless Steel Series

316 grade highly corrosion resistant ball bearings for radial loads and moderate thrust loads in both directions.



These semi-precision marine grade stainless steel bearings are made from 316 grade stainless steel which is highly resistant to seawater and many chemicals. They can be supplied with 316 stainless steel or ceramic balls. Cages and seals are normally PE (polyethylene) but can be offered in PEEK. Some designations are suitable for very high temperatures and cryogenic applications. These bearings are only suitable for low loads and speeds. Please refer to Engineering Data for more information.

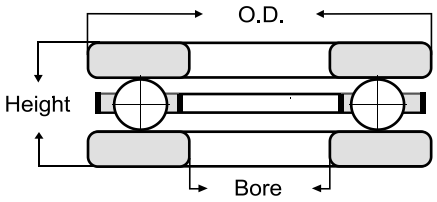
STAINLESS STEEL ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Width	Open Bearing	Sealed Bearing	Max Load (kgf)		Rpm * (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
25	47	12	S316-6005	S316-6005-2PES	123	96	1.1
	52	15	S316-6205	S316-6205-2PES	171	128	0.9
	62	17	S316-6305	S316-6305-2PES	252	185	0.8
30	55	13	S316-6006	S316-6006-2PES	162	135	0.9
	62	16	S316-6206	S316-6206-2PES	238	184	0.8
	72	19	S316-6306	S316-6306-2PES	326	247	0.7
35	62	14	S316-6007	S316-6007-2PES	195	168	0.8
	72	17	S316-6207	S316-6207-2PES	314	252	0.7
40	68	15	S316-6008	S316-6008-2PES	205	188	0.7
	80	18	S316-6208	S316-6208-2PES	356	299	0.6
45	75	16	S316-6009	S316-6009-2PES	218	197	0.6
	85	19	S316-6209	S316-6209-2PES	333	261	0.5
50	80	16	S316-6010	S316-6010-2PES	223	212	0.6
	90	20	S316-6210	S316-6210-2PES	357	298	0.5

Three-Part Thrust Series

Miniature thrust bearings with flat washers (no raceway) for thrust loads in both directions.

Miniature thrust bearings are normally supplied in chrome steel but may be available in stainless steel subject to minimum requirements. These bearings can withstand axial or thrust loads only. The bearings in the table below can take thrust loads in both directions but have a smaller load capacity than the grooved washer type and are for low speed use only.



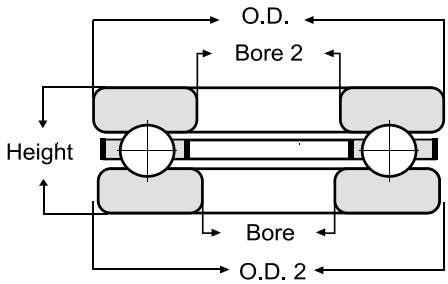
CHROME STEEL/BRASS ***Dimensions in mm unless otherwise specified***

Bore	O.D.	Height	Flat Washers	Max Load (kgf)	
			SMB Reference	Dyn	Stat
2	6	3.0	F2-6	12	8
3	8	3.5	F3-8	17	14
4	10	4.5	F4-10	27	25
5	11	4.5	F5-11	29	29
6	12	4.5	F6-12	27	28
7	15	5.0	F7-15	57	56
8	16	5.0	F8-16	55	52
9	17	5.0	F9-17	64	59
10	18	5.5	F10-18	72	63

Three-Part Thrust Series

Miniature thrust bearings with grooved washers for thrust loads in one direction only.

Miniature thrust bearings are normally supplied in chrome steel but may be available in stainless steel subject to minimum quantity. These bearings can withstand axial or thrust loads only. The bearings in the table below can take thrust loads in one direction only due to different sized washers. They have a greater load capacity and higher speed rating than the flat washer type.



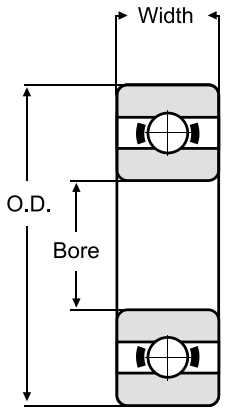
CHROME STEEL/BRASS ***Dimensions in mm unless otherwise specified***

Bore	Bore2	O.D.	O.D.2	Width	Grooved Washers	Max Load (kgf)	
					SMB Reference	Dyn	Stat
3	3.2	8	7.8	3.5	F3-8G	59	99
4	4.2	9	8.8	4.0	F4-9G	64	94
		10	9.8	4.0	F4-10G	66	92
5	5.2	10	9.8	4.0	F5-10G	83	78
		12	11.8	4.0	F5-12G	94	105
6	6.2	12	11.8	4.5	F6-12G	159	182
		13	12.8	5.0	F6-13G	156	187
		14	13.8	5.0	F6-14G	215	170
7	7.2	13	12.8	4.5	F7-13G	215	170
		17	16.8	6.0	F7-17G	215	170
8	8.2	16	15.8	5.0	F8-16G	215	170
		19	18.8	7.0	F8-19G	393	347
9	9.2	20	19.8	7.0	F9-20G	385	357
10	10.2	18	17.8	5.5	F10-18G	247	272

Imperial Miniature Series

Chrome steel miniature bearings for radial loads and moderate thrust loads in both directions.

These smaller sizes are sometimes referred to as instrument bearings or micro bearings. We provide miniature bearings for applications as varied as gyros, anemometers, miniature gearboxes, small motors and radio controlled models. These bearings are supplied in SAE52100 chrome steel.



CHROME STEEL ***Dimensions in inches unless otherwise specified***

Bore	O.D.	Open Bearing		Shielded and Sealed Bearing			Max Load (kgf)		Rpm ** (x1000)
		Width	SMB Reference	Width	SMB Shielded Reference	SMB Sealed Reference *	Dyn	Stat	
0.0937	0.1875	0.0625	R133	0.0937	R133ZZ		19	6	95
0.125	0.2500	0.0937	R144	0.1094	R144ZZ		28	10	80
	0.3125	0.1094	R2-5	0.1406	R2-5ZZ		56	18	67
	0.3750	0.1094	R2-6	0.1406	R2-6ZZ		64	23	63
	0.3750	0.1562	R2	0.1562	R2ZZ	R2-2RS	63	22	67
	0.5000	0.1719	R2A	0.1719	R2AZZ	R2A-2RS	64	28	63
0.1562	0.3125	0.1094	R155	0.1250	R155ZZ		36	15	63
0.1875	0.3125	0.1094	R156	0.1250	R156ZZ	R156-2RS	36	15	63
	0.3750	0.1250	R166	0.1250	R166ZZ	R166-2RS	71	27	60
	0.5000	0.1562	R3	0.1960	R3ZZ	R3-2RS	130	49	53
	0.6250	0.1960	R3A	0.1960	R3AZZ	R3A-2RS	148	62	45
	0.6875	0.2500	1601	0.2500	1601ZZ		153	64	43
	0.6875			0.3125		1601-2RS	153	64	26
0.25	0.3750	0.1250	R168	0.1250	R168ZZ	R168-2RS	37	17	56
	0.5000	0.1250	R188	0.1875	R188ZZ	R188-2RS	108	44	50
	0.6250	0.1960	R4	0.1960	R4ZZ	R4-2RS	148	62	45
	0.6875	0.2500	1602	0.2500	1602ZZ		171	78	42
	0.6875			0.3125		1602-2RS	171	78	25
	0.7500	0.2188	R4A	0.2812	R4AZZ	R4A-2RS	234	90	43
0.3125	0.5000	0.1562	R1810	0.1562	R1810ZZ	R1810-2RS	54	28	48
	0.8750	0.2812	1603	0.2812	1603ZZ		317	135	37
	0.8750			0.3438		1603-2RS	317	135	22
	0.9062	0.3125	1605	0.3125	1605ZZ	1605-2RS	317	135	37

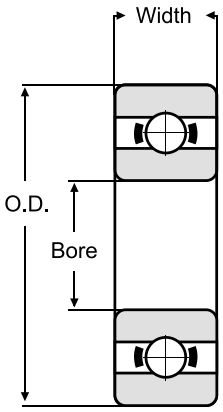
** Some sizes available with non-contact seals or teflon seals.*

*** Rpm may be lower for ZZ and 2RS types*

Imperial Miniature Series

Chrome steel miniature bearings for radial loads and moderate thrust loads in both directions.

These smaller sizes are sometimes referred to as instrument bearings or micro bearings. We provide miniature bearings for applications as varied as gyros, anemometers, miniature gearboxes, small motors and radio controlled models. These bearings are supplied in SAE52100 chrome steel.



CHROME STEEL ***Dimensions in inches unless otherwise specified***

Bore	O.D.	Open Bearing		Shielded and Sealed Bearing			Max Load (kgf)		Rpm ** (x1000)
		Width	SMB Reference	Width	SMB Shielded Reference	SMB Sealed Reference *	Dyn	Stat	
	0.6250	0.1562	R1038	0.1562	R1038ZZ	R1038-2RS	85	42	33
	0.8750			0.2188		R6-2RSW21	333	142	23
	0.8750	0.2188	R6	0.2812	R6ZZ	R6-2RS	333	142	38
0.375	0.8750	0.2812	1604	0.2812	1604ZZ		322	139	36
	0.8750			0.3438		1604-2RS	322	139	22
	0.9062	0.3125	1606	0.3125	1606ZZ	1606-2RS	322	139	36
	1.1250	0.3750	1614	0.3750	1614ZZ	1614-2RS	468	219	32
	0.9062	0.3125	1607	0.3125	1607ZZ	1607-2RS	244	122	34
0.4375	1.1250	0.3750	1615	0.3750	1615ZZ	1615-2RS	468	219	32
	1.3750	0.4375	1620	0.4375	1620ZZ	1620-2RS	742	316	24
	0.7500	0.1562	R1212	0.1562	R1212ZZ	R1212-2RS	78	45	27
0.5	1.1250	0.2500	R8	0.3125	R8ZZ	R8-2RS	511	241	32
	1.1250	0.3750	1616	0.3750	1616ZZ	1616-2RS	498	231	30
	1.3750	0.4375	1621	0.4375	1621ZZ	1621-2RS	718	346	24
0.5625	1.3750	0.4375	1622	0.4375	1622ZZ	1622-2RS	718	346	24
	1.3750	0.2812	R10	0.3438	R10ZZ	R10-2RS	599	329	25
0.625	1.3750	0.4375	1623	0.4375	1623ZZ	1623-2RS	588	312	22
	1.6250	0.5000	1628	0.5000	1628ZZ	1628-2RS	886	412	18
0.75	1.6250	0.3125	R12	0.4375	R12ZZ	R12-2RS	938	506	21
	1.6250	0.5000	1630	0.5000	1630ZZ	1630-2RS	780	428	20
0.875	1.8750	0.3750	R14	0.5000	R14ZZ	R14-2RS	1080	576	18
1.0	2.0000	0.3750	R16	0.5000	R16ZZ	R16-2RS	1150	700	16

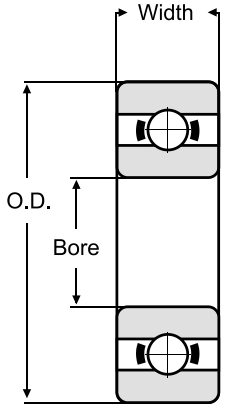
** Some sizes available with non-contact seals or teflon seals.*

*** Rpm may be lower for ZZ and 2RS types*

Imperial Stainless Steel Miniature Series

Corrosion resistant miniature bearings for radial loads and moderate thrust loads in both directions.

These smaller sizes are sometimes referred to as instrument bearings or micro bearings. We provide miniature bearings for applications as varied as gyros, anemometers, miniature gearboxes, small motors and radio controlled models. These bearings are supplied in AISI440C or KS440 stainless steel.



STAINLESS STEEL ***Dimensions in inches unless otherwise specified***

Bore	O.D.	Open Bearing		Shielded and Sealed Bearing			Max Load (kgf)		Rpm ** (x1000)
		Width	SMB Reference	Width	SMB Shielded Reference	SMB Sealed Reference *	Dyn	Stat	
0.04	0.1250	0.0469	SR09				8	2	150
0.0469	0.1562	0.0625	SR0	0.0937	SR0ZZ		9	3	130
0.055	0.1875	0.0781	SR1	0.1094	SR1ZZ		19	5	110
0.0781	0.2500	0.0937	SR1-4	0.1406	SR1-4ZZ		23	7	80
0.0937	0.1875	0.0625	SR133	0.0937	SR133ZZ		15	5	95
	0.3125	0.1094	SR1-5	0.1406	SR1-5ZZ		44	14	71
0.125	0.2500	0.0937	SR144	0.1094	SR144ZZ		23	8	80
	0.2500			0.0937	SR144ZZW09		23	8	67
	0.3125	0.1094	SR2-5	0.1406	SR2-5ZZ		45	14	67
	0.3125			0.1094	SR2-5ZZW10		45	14	60
	0.3750	0.1094	SR2-6	0.1406	SR2-6ZZ		51	17	63
	0.3750			0.1094	SR2-6ZZW10		51	17	53
	0.3750	0.1562	SR2	0.1562	SR2ZZ	SR2-2RS	50	17	67
	0.5000	0.1094	SR184	0.1094	SR184ZZ		52	17	67
	0.5000	0.1719	SR2A	0.1719	SR2AZZ	SR2A-2RS	51	21	63
0.1562	0.3125	0.1094	SR155	0.1250	SR155ZZ		29	11	63
0.1875	0.3125	0.1094	SR156	0.1250	SR156ZZ	SR156-2RS	29	11	63
	0.3750	0.1250	SR166	0.1250	SR166ZZ	SR166-2RS	57	20	60
	0.5000	0.1562	SR3	0.1960	SR3ZZ	SR3-2RS	104	37	53
	0.5000			0.1562	SR3ZZW15	SR3-2RSW15	104	37	43

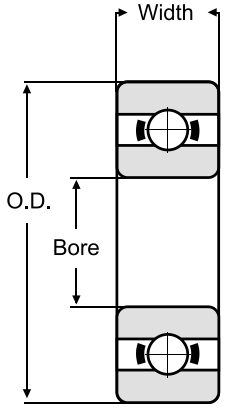
* *Some sizes available with non-contact seals or teflon seals.*

** *Rpm may be lower for ZZ and 2RS types*

Imperial Stainless Steel Miniature Series

Corrosion resistant miniature bearings for radial loads and moderate thrust loads in both directions.

These smaller sizes are sometimes referred to as instrument bearings or micro bearings. We provide miniature bearings for applications as varied as gyros, anemometers, miniature gearboxes, small motors and radio controlled models. These bearings are supplied in AISI440C or KS440 stainless steel.



STAINLESS STEEL ***Dimensions in inches unless otherwise specified***

Bore	O.D.	Open Bearing		Shielded and Sealed Bearing			Max Load (kgf)		Rpm ** (x1000)
		Width	SMB Reference	Width	SMB Shielded Reference	SMB Sealed Reference *	Dyn	Stat	
0.25	0.3750	0.1250	SR168	0.1250	SR168ZZ	SR168-2RS	31	14	56
	0.5000	0.1250	SR188	0.1875	SR188ZZ	SR188-2RS	86	33	50
	0.5000			0.1250	SR188ZZW12		86	33	40
	0.6250	0.1960	SR4	0.1960	SR4ZZ	SR4-2RS	118	47	45
	0.7500	0.2188	SR4A	0.2812	SR4AZZ	SR4A-2RS	187	68	43
0.3125	0.5000	0.1562	SR1810	0.1562	SR1810ZZ	SR1810-2RS	43	21	48
	0.6250			0.1562	SR1810AZZ		43	21	40
0.375	0.6250	0.1562	SR1038	0.1562	SR1038ZZ	SR1038-2RS	72	37	33
	0.8750	0.2188	SR6	0.2812	SR6ZZ	SR6-2RS	266	107	38
0.5	0.7500	0.1562	SR1212	0.1562	SR1212ZZ	SR1212-2RS	62	34	27
	0.7500			0.1960	SR1212ZZW19		62	34	23
	0.8750	0.2188	SR6-1/2	0.2812	SR6ZZ-1/2		232	93	36
	1.1250	0.2500	SR8	0.3125	SR8ZZ	SR8-2RS	409	181	32
0.625	0.8750	0.1562	SR1458	0.1562	SR1458ZZ		82	50	23
	1.3750	0.2812	SR10	0.3438	SR10ZZ	SR10-2RS	479	247	25
0.75	1.0000	0.1562	SR1634	0.1562	SR1634ZZ		86	55	20
	1.6250	0.3125	SR12	0.4375	SR12ZZ	SR12-2RS	750	380	21
0.875	1.8750	0.3750	SR14	0.5000	SR14ZZ	SR14-2RS	864	432	18
1.0	2.0000	0.3750	SR16	0.5000	SR16ZZ	SR16-2RS	920	525	16

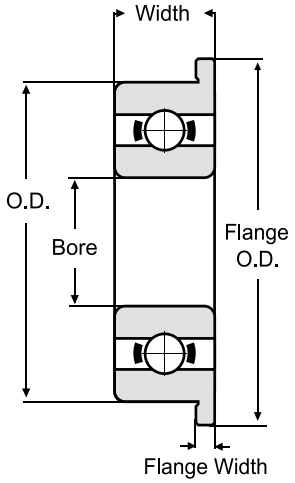
* *Some sizes available with non-contact seals or teflon seals.*

** *Rpm may be lower for ZZ and 2RS types*

Imperial Flanged Miniature Series

Chrome steel flanged miniature bearings for radial loads and moderate thrust loads in both directions.

The flange allows easier location in a housing. The smaller sizes are sometimes referred to as instrument bearings or micro bearings. For load and speed ratings, please see the non-flanged type. These bearings are supplied in SAE52100 chrome steel.



CHROME STEEL ***Dimensions in inches unless otherwise specified***

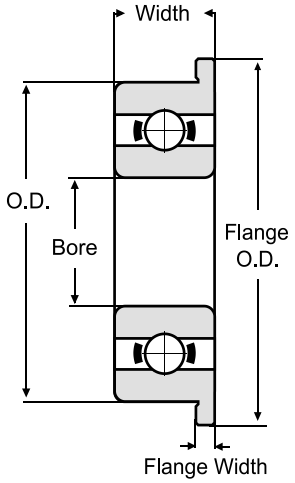
Bore	O.D.	Flange O.D.	Open Bearing			Shielded and Sealed Bearing			
			Width	Flange Width	SMB Reference	Width	Flange Width	SMB Shielded Reference	SMB Sealed Reference **
0.125	0.3750	0.440	0.1562	0.0300	FR2	0.1562	0.0300	FR2ZZ	FR2-2RS
0.1875	0.3125	0.359	0.1094	0.0230	FR156	0.1250	0.0360	FR156ZZ	
	0.5000	0.565	0.1562	0.0420	FR3	0.1960	0.0420	FR3ZZ	FR3-2RS
0.25	0.3750	0.422	0.1250	0.0230	FR168	0.1250	0.0360	FR168ZZ	
	0.5000	0.547	0.1250	0.0230	FR188	0.1875	0.0450	FR188ZZ	
	0.6250	0.690	0.1960	0.0420	FR4	0.1960	0.0420	FR4ZZ	FR4-2RS
0.375	0.8750	0.969	0.2188	0.0620	FR6	0.2812	0.0620	FR6ZZ	FR6-2RS
0.5	1.1250	1.225	0.2500	0.0620	FR8	0.3125	0.0620	FR8ZZ	FR8-2RS
0.625	1.3750	1.490	0.2812	0.0687	FR10	0.3438	0.0687	FR10ZZ	FR10-2RS

* *Some sizes available with non-contact seals or teflon seals.*

Imperial Stainless Steel Flanged Miniature Series

Corrosion resistant flanged miniature bearings for radial loads and moderate thrust loads in both directions.

The flange allows easier location in a housing. The smaller sizes are sometimes referred to as instrument bearings or micro bearings. For load and speed ratings, please see the non-flanged type. These bearings are supplied in AISI440C or KS440 stainless steel.



STAINLESS STEEL ***Dimensions in inches unless otherwise specified***

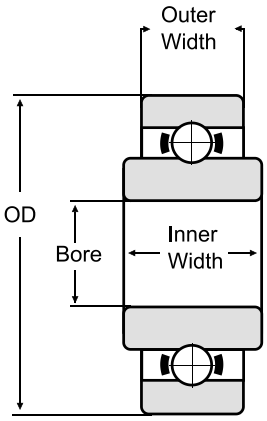
Bore	O.D.	Flange O.D.	Open Bearing			Shielded and Sealed Bearing			
			Width	Flange Width	SMB Reference	Width	Flange Width	SMB Shielded Reference	SMB Sealed Reference **
0.04	0.1250	0.171	0.0469	0.013	SFR09				
0.0469	0.1562	0.203	0.6250	0.013	SFR0	0.0937	0.031	SFR0ZZ	
0.055	0.1875	0.234	0.0781	0.023	SFR1	0.1094	0.031	SFR1ZZ	
0.0781	0.2500	0.296	0.0937	0.023	SFR1-4	0.1406	0.031	SFR1-4ZZ	
0.0937	0.1875	0.234	0.0625	0.018	SFR133	0.0937	0.031	SFR133ZZ	
	0.3125	0.359	0.1094	0.023	SFR1-5	0.1406	0.031	SFR1-5ZZ	
0.125	0.2500	0.296	0.0937	0.023	SFR144	0.1094	0.031	SFR144ZZ	
	0.3125	0.359	0.1094	0.023	SFR2-5	0.1406	0.031	SFR2-5ZZ	
	0.3750	0.422	0.1094	0.023	SFR2-6	0.1406	0.031	SFR2-6ZZ	
	0.3750	0.440	0.1562	0.030	SFR2	0.1562	0.030	SFR2ZZ	SFR2-2RS
0.1562	0.3125	0.359	0.1094	0.023	SFR155	0.1250	0.036	SFR155ZZ	
0.1875	0.3125	0.359	0.1094	0.023	SFR156	0.1250	0.036	SFR156ZZ	
	0.3750	0.422	0.1250	0.023	SFR166	0.1250	0.031	SFR166ZZ	
	0.5000	0.565	0.1562	0.042	SFR3	0.1960	0.042	SFR3ZZ	SFR3-2RS
	0.5000	0.565	0.1960	0.042	SFR3W19				
0.25	0.3750	0.422	0.1250	0.230	SFR168	0.1250	0.036	SFR168ZZ	
	0.5000	0.547	0.1250	0.230	SFR188	0.1875	0.045	SFR188ZZ	
	0.6250	0.690	0.1960	0.420	SFR4	0.1960	0.042	SFR4ZZ	SFR4-2RS
0.3125	0.5000	0.547	0.1562	0.031	SFR1810	0.1562	0.031	SFR1810ZZ	SFR1810-2RS
0.375	0.8750	0.969	0.2188	0.062	SFR6	0.2812	0.062	SFR6ZZ	SFR6-2RS
0.5	1.1250	1.225	0.2500	0.062	SFR8	0.3125	0.062	SFR8ZZ	

* *Some sizes available with non-contact seals or teflon seals.*

Imperial Extended Inner Series

Corrosion resistant miniature bearings with extended inner ring for radial loads and moderate thrust loads in both directions.

These bearings have an inner ring that is wider than the outer ring by 0.0312" (0.0156" on each side. These bearings are easier to mount with the wider inner ring eliminating the need for spacers or washers. These are supplied in AISI440C or KS440 stainless steel.



STAINLESS STEEL ***Dimensions in inches unless otherwise specified***

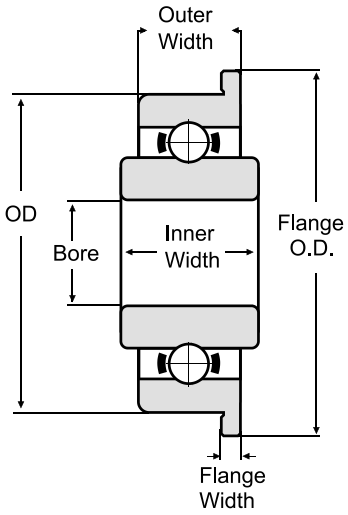
Bore	O.D.	Open Bearing			Shielded Bearing			Max Load (kgf)		Rpm ** (x1000)
		Outer Width	Inner Width	SMB Reference	Outer Width	Inner Width	SMB Reference	Dyn	Stat	
0.0469	0.1562	0.0625	0.0937	SRW0	0.9370	0.1250	SRW0ZZ	9	3	130
0.055	0.1875	0.0781	0.1094	SRW1	0.1094	0.1406	SRW1ZZ	19	5	110
0.0781	0.2500	0.0937	0.1250	SRW1-4	0.1406	0.1719	SRW1-4ZZ	23	7	80
0.0937	0.1875	0.0625	0.0937	SRW133	0.0937	0.1250	SRW133ZZ	15	5	95
	0.3125	0.1094	0.1406	SRW1-5	0.1406	0.1719	SRW1-5ZZ	44	14	71
0.125	0.2500	0.0937	0.1250	SRW144	0.1094	0.1406	SRW144ZZ	23	8	80
	0.3125	0.1094	0.1406	SRW2-5	0.1406	0.1719	SRW2-5ZZ	45	14	67
	0.3750	0.1094	0.1406	SRW2-6	0.1406	0.1719	SRW2-6ZZ	51	17	63
	0.3750	0.1562	0.1875	SRW2	0.1562	0.1875	SRW2ZZ	50	17	67
0.1562	0.3125	0.1094	0.1406	SRW155	0.1250	0.1562	SRW155ZZ	29	11	63
0.1875	0.3125	0.1094	0.1406	SRW156	0.1250	0.1562	SRW156ZZ	29	11	63
	0.3750	0.1250	0.1562	SRW166	0.1250	0.1562	SRW166ZZ	57	20	60
	0.5000	0.1562	0.1875	SRW3	0.1960	0.2272	SRW3ZZ	104	37	53
0.25	0.3750	0.1250	0.1562	SRW168	0.1250	0.1562	SRW168ZZ	31	14	56
	0.5000	0.1250	0.1562	SRW188	0.1875	0.2188	SRW188ZZ	86	33	50
	0.6250	0.1960	0.2272	SRW4	0.1960	0.2272	SRW4ZZ	118	47	45
0.3125	0.5000	0.1562	0.1875	SRW1810	0.1562	0.1875	SRW1810ZZ	43	21	48

** Rpm may be lower for ZZ types*

Imperial Flanged Extended Inner Series

Corrosion resistant flanged miniature bearings with extended inner ring for radial loads and moderate thrust loads in both directions.

These bearings have an inner ring that is wider than the outer ring by 0.0312". They are easier to mount with the wider inner ring eliminating the need for spacers or washers. The flange provides easier location in a housing. These are supplied in AISI440C or KS440 stainless steel. For load and speed ratings, please see the non-flanged type.



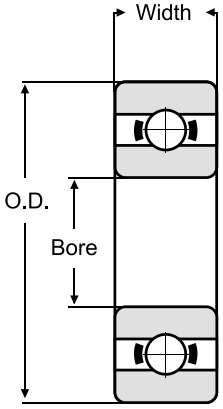
STAINLESS STEEL ***Dimensions in inches unless otherwise specified***

Bore	O.D.	Flange O.D.	Open Bearing				Shielded Bearing			
			Outer Width	Inner Width	Flange Width	SMB Reference	Outer Width	Inner Width	Flange Width	SMB Reference
0.0469	0.1562	0.203	0.0625	0.0937	0.013	SFRW0	0.0937	0.1250	0.031	SFRW0ZZ
0.055	0.1875	0.234	0.0781	0.1094	0.023	SFRW1	0.1094	0.1406	0.031	SFRW1ZZ
0.0781	0.2500	0.296	0.0937	0.1250	0.023	SFRW1-4	0.1406	0.1719	0.031	SFRW1-4ZZ
0.0937	0.1875	0.234	0.0625	0.0937	0.018	SFRW133	0.0937	0.1250	0.031	SFRW133ZZ
	0.3125	0.359	0.1094	0.1406	0.023	SFRW1-5	0.1406	0.1719	0.031	SFRW1-5ZZ
0.125	0.2500	0.296	0.0937	0.1250	0.023	SFRW144	0.1094	0.1406	0.031	SFRW144ZZ
	0.3125	0.359	0.1094	0.1406	0.023	SFRW2-5	0.1406	0.1719	0.031	SFRW2-5ZZ
	0.3750	0.422	0.1094	0.1406	0.023	SFRW2-6	0.1406	0.1719	0.031	SFRW2-6ZZ
	0.3750	0.440	0.1562	0.1875	0.030	SFRW2	0.1562	0.1875	0.03	SFRW2ZZ
0.1562	0.3125	0.359	0.1094	0.1406	0.023	SFRW155	0.1250	0.1562	0.036	SFRW155ZZ
0.1875	0.3125	0.359	0.1094	0.1406	0.023	SFRW156	0.1250	0.1562	0.036	SFRW156ZZ
	0.3750	0.422	0.1250	0.1562	0.023	SFRW166	0.1250	0.1562	0.031	SFRW166ZZ
	0.5000	0.565	0.1562	0.1875	0.042	SFRW3	0.1960	0.2272	0.042	SFRW3ZZ
0.25	0.3750	0.422	0.1250	0.1562	0.023	SFRW168	0.1250	0.1562	0.036	SFRW168ZZ
	0.5000	0.547	0.1250	0.1562	0.023	SFRW188	0.1875	0.2188	0.045	SFRW188ZZ
	0.6250	0.690	0.1960	0.2272	0.042	SFRW4	0.1960	0.2272	0.042	SFRW4ZZ
0.3125	0.5000	0.547	0.1562	0.1875	0.031	SFRW1810	0.1562	0.1875	0.031	SFRW1810ZZ

** Rpm may be lower for ZZ types*

Imperial Plastic Series

Semi-precision plastic bearings for radial loads and moderate thrust loads in both directions.



These bearings have acetal resin rings (POM) and nylon cages (PA66). We can supply many of these sizes in more chemically resistant material or high temperature material such as polypropylene or PEEK.

Plastic bearings are only suitable for low loads and low speeds. Normal inner and outer ring tolerances on these bearings are +/- 0.1mm. For chemical compatibility and temperature limits, please see our Engineering Data section.

ACETAL RESIN ***Dimensions in inches unless otherwise specified***

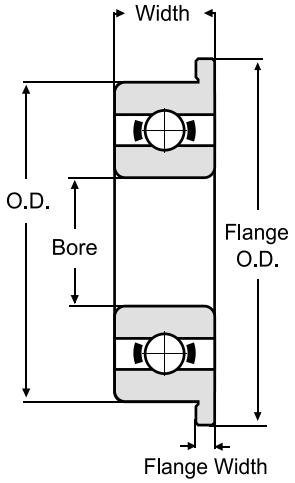
Bore	O.D.	Width	316 Stainless Balls	Glass Balls	Max Load (kgf)		Rpm (x1000)
			SMB Reference	SMB Reference	Dyn	Stat	
0.125	0.375	0.1562	ACR2-316	ACR2-GL	5	3	3.0
0.1875	0.500	0.1562	ACR3-316	ACR3-GL	7	5	3.0
0.25	0.625	0.1960	ACR4-316	ACR4-GL	8	6	2.6
	0.750	0.2188	ACR4A-316	ACR4A-GL	9	7	2.6
0.375	0.875	0.2188	ACR6-316	ACR6-GL	12	9	2.6
0.5	1.125	0.2500	ACR8-316	ACR8-GL	16	13	1.8
0.625	1.375	0.2812	ACR10-316	ACR10-GL	18	15	1.6
0.75	1.625	0.3125	ACR12-316	ACR12-GL	24	19	1.2
0.875	1.875	0.3750	ACR14-316	ACR14-GL	29	22	1.2
1.0	2.000	0.3750	ACR16-316	ACR16-GL	37	29	1.1

Imperial Plastic Flanged Series

Semi-precision plastic bearings for radial loads and moderate thrust loads in both directions.

These bearings have acetal resin rings (POM) and nylon cages (PA66). We can supply many of these sizes in more chemically resistant material or high temperature material such as polypropylene or PEEK.

Plastic bearings are only suitable for low loads and low speeds. Normal inner and outer ring tolerances on these bearings are +/- 0.1mm. For chemical compatibility and temperature limits, please see our Engineering Data section.



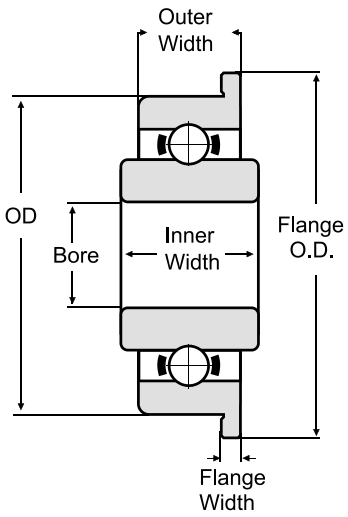
ACETAL RESIN ***Dimensions in inches unless otherwise specified***

Bore	O.D.	Width	Flange O.D.	316 Stainless Balls	Glass Balls	Max Load (kgf)		Rpm (x1000)
				SMB Reference	SMB Reference	Dyn	Stat	
0.125	0.375	0.1562	0.440	ACFR2-316	ACFR2-GL	5	3	3.0
0.1875	0.500	0.1562	0.565	ACFR3-316	ACFR3-GL	7	5	3.0
0.25	0.625	0.1960	0.690	ACFR4-316	ACFR4-GL	8	6	2.6
0.375	0.875	0.2188	0.969	ACFR6-316	ACFR6-GL	12	9	2.6
0.5	1.125	0.2500	1.225	ACFR8-316	ACFR8-GL	16	13	1.8
0.625	1.375	0.2812	1.490	ACFR10-316	ACFR10-GL	18	15	1.6

Imperial Taper O.D. Series

Miniature bearings with tapered outer ring - for radial loads and moderate thrust loads in both directions.

Taper O.D. bearings have a flange on the outer ring, an extended or wider inner ring and an outer ring that is slightly tapered for fitting into soft steel or sheet metal. The outer ring tapers at 0.068 inches per foot. These bearings are supplied in SAE52100 Chrome Steel.



CHROME STEEL ***Dimensions in inches unless otherwise specified***

Bore	O.D.	Flange O.D.	Outer Width	Inner Width	Flange Width	SMB Reference	Max Load (kgf)		Rpm (x1000)
							Dyn	Stat	
0.1875	0.5632	0.625	0.163	0.188	0.042	F3ZZ	126	47	43
0.25	0.6257	0.687	0.226	0.250	0.042	F4ZZ	142	59	38
0.3125	0.6882	0.750	0.226	0.250	0.042	F5ZZ	190	68	35

Relubrication services

Cleaning and relubrication of open, shielded, sealed ball and roller bearings.

We offer a full relubrication service for either our own miniature bearings or customer supplied bearings. We have many years' experience of degreasing and relubricating bearings with SMB-recommended or customer-specified lubricants. Every day, our customers require bearings with specialised greases and oils designed to handle everything from food safe applications to low torque conditions. We regularly supply bearings with:

cleanroom lubricants
dampening greases
food safe greases
high temperature lubricants
low temperature lubricants
low torque lubricants
molybdenum disulphide coating
tungsten disulphide coating
chemically resistant lubricants
radiation-resistant lubricants
vacuum lubricants
waterproof greases

SAMPLES AT SHORT NOTICE

Manufacturers are rarely interested in small volumes of bearings with non-standard lubricants but we can help. We have a range of degreasing methods to clean all bearing surfaces before using proprietary lubrication equipment to apply your choice of oil, grease or dry lubricant.

Whether you need to re-lubricate a high precision miniature bearing with instrument oil or re-grease a deep groove ball bearing for a vacuum application, we have the equipment to do it.

WE CAN RELUBRICATE BEARINGS WITH NON-REMOVABLE SHIELDS

We can control the lubrication to within a few milligrams so if you require a specific grease fill, we can handle it.

We have been relubricating bearings for over 25 years so our experience with different types of customer-supplied bearings is comprehensive. We have the technical expertise to handle cylindrical and needle roller bearings, plain spherical bearings, thin section bearings and miniature ball bearings from customers worldwide.

We have also developed a system to clean and lubricate bearings without removing the shields so open, shielded and rubber sealed bearings are all reworkable.

WE OFFER EXPERT LUBRICATION ADVICE

We can advise you on the best choice of bearing lubricant for problem applications. If you are involved in testing or R&D, our in-house ultrasonic bearing degreasing and relubrication facility enables us to supply bearing samples at short notice.

If you want to know more about our bearing relubrication capabilities, please ask.

Engineering Data

The following pages give an overview and detailed explanations of the design and selection criteria for the SMB range of radial and thrust ball bearings.

1. Bearing Materials

STEELS

SAE52100 Chrome Steel (no prefix)

- Higher hardness so longer life ratings
- Lower cost
- Good for temperatures up to 150°C
- Poor corrosion resistance

This is the standard steel for most ball bearings. It is harder than stainless steel and gives greater life ratings. It also has superior low noise qualities to standard 440 grade stainless steel. Chrome steel actually has a low chromium content and is not corrosion resistant so not suitable for corrosive environments or for dry (unlubricated) bearings as chrome bearings require an oil coating on the external surfaces for protection. Chrome steel can tolerate continuous temperatures of up to 120°C. Above this temperature, it undergoes greater dimensional change and the hardness is affected, reducing load capacity. It can withstand up to 150°C intermittently but, at higher temperatures, bearing life is significantly reduced.

440 Grade Martensitic Stainless Steel (prefix "S")

- Good corrosion resistance to water and many weak chemicals
- Corrosion resistance can be improved by passivation
- Good for temperatures up to 300°C
- Slightly softer than chrome steel so lower load ratings
- Will corrode in salt water or salt spray and poor resistance to acids/alkalis
- More expensive than chrome steel

More resistant to corrosion due to the greater chromium content and the addition of nickel, 440 grade stainless steel is the most commonly used for corrosion resistant ball bearings. The chromium reacts with oxygen in the air to form a chromium oxide layer, known as the passive film, on the surface of the steel. 440 grade stainless steel is hardened by heat treatment and gives a good combination of strength and corrosion resistance. It is magnetic unlike 300 grade austenitic steel.

The load capacity of AISI440C stainless steel is approximately 20% less than chrome steel so life ratings will be slightly reduced. This grade exhibits good corrosion resistant when exposed to fresh water and some weaker chemicals but will corrode in seawater environments or in contact with many aggressive chemicals. KS440 or ACD34/X65Cr13 grade stainless steel with a lower carbon content, is widely used by EZO and has greater corrosion resistance, greater load capacity and superior low noise qualities to the standard AISI440C grade. 440 grade stainless steel will also withstand higher temperatures than chrome steel, coping with up to 250°C constant and up to 300°C intermittent with reduced load capacity. Above 300°C, 440 grade steel suffers a loss of strength and bearing life can be considerably shortened.

A note on passivation....
The corrosion resistance of stainless steel can be increased by passivation. This is a process by which free iron particles and other impurities are removed from the surface of stainless steel by immersion in nitric or citric acid, thus regenerating the passive film. This reduces the likelihood of surface discolouration so making it a useful process in some corrosive environments. Passivation does not increase the resistance of stainless steel to pitting corrosion. This means that where a bearing has incidental contact with, say, salt spray, passivation may be beneficial but it will not offer long term protection in harsher applications.

AISI316 Austenitic Stainless Steel (prefix "S316")

- Excellent corrosion resistance to water, salt water and chemicals
- Good for temperatures up to 500°C as full complement type
- Suitable for cryogenic applications down to -250°C
- Non magnetic
- More expensive than 440 grade due to low production quantities.
- Semi-precision and suitable for very low load and low speed only

316 grade stainless steel bearings are used instead of 440 grade bearings for greater corrosion resistance to seawater, salt spray and some acids/alkalis. They are suitable for very high temperature applications as the steel is useful in temperatures of up to 500°C. They can also be used in cryogenic applications as the steel retains its toughness down to -250°C. 316 stainless steel bearings are also non-magnetic.

316 grade stainless steel cannot be hardened by heat treatment so 316 grade bearings are lower precision than 440 grade bearings and will only support low loads and low speeds. The static load rating of a 316 grade bearing is less than 15% of the 440 grade equivalent and the maximum speed is well under 10% of the 440 stainless steel version. 316 grade stainless steel exhibits good corrosion resistance in sea atmosphere and may perform well submerged in seawater. However, as the passive film on the surface of stainless steel relies on the presence of oxygen to regenerate itself, in a low oxygen underwater marine environment (e.g under washers or o-rings) the steel may be prone to pitting or crevice corrosion.

Bearings made from 316 grade stainless steel can be used at high temperatures provided a suitable cage material is used or the bearings are full complement. Due to the difficulty of using 316 grade for the cage, PEEK, acetal resin or nylon is often used for retainers in 316 stainless steel bearings.

PLASTICS

Acetal resin/POM (prefix "AC")

- Excellent corrosion resistance to water, salt water and weak chemicals
- Non magnetic
- Only semi-precision grade is possible
- Maximum temperature 110°C
- Suitable for very low load and low speed only

Polypropylene (prefix "PP")

- Excellent corrosion resistance to water, salt water and many chemicals
- Non magnetic
- Only semi-precision grade is possible
- Maximum temperature 80°C
- Suitable for very low load and low speed only

PTFE (prefix "PTFE")

- Excellent corrosion resistance to water, salt water and most chemicals
- Good high temperature performance
- Non magnetic
- Only semi-precision grade is possible
- Maximum temperature 260°C
- Suitable for low load and low speed

PEEK (prefix "PK")

- Excellent corrosion resistance to water, salt water and most chemicals
- Good high temperature performance
- Non magnetic
- Only semi-precision grade is possible
- Maximum temperature 260°C
- Greater strength so suitable for higher load and speed than other plastics

Our standard plastic corrosion resistant bearings have acetal resin (POM) rings, nylon (PA66) cages and balls made from 316 stainless steel or glass. They may corrode in the presence of certain chemicals and PA66 cages may absorb water after very long exposure causing loss of tensile strength. A number of alternative materials for rings, cages and balls are available such as polypropylene, PTFE or PEEK to suit a variety of applications.

All plastic bearings are semi precision and like 316 stainless steel bearings, should not be used for precision applications. Due to the softer material, they are not suitable for anything other than low loads and low speeds although PEEK has better load bearing capabilities. Corrosion resistance varies between the materials with PTFE and PEEK giving the best all round chemical resistance.

Care should be taken to choose the correct material when using plastic bearings at elevated temperatures. Acetal bearings should not be used in temperatures of greater than 110°C and polypropylene should only used up to 80°C but other materials have good high temperature resistance such as PTFE or PEEK which are both suitable for temperatures of up to 260°C.

Generally plastic bearings are not recommended for vacuum applications apart from PEEK which has very good outgassing characteristics.

CERAMICS

Zirconia (prefix "CCZR")

- Good corrosion resistance to acids and alkalis but can degrade in the presence of hot water or steam.
- Good high temperature performance up to 400°C without cage
- Non magnetic and electrically insulating
- Lower speed and load than steel bearings
- Not suitable for low noise applications
- Higher fracture toughness than other ceramics so better for small shock loads
- Expansion similar to steel so not a problem to use with steel shaft at high temperature

Silicon Nitride (prefix "CCSI")

- Very good corrosion resistance to water, salt water, acids and alkalis
- Good high temperature performance up to 800°C without cage
- Non magnetic and electrically insulating
- Lower speed and load than steel bearings
- Not suitable for low noise applications
- Not recommended for shock loads
- Much lighter than steel or Zirconia
- Very low thermal expansion so consider shaft/housing fits in high temperature applications

Silicon Carbide (prefix "CCSC")

- Best corrosion resistance of the ceramics
- Best high temperature performance up to 1600°C without cage
- Non magnetic
- Electrically conductive
- Not suitable for low noise applications
- Most brittle so cannot tolerate shock loads
- Much lighter than steel or Zirconia
- Very low thermal expansion so consider shaft/housing fits in high temperature applications

Full ceramic bearings are much more expensive than steel bearings so are normally used in environments that are too hostile for steel bearings. They have good to excellent corrosion resistance depending on the material and the chemicals encountered and are normally supplied without lubrication.

They are non-magnetic and, apart from silicon carbide, are electrically insulating. Full ceramic bearings may have PTFE, PEEK or 316 stainless steel retainers or be supplied as full complement type for very high temperatures.

As ceramics are more brittle than steel, full ceramic bearings, particularly silicon nitride and silicon carbide, are not recommended where heavy shock loads are likely due to the risk of cracking. Full ceramic bearings will accept approximately 65% to 75% of the load of a steel bearing due to the greater brittleness. The limiting speed of a full ceramic bearing is only about 25% of the speed of the same steel bearing due to the lower precision and roundness of the rings.

Using silicon nitride or silicon carbide bearings with steel shafts or housings in high temperature applications can cause fitting problems due to the large difference in thermal expansion. Bearing damage can occur if allowance is not made for the the greater expansion of a steel shaft in a ceramic inner ring at high temperature. There is less of a problem with Zirconia as the coefficient of expansion is much more similar to steel. For more information see the section on Shaft/Housing Fit.

Hybrid bearings (prefix "CB" or "SCB"): Silicon nitride is the most popular for the balls in hybrid bearings as it has only 40% of the density of bearing steel but is much harder giving greater wear resistance. Hybrid bearings are also capable of higher speeds due to the lower centrifugal force generated by the ceramic balls. However, due to the lower elasticity of the balls, the contact area between the balls and the raceway is smaller which causes a higher contact pressure. This can cause the raceways to wear faster. The speed increase for hybrid bearings is approximately 30-40% with adequate lubrication. Hybrid bearings can also operate better with limited lubrication but running speed should be reduced. They are also less subject to ball skidding under high acceleration with a low load.

Electrical resistance:	Si3N4 best, then ZrO2 (SIC is conductive).
High temp resistance:	SiC best (1600°C), then Si3N4 (800°C), then ZrO2 (400°C)
Corrosion resistance:	SIC (excellent), then Si3N4 (very good) and ZrO2 (good)
Load capacity:	SIC highest then Si3N4, then ZrO2
Fracture toughness:	ZrO2 best, then Si3N4, then SiC

MATERIAL

(a) Chemical composition of bearing steel

	Steel	C %	Si %	Mn %	P %	S %	Cr %	Mo %	Ni %	Hard-ness
Chrome steel	SAE52100 SUJ2 100Cr6	0.95~ 1.10	0.15~ 0.35	0.50 max	0.025 max	0.025 max	1.30~ 1.60	0.08 max		64 Hrc max
Stainless steel	AISI440C SUS440C X105CrMo17	0.95~ 1.20	1.00 max	1.00 max	0.04 max	0.03 max	16.0~ 18.0	0.75 max		60 Hrc max
	KS440 ACD34 X65Cr13	0.60~ 0.75	1.00 max	1.00 max	0.03 max	0.02 max	11.5~ 13.0	0.3 max		58 Hrc max
	AISI420 SUS420 X20Cr13	0.26~ 0.35	1.00 max	1.50 max	0.04 max	0.03 max	12.0~ 14.0			55 Hrc max
	AISI304 SUS304 X5CrNi1810	0.08 max	0.75 max	2.00 max	0.045 max	0.03 max	18.0~ 20.0		8.0~ 10.5	39 Hrc max
	AISI316 SUS316 X5CrNiMo17- 12-2	0.08 max	1.00 max	2.00 max	0.045 max	0.03 max	16.0~ 18.0	2.0~ 3.0	10.0~ 14.0	39 Hrc max

(b) Material of components

Component	Chrome steel bearings	Stainless steel bearings
Inner / Outer rings	SAE52100 / SUJ2 / 100Cr6	AISI440C / SUS440C / X105CrMo17 or KS440 / ACD34 / X65Cr13
Balls	SAE52100 / SUJ2 / 100Cr6	AISI440C / SUS440C / X105CrMo17
Shields	SPCC steel sheet	AISI304 / SUS304 / X5CrNi1810
Retainer	SPCC steel strip	AISI304 / SUS304 / X5CrNi1810 or AISI420 / SUS420 / X20Cr13

Recommendations on Material Selection

Non-corrosive Environment

Normal use, low to medium speed, temperature less than 120°C constant or 150°C intermittent.

- Use chrome steel bearings
- Check grease capabilities if in the higher temperature or higher speed range
- Nylon or polyamide cage not desirable for 110°C or more

High speed with temperature less than 120°C constant or 150°C intermittent.

- Use chrome steel bearings with high speed grease
- Consider high speed cage and/or ceramic balls for higher speeds
- Consider high temperature grease if in the higher temperature range

High temperature from 121°C to 250°C constant or 151°C to 300°C intermittent.

- Use 440 stainless steel bearings with stainless steel cage
- Use high temperature grease (check speed rating if in the higher speed range)
- Consider non-standard radial play if temperature differential between inner and outer ring

High speed & high temperature from 121°C to 250°C constant or 151°C to 300°C intermittent.

- Use 440 stainless steel bearings with stainless steel cage
- Consider ceramic balls if increased speed required
- Use high speed/high temperature grease
- Consider non-standard radial play if temperature differential between inner and outer ring

Very high temperature over 300°C.

- Use unlubricated full complement (no cage) full ceramic bearings.
- Beware of changes in shaft/housing fit due to expansion differences
-

Moderately Corrosive Environment

Normal use, low to medium speed, temperature less than 120°C constant or 150°C intermittent.

- Use corrosion resistant 440 stainless steel bearings
- Check grease capabilities if in the higher temperature or higher speed range

Moderately Corrosive Environment continued....

Low load and speed, temperature up to 100°C constant.
- Use corrosion resistant 440 stainless steel bearings, plastic bearings or 316 stainless bearings
- Beware lower rolling accuracy of plastic bearings
- Check load/speed ratings for plastic bearings and 316 stainless bearings

High speed, temperature less than 120°C constant and/or 150°C intermittent.
- Use corrosion resistant 440 stainless steel bearings
- Consider high speed cage and/or ceramic balls for higher speeds

Low load and low speed, temperature up to 250°C constant.
- Use 440 stainless steel bearings with high temp grease
- Consider PEEK/PTFE bearings but beware lower rolling accuracy

High temperature (up to 250°C constant), medium to high speed.
- Use 440 stainless steel bearings with high temperature grease.
- Consider high speed cage and/or ceramic balls for higher speeds

Highly Corrosive Environment

Highly corrosive environment, low load/speed.
- Use full ceramic bearings or 316 stainless steel bearings
- Consider PEEK/PTFE bearings but beware lower rolling accuracy
- consider chemical or saltwater resistant lubricant

Highly corrosive environment, moderate load, low speed.
- Use unlubricated full ceramic bearings with PEEK retainer or full complement type

Non-magnetic Environment:

Very low load/speed.
- 316 stainless steel or full ceramic bearings
- Consider plastic bearings but beware lower rolling accuracy

Moderate load, low speed.
- Use full ceramic bearings with PEEK or PTFE cage or full complement type

Food Environment

H1 food grade lubricants are used where incidental contact with food is possible and H2 grade where there is no possibility of contact. These greases are also resistant to washout.

Normal use, low to high speed, temperature less than 120°C constant or 150°C intermittent.
- Use 440 stainless steel bearings with food grease

Low load and low speed, temperature up to 100°C constant.
- Use 440 stainless steel bearings with food grease
- Consider unlubricated plastic bearings but beware lower rolling accuracy

High speed use, temperature less than 120°C constant or 150°C intermittent.
- Use 440 stainless steel bearings with food grease
- Consider polyamide cage and/or ceramic balls for higher speeds

Food Environment continued....

High temperature up to 250°C constant, very low load/speed.

- Use 440 stainless steel bearings with high temp food grease
- Also consider unlubricated full ceramic bearings or 316 stainless bearings
- Consider PTFE/PEEK bearing but beware lower rolling accuracy

High temperature up to 250°C constant, medium to high load/speed.

- Use 440 stainless steel bearings with high temp food grease

Vacuum Environment

Normal use, low speed, temperature less than 120°C constant or 150°C intermittent.

- Use 440 stainless steel bearings with stainless steel cage
- Specify no lubrication, vacuum grease or dry lubricant such as MOS or WS2
- Consider stainless hybrid bearings or full ceramic bearings

Low load and low speed, temperature up to 250°C constant.

- Use 440 stainless steel bearings with vacuum grease or dry lubricant
- Consider unlubricated PEEK bearings but beware lower rolling accuracy

High speed, temperature up to 150°C constant.

- Use 440 stainless steel bearings with stainless steel cage and vacuum grease

High temperature (up to 250°C constant), medium to high load/speed.

- Use 440 stainless steel bearings with stainless steel cage and high temp vacuum grease
- Consider ceramic balls or unlubricated all-ceramic bearings

Very high temperature (up to 1200°C).

- Use unlubricated full complement full-ceramic bearings

2. Retainer

Crown

Ribbon

Metal Crown/Ribbon retainer

These standard retainers are manufactured from carbon steel for chrome bearings and AISI304 or AISI420 grade stainless steel for stainless bearings. These were often made from brass which also offered a high temperature capability but this is much less common due to higher cost of brass and advances in steel technology.

For higher temperatures, stainless steel is recommended. The crown cage and ribbon cage perform the same function but the crown cage is used primarily on smaller miniature bearings and thin-section bearings where space is more limited. Steel cages are preferred for arduous operating conditions and where high levels of vibration are experienced.

- Good for low to medium speeds
- Can withstand higher temperatures according to the type of steel (see "Bearing Material" section)
- Crown type - inner ring guided
- Ribbon type - mainly ball guided

Nylon Crown Retainer (TW)

This moulded synthetic retainer has better sliding characteristics than the steel cage and produces fewer fluctuations in running torque. It can increase maximum speeds by up to 60% so is generally used in high speed applications and has good low noise properties. This retainer is not suitable for low temperature applications as it loses elasticity below about 35°C. In vacuum applications, it may become brittle.

- High speed and low noise
- Max temperature range approx -35 to +110°C
- Ball guided

Phenolic Crown Retainer (TP)

This retainer is also used for high speed applications. Generally more expensive, it does have advantages over the synthetic type such as absorbency allowing it to be vacuum impregnated with oil for long life application.

- Good oil retention
- Can operate well with marginal lubrication
- Max temperature approx. 140°C
- Inner ring guided

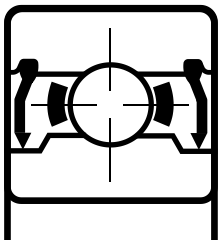
Full Complement (F/B)

A full complement bearing contains extra balls and has no retainer. It is used for its greater radial load capacity although axial load capacity is very small. These are for low speed use and bearing torque is increased due to ball to ball friction although full complement bearings with ceramic balls can be used for high speeds due to the lower friction coefficient of the ceramic material. Improved steel and hardening techniques have increased the load capacities of bearings with cages and the full complement bearing is much less common now.

- Higher radial load capacity
- Low speed only (except with ceramic balls)
- Low axial load

3. Closures

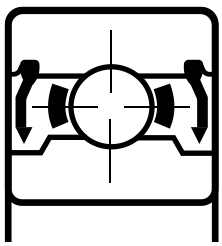
Shields (ZZ)



Most sizes are available with metal shields. Shields are designed to prevent larger particles from entering the bearing and also to keep grease inside the bearing. They may be pressed into the bearing's outer ring (non-removable) or retained by a circlip (removable). As the shields make no contact with the inner ring, they do not increase starting or running torque. Shields on stainless steel bearings are generally made from AISI 304 grade stainless steel.

- Prevent contamination by larger particles
- Reduce lubricant leakage
- Do not increase torque

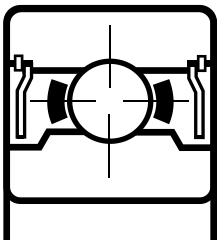
Contact Seals (2RS)



The standard bearing seal consists of nitrile/BUNA-N rubber bonded to a metal washer. High temperature PTFE seals (up to 250°C) or Viton seals (up to 230°C) are available on some sizes. The inner lip of the seal rubs against the bearing inner ring to provide an effective seal against smaller particles such as dust and moisture while preventing lubricant leakage. Contact seals produce much higher frictional torque levels than shields and reduce the maximum speed of a bearing. Below -40°C nitrile rubber and viton will stiffen and provide a less effective seal so PTFE seals or metal shields should be considered for very low temperatures.

- Good protection against contamination
- Greatly reduce lubricant leakage
- Reduce maximum speed by approx. 40%
- Greatly increase bearing torque
- Temp. range –40°C/+110°C (except for PTFE/Viton)

Non-contact seals (2RU)



These seals are also made of nitrile rubber bonded to a metal washer but do not rub against the bearing inner ring and therefore do not have the same effect on bearing torque and maximum speed as contact seals. This means they can be used for low torque, high speed applications. They offer superior protection over metal shields but do not provide as effective a seal as the contact type.

- Good protection against contamination
- Reduced lubricant leakage
- No torque increase
- Do not affect maximum speed
- Temp. range –40°C/+110°C

4. Load Rating

Load ratings are expressed in Kgf (kilogramme force) in this catalogue. That is the force exerted by a mass of 1 kilogramme at the Earth's surface. You will often see force expressed in Newtons elsewhere. A Newton is defined as the force that will accelerate a mass of one kilogram at the rate of one meter per second per second (or 1 m/s²). Since the force of gravity at the Earth's surface is 9.80665 m/s², 1 Kgf = 9.80665 Newtons but, to keep it simple, we say 1 Kgf = 10 Newtons.

Dynamic load rating

The dynamic load rating is that constant stationary radial load which 90% of a group of identical chrome steel bearings, with only the inner ring rotating, can endure for one million revolutions before the first signs of fatigue develop. Yes, 1 million revolutions sounds a lot but is it really? If you take a bearing running at 5000 rpm with the max dynamic load applied to it, it will last for 1,000,000 revs divided by 5000 = 200 minutes or 3 hours and 20 minutes! If long life is required, it is preferable to limit the actual load to between 6% and 12% of a bearing's dynamic load rating. Heavier loads can be tolerated but life will be shortened. AISI440C/KS440 stainless steel bearings will support approximately 80% - 85% of the load figures for chrome steel bearings. Load ratings for thrust bearings are based on the constant axial load endured for 1 million revolutions. For life ratings, please contact SMB.

Static load rating

The static rating represents the purely radial load (or axial load for thrust bearings) which will cause a total permanent deformation of the balls or raceway equal to one ten-thousandth of the ball diameter. This may be tolerable for certain applications but not where any smoothness or accuracy is required. Static load ratings for stainless steel bearings are approximately 75 - 85% of the load ratings for chrome steel bearings.
The load capacity of a bearing may be limited by the lubricant. Certain lubricants are only suitable for light loads while others are designed for high load applications. Load ratings are higher for full complement bearings (see Section 2: Retainer). The axial load capacity of a radial ball bearing can be increased by specifying loose radial play.

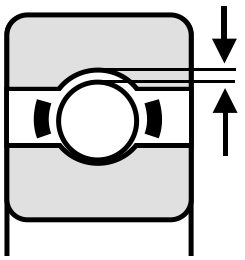
Axial load rating

Heavy duty bearing types such as 6200 or 6300 series may take axial loads of up to 50 percent of the static radial load rating. Thin-section deep groove ball bearings can only support axial loads of between 10 and 30 percent of the bearing's static radial load rating due the shallower raceways. Please note, these figures are based on pure axial load. Additional radial loads or moment (misalignment loads) will have an impact on the axial load capacity. To exceed the total recommended limits for combined loads will have a detrimental effect on bearing life.

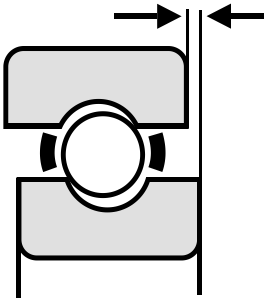
To see the load ratings for our bearings, please refer to the relevant dimension table.

5. Internal clearance

Internal clearance is commonly expressed as radial play but can also be measured as axial play and it represents the amount of space between the inner and outer ring raceways and the balls.



Radial play is the clearance measured perpendicular to the bearing axis or more specifically: *average outer ring raceway diameter minus average inner ring raceway diameter minus (2 x ball diameter)*.



Axial play is the clearance measured along the bearing axis. Axial play is approximately 10 times the radial play value.

Radial play is an important consideration when choosing a bearing. The radial play in the bearing before it is fitted can be called the "initial" radial play. "Residual" or "operational" radial play is what is left when the bearing has been fitted. There should normally be a slight residual radial play in the bearing to minimize ball skidding and reduce axial play (end play). Correct selection of the initial radial play can avoid faster bearing wear and reduce unwanted play.

A number of things can alter the radial play during the fitting process. A tight shaft fit where the shaft is slightly larger than the bearing inner ring (often called an interference fit or a press fit) will stretch the inner ring so making it bigger. This reduces radial play by up to 80% of the interference fit. The same thing happens if the outer ring is a tight fit in the housing. This can squash or compress the outer ring also reducing radial play. A difference between the shaft and housing temperatures can also be a problem. If a bearing inner ring gets hotter than the outer ring, it will expand more and reduce radial play. This can be calculated as follows:

Chrome Steel: 0.0000125 x (inner ring temp - outer ring temp °C) x outer ring raceway diameter in mm.

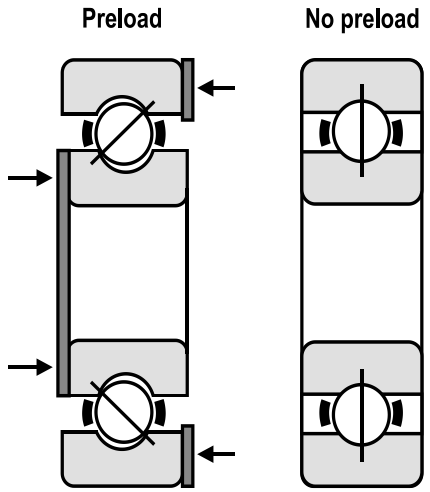
440 Stainless Steel: 0.0000103 x (inner ring temp - outer ring temp °C) x outer ring raceway diameter in mm.

The outer ring raceway diameter is roughly calculated as: **0.2 x (d + 4D)** where d is the bore in mm and D is the outer diameter in mm.

Radial play can also be affected where the shaft or housing is of a different material to the bearing. Different rates of thermal expansion can lead to a reduction in radial play. In such a case, a bearing with a looser radial play may be needed.

In most cases, a standard radial play is suitable and also preferable as these bearings are usually more readily available and cost less. However, there are certain conditions where a non-standard clearance is recommended. A tight radial play is better for greater rigidity and running accuracy if the load is purely radial. This may be worth considering for very low noise, low vibration applications which is why many of our miniature bearings are MC3 radial play. In other applications, a tight radial play may be highly undesirable. If there is a high axial load, a loose radial play is preferable as it increases the bearing's axial load capacity. Also, a loose radial play will better accommodate misalignment between the shaft and housing and cope better with heavy loads or shock loads.

Finally, radial play has nothing to do with precision grade or tolerance. It is often believed that when there is too much play, a higher precision bearing will solve the problem. In this case, the answer is often to use a bearing with a tighter radial play or use a tighter shaft/housing fit or introduce an axial preload to the bearing (see below). Using a higher precision grade will make no difference to the "looseness" of the bearing. You can have a P4 (Abec7) grade bearing with a loose radial play just as you can have a P0 (Abec1) bearing with a tight radial play.



Preload

In many low noise, low vibration or high speed applications, zero radial play is desirable. This gives greater rigidity, reduces noise and vibration, gives greater ball alignment and running accuracy and can eliminate ball skidding under high acceleration. This is achieved by applying a preload to the bearing. A preload is an axial load deliberately applied via the inner or outer ring to offset the outer ring against the inner ring and reduce the radial play to zero.

Preload is usually applied by the use of wave or spring washers or springs and normally to the stationary ring which should have a sliding fit to the shaft or housing to allow for axial movement. If the bearings are glued on to the shaft or housing, it may be possible to use weights to keep the bearing preloaded while the adhesive cures. The amount of preload should be as small as possible. Excessive preload can cause the bearing to be too tight leading to very high frictional torque and rapid failure.

RADIAL PLAY CONSIDERATIONS

Tight radial play	MC1, MC2, C2	Consider for pure radial loads and low noise, low vibration applications. Beware of axial loads, high speed applications, heavy vibration and very low torque applications. Interference fits should not be used.
Standard radial play	MC3, MC4, CN	Acceptable for most applications
Loose radial play	MC5, MC6, C3, C4	Consider for higher axial loads due to greater thrust load capacity. Greater interference fits and shaft misalignment can be tolerated. Better for heavy or shock loads. Not recommended for low noise applications unless tighter radial play not suitable.

RADIAL PLAY TABLES

(a) Bore size under 10 mm (x 0.001mm)

Tight		Standard		Loose	
MC1	MC2	MC3	MC4	MC5	MC6
0 ~ 5	3 ~ 8	5 ~ 10	8 ~ 13	13 ~ 20	20 ~ 28

(b) Bore size from 10 mm (x 0.001mm)

Nominal bore (mm)		Tight	Standard	Loose	Looser
Over	Including	C2	CN	C3	C4
	10	0 ~ 7	2 ~ 13	8~ 23	14 ~ 29
10	18	0 ~ 9	3 ~ 18	11 ~ 25	18 ~ 33
18	24	0 ~ 10	5 ~ 20	13 ~ 28	20 ~ 36
24	30	1 ~ 11	5 ~ 20	13 ~ 28	23 ~ 41
30	40	1 ~ 11	6 ~ 20	15 ~ 33	28 ~ 46
40	50	1 ~ 11	6 ~ 23	18 ~ 36	30 ~ 51
50	65	1 ~ 15	8 ~ 28	24 ~ 43	38 ~ 61
65	80	1 ~ 15	10 ~ 30	25 ~ 51	46 ~ 71
80	100	1 ~ 18	12 ~ 36	30 ~ 58	53 ~ 84

6. Maximum Speeds

A number of factors affect speed limitation such as temperature, load, vibration, radial play, retainer, lubricant, ball material and closures. The speeds quoted in our catalogue pages are only approximate and valid for bearings used on a horizontal shaft with a metal cage, standard tolerance grade and radial play, medium loading, rotating inner ring and suitable lubricant (see below).

Vertical shaft applications will require a maximum speed reduction of approximately 20%. Temperature excesses and heavy loadings will also require slower speeds. Bearings fitted with contact seals cannot achieve the same speeds due to increased friction between seal lip and bearing inner ring. The choice of lubricant may also have a significant effect on the speed rating. The maximum rpm at which a lubricant can effectively operate varies from type to type.

Greases also have speed ratings sometimes called "DN" ratings. The calculation for the "DN" of an application is as follows:

Speed in rpm x (bearing ID + bearing OD) ÷ 2

Assume a bearing rotates at 20,000 rpm. The bearing ID is 8mm and the OD is 22mm. The above formula produces a DN of 300,000 so the grease should be rated above this figure. Many modern greases are suitable for high speeds with some rated at 1 million DN or more.

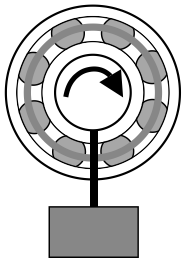
The adjustment factors shown in the following speed reduction table are approximate and are based on bearings with a metal crown or ribbon cage. The maximum speed of a bearing can be increased by the use of a nylon or phenolic cage provided a suitable lubricant is used. The use of ceramic balls will increase maximum bearing speed by up to 40%

SPEED REDUCTION TABLE

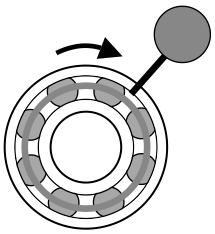
Lubricant	Rotating inner ring		Rotating outer ring	
	Open, ZZ, 2RU	2RS	Open, ZZ, 2RU	2RS
Petroleum oil	Nil reduction	40% reduction	20% reduction	40% reduction
Synthetic oil	Nil reduction	40% reduction	20% reduction	40% reduction
Silicone oil	30% reduction	40% reduction	50% reduction	50% reduction
Standard grease	30% reduction	40% reduction	50% reduction	50% reduction
High speed grease	Nil reduction	40% reduction	20% reduction	40% reduction
Silicone grease	30% reduction	40% reduction	50% reduction	50% reduction

7. Shaft/Housing Fits

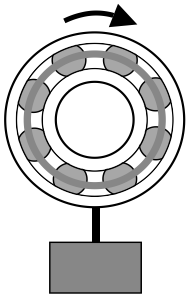
The ideal fit is where the shaft/housing is the same size as the bore/O.D. of the bearing. This is known as a line-to-line fit and gives optimum bearing performance. Looser fits are commonly used and often preferred for ease of assembly or where spring preloading is used (see "Preload" in the Radial Play section). Where heavier radial loads or greater vibration are present, bearing rings under a rotating load may need to be firmly located by an interference fit or other means such as a nut or adhesive. This prevents them from creeping in a circumferential direction which gives rise to increased wear. A bearing ring is subjected to a rotating load when the load is applied to all points of that ring during operation. For a better understanding, see the examples below.



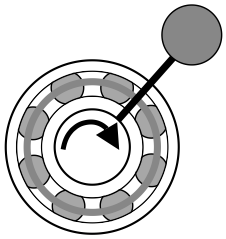
Inner ring rotating load: e.g. a bearing in a vacuum cleaner motor driving the roller brush. The shaft and bearing inner ring are rotating. The load is in a constant direction in relation to the bearing so as the inner ring turns, all parts of it are subjected to the load. The outer ring does not rotate so the load acts on only one point of the outer ring.
This application requires an interference shaft fit and a clearance housing fit.



Another possibility is a static inner ring and rotating outer ring but this time, the load rotates with the outer ring. As above, the load acts on only one point of the outer ring while all parts of the inner ring are subjected to the load.
This application requires an interference shaft fit and a clearance housing fit.



Outer ring rotating load: e.g. a bearing in a pulley wheel. The shaft and inner ring are fixed while the outer ring and housing (the pulley) rotate. The load is in a constant direction in relation to the bearing so as the outer ring turns, all parts of it are subjected to the load. The inner ring does not rotate so the load acts on only one point of the inner ring.
This application requires a clearance shaft fit and an interference housing fit.



This example involves a static outer ring and rotating inner ring, the load rotating with the inner ring. As above, the load acts on only one point of the inner ring while all parts of the outer ring are subjected to the load.
This application requires a clearance shaft fit and an interference housing fit.

This means that usually only one ring is subjected to an interference fit. There may be instances where a fluctuating load direction will require interference fits for both shaft and housing. This may also be true where there is excessive vibration. Make sure that interference fits do not reduce the radial play of the bearing to an unacceptable level or early failure will occur. These fits will stretch the bearing inner ring or compress the outer ring, reducing the bearing's internal space. Excessive interference fits can also cause high stress which may fracture rings.

An interference fit can reduce radial play by up to 80% of the size of the interference fit. Let's use a shaft with a 10mm diameter and a bearing with a 10mm bore as an example. Imagine the shaft diameter is actually 10.007mm and the actual bearing bore is 9.993mm. This gives an interference fit of 0.014mm (i.e. the shaft is 0.014mm larger than the bearing bore). The radial play of the bearing may be reduced by as much as 80% of this figure or approx 0.011mm. If the bearing radial play (before fitting) is less than 0.011mm, the bearing may fail quickly.

The material of the shaft and housing should be taken into consideration so that temperature induced changes in radial play can be calculated. An aluminium housing will expand more than a steel housing so requires a greater interference fit than a steel housing. Greater interference fits are required in thin walled or plastic housings and also on hollow shafts.

Care should also be taken where shaft and housing materials have different expansion coefficients to the bearing material. This may lead to change in radial play and possible damage to the bearing. Silicon nitride has a very low coefficient of expansion so if a silicon nitride bearing is used on a stainless steel shaft at high temperature, there is a risk of the inner ring breaking or cracking particularly as ceramics are more brittle than steel. Much looser fits should be considered to accommodate these differences. There is less of a risk with zirconia as the coefficient is similar to stainless steel but differences in expansion should be taken into account.

To calculate expansion, we need the initial temperature and final temperature, the expansion coefficient and the relevant bearing dimension. Say a 440 stainless steel bearing bore is 30mm at ambient temperature 20°C. The bore size at 250°C can be calculated as follows:

Final temperature 250°C, initial temperature 20°C, temperature increase = **230°C**
Expansion coefficient of 440 grade steel = **0.0000105 per °C**
Bearing bore = **30mm**
230 x **0.0000105** x **30** = **0.072**
Bearing bore at 250°C = **30.072mm**

COEFFICIENTS OF EXPANSION

Bearing Material	Coefficient of expansion
52100 chrome steel	12.5 x 10-6 (0.0000125) per ˚C
440 stainless steel	10.5 x 10-6 (0.0000105) per ˚C
316 stainless steel	16 x 10-6 (0.000016) per ˚C
ZrO2 (zirconia)	10.3 x 10-6 (0.0000103) per ˚C
Si3N4 (silicon nitride)	3.3 x 10-6 (0.0000033) per ˚C

Interference fits can affect rotational accuracy by distorting bearing rings. **The standards of roundness and surface finish which apply to the bearing should also apply to shaft and housing.** This is very important for electric motor and other quiet-running applications. Miniature and thin-section bearings are particularly susceptible to distortion which leads to higher noise and vibration levels. If rotational accuracy is important, a combination of close bearing tolerances and close shaft/housing tolerances should be used to obtain the correct fit with the minimum interference.

8. Tolerances

Tolerances control the dimensional accuracy of a bearing. We use ISO bearing tolerances measured in thousandths of a millimetre (or microns) starting at P0 and moving upwards in precision grade to P6, P5 and then P4. Some manufacturers use AFBMA (ABEC) bearing tolerances which are measured in ten-thousandths of an inch.

It is important to understand that tolerances do not affect radial play although it is sometimes mistakenly thought that improving the tolerances will produce a bearing with less play. Assuming that the shaft and housing are manufactured to the same tolerances as the bearing, higher bearing tolerances will produce better mating between shaft/housing and bearing, lower noise and vibration due to improved roundness. Higher tolerances will produce slightly lower starting and running torque but this is also subject to correct selection of radial play and lubricant.

INNER RING TOLERANCES

Inner Ring and Width x 0.001mm – up to 2.5mm bore **(1) applies to inner ring only**

Grade	Mean bore deviation	Single bore variation			Mean bore variation	Width deviation	Width variation	Radial runout	Face runout with bore	Face runout with raceway
		67,68,69 series	60 series	62,63 series						
P0	+0/-8	10	8	6	6	+0/-40	12	10	_	_
P6	+0/-7	9	7	5	5	+0/-40	12	5	_	_
P5	+0/-5	5	4	4	3	+0/-40	5 (1)	4	7	7
P4	+0/-4	4	3	3	2	+0/-40	2.5 (1)	2.5	3	3

Inner Ring and Width x 0.001mm – over 2.5mm up to 10mm bore **(1) applies to inner ring only**

Grade	Mean bore deviation	Single bore variation			Mean bore variation	Width deviation	Width variation	Radial runout	Face runout with bore	Face runout with raceway
		67,68,69 series	60 series	62,63 series						
P0	+0/-8	10	8	6	6	+0/-120	15	10	_	_
P6	+0/-7	9	7	5	5	+0/-120	15	6	_	_
P5	+0/-5	5	4	4	3	+0/-40	5 (1)	4	7	7
P4	+0/-4	4	3	3	2	+0/-40	2.5 (1)	2.5	3	3

Inner Ring and Width x 0.001mm – over 10mm up to 18mm bore **(1) applies to inner ring only**

Grade	Mean bore deviation	Single bore variation			Mean bore variation	Width deviation	Width variation	Radial runout	Face runout with bore	Face runout with raceway
		67,68,69 series	60 series	62,63 series						
P0	+0/-8	10	8	6	6	+0/120	20	10	_	_
P6	+0/-7	9	7	5	5	+0/120	20	7	_	_
P5	+0/-5	5	4	4	3	+0/-80	5 (1)	4	7	7
P4	+0/-4	4	3	3	2	+0/-80	2.5 (1)	2.5	3	3

INNER RING TOLERANCES (...continued)

Inner Ring and Width x 0.001mm – over 18mm up to 30mm bore (1) applies to inner ring only

Grade	Mean bore deviation	Single bore variation			Mean bore variation	Width deviation	Width variation	Radial runout	Face runout with bore	Face runout with raceway
		67,68,69 series	60 series	62,63 series						
P0	+0/-10	13	10	8	8	+0/120	20	13	_	_
P6	+0/-8	10	8	6	6	+0/120	20	8	_	_
P5	+0/-6	6	5	5	3	+0/120	5 (1)	4	8	8
P4	+0/-5	5	4	4	2.5	+0/120	2.5 (1)	3	4	4

Inner Ring and Width x 0.001mm – over 30mm up to 50mm bore (1) applies to inner ring only

Grade	Mean bore deviation	Single bore variation			Mean bore variation	Width deviation	Width variation	Radial runout	Face runout with bore	Face runout with raceway
		67,68,69 series	60 series	62,63 series						
P0	+0/-12	15	12	9	9	+0/-120	20	15	_	_
P6	+0/-10	13	10	8	8	+0/-120	20	10	_	_
P5	+0/-8	8	6	6	4	+0/-120	5 (1)	5	8	8
P4	+0/-6	6	5	5	3	+0/-120	3 (1)	4	4	4

Inner Ring and Width x 0.001mm – over 50mm up to 80mm bore (1) applies to inner ring only

Grade	Mean bore deviation	Single bore variation			Mean bore variation	Width deviation	Width variation	Radial runout	Face runout with bore	Face runout with raceway
		67,68,69 series	60 series	62,63 series						
P0	+0/-15	19	19	11	11	+0/-150	25	20	_	_
P6	+0/-12	15	15	9	9	+0/-150	25	10	_	_
P5	+0/-9	9	7	7	5	+0/-150	6 (1)	5	8	8
P4	+0/-H57	7	5	5	3.5	+0/-150	4 (1)	4	5	5

Inner Ring and Width x 0.001mm – over 80mm up to 120mm bore (1) applies to inner ring only

Grade	Mean bore deviation	Single bore variation			Mean bore variation	Width deviation	Width variation	Radial runout	Face runout with bore	Face runout with raceway
		67,68,69 series	60 series	62,63 series						
P0	+0/-20	25	25	15	15	+0/-200	25	25	_	_
P6	+0/-15	19	19	11	11	+0/-200	25	13	_	_
P5	+0/-10	10	8	8	5	+0/-200	7 (1)	6	9	9
P4	+0/-8	8	6	6	4	+0/-200	4 (1)	5	5	5

OUTER RING TOLERANCES

Outer Ring and Width x 0.001mm – up to 6mm bore (2) same as inner ring value

Grade	Mean O.D. Deviation	Single O.D. variation				Mean O.D. variation	Width variation	Radial runout	Face runout with O.D.	Face runout with raceway
		67,68,69 series	60 series	62,63 series	60,62,63 ZZ/2RS					
P0	+0/-8	10	8	6	10	6	(2)	15	_	_
P6	+0/-7	9	7	5	9	5	(2)	8	_	_
P5	+0/-5	5	4	4	_	3	5	5	8	8
P4	+0/-4	4	3	3	_	2	2.5	3	4	5

Outer Ring and Width x 0.001mm – over 6mm up to 18mm bore (2) same as inner ring value

Grade	Mean O.D. Deviation	Single O.D. variation				Mean O.D. variation	Width variation	Radial runout	Face runout with O.D.	Face runout with raceway
		67,68,69 series	60 series	62,63 series	60,62,63 ZZ/2RS					
P0	+0/-8	10	8	6	10	6	(2)	15	_	_
P6	+0/-7	9	7	5	9	5	(2)	8	_	_
P5	+0/-5	5	4	4	_	3	5	5	8	8
P4	+0/-4	4	3	3	_	2	2.5	3	4	5

Outer Ring and Width x 0.001mm – over 18mm up to 30mm bore (2) same as inner ring value

Grade	Mean O.D. Deviation	Single O.D. variation				Mean O.D. variation	Width variation	Radial runout	Face runout with O.D.	Face runout with raceway
		67,68,69 series	60 series	62,63 series	60,62,63 ZZ/2RS					
P0	+0/-9	12	9	7	12	7	(2)	15	_	_
P6	+0/-8	10	8	6	10	6	(2)	9	_	_
P5	+0/-6	6	5	5	_	3	5	6	8	8
P4	+0/-5	5	4	4	_	2.5	2.5	4	4	5

Outer Ring and Width x 0.001mm – over 30mm up to 50mm bore (2) same as inner ring value

Grade	Mean O.D. Deviation	Single O.D. variation				Mean O.D. variation	Width variation	Radial runout	Face runout with O.D.	Face runout with raceway
		67,68,69 series	60 series	62,63 series	60,62,63 ZZ/2RS					
P0	+0/-11	14	11	8	16	8	(2)	20	_	_
P6	+0/-9	11	9	7	13	7	(2)	10	_	_
P5	+0/-7	7	5	5	_	4	5	7	8	8
P4	+0/-6	6	5	5	_	3	2.5	5	4	5

OUTER RING TOLERANCES (...continued)

Outer Ring and Width x 0.001mm – over 50mm up to 80mm bore (2) same as inner ring value

Grade	Mean O.D. Deviation	Single O.D. variation				Mean O.D. variation	Width variation	Radial runout	Face runout with O.D.	Face runout with raceway
		67,68,69 series	60 series	62,63 series	60,62,63 ZZ/2RS					
P0	+0/-13	16	13	10	20	10	(2)	25	_	_
P6	+0/-11	14	11	8	16	8	(2)	13	_	_
P5	+0/-9	9	7	7	_	5	6	8	8	10
P4	+0/-7	7	5	5	_	3.5	3	5	4	5

Outer Ring and Width x 0.001mm – over 80mm up to 120mm bore (2) same as inner ring value

Grade	Mean O.D. Deviation	Single O.D. variation				Mean O.D. variation	Width variation	Radial runout	Face runout with O.D.	Face runout with raceway
		67,68,69 series	60 series	62,63 series	60,62,63 ZZ/2RS					
P0	+0/-15	19	19	11	26	11	(2)	35	_	_
P6	+0/-13	16	16	10	20	10	(2)	18	_	_
P5	+0/-10	10	8	8	_	5	8	10	9	11
P4	+0/-8	8	6	6	_	4	4	6	5	6

FLANGE TOLERANCES

Grade	Mean O.D. Deviation	Mean Width Deviation
P0	+125 / -50	+0 / -50
P6	+125 / -50	+0 / -50
P5	+0 / -25	+0 / -50
P4	+0 / -25	+0 / -50

THRUST BEARING TOLERANCES

All sizes x 0.001mm

Grade	Mean Bore Deviation	Mean Bore2 Deviation	Mean O.D. Deviation	Mean O.D. 2 Deviation	Mean Height Deviation
P0	+0 / -8	+0 / -50	+0 / -11	-5 / -20	+0 / -75

Tolerances Explained

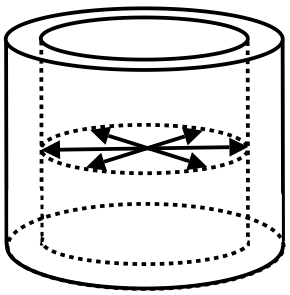
Do you understand bearing tolerances and what they really mean? If not, you're not alone. These are often quoted but often without any real understanding of what they mean. Websites with simple explanations of bearing tolerances are extremely rare so we decided to fill the gap. Many thanks to EZO in Japan for their help. So, if you want to know what "Mean Bore Deviation" and "Single Bore Variation" actually mean, read on as we hope to make this much clearer.

Deviation

This dictates how far away from the nominal dimension, the actual measurement is allowed to be. The nominal dimension is the one shown in the manufacturer's catalogue e.g. 6200 has a nominal bore of 10mm, 688 has a nominal bore of 8mm etc. Limits on the maximum deviation from these dimensions are extremely important. Without international tolerance standards for bearings (ISO and AFBMA), it would be up to each individual manufacturer. This could mean you order a 688 bearing (8mm bore) only to find that the bore is closer to 7mm and won't fit the shaft. Deviation tolerances usually allow the bore or OD to be smaller but no bigger than the nominal dimension.

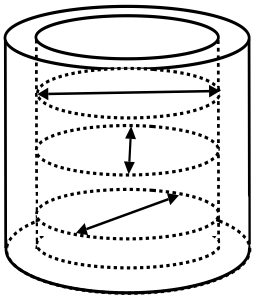
Mean Bore/OD Deviation

... or single plane mean bore diameter deviation. This is an important tolerance when looking to closely mate inner ring and shaft or outer ring and housing. First you need to understand that a bearing is not round. Of course its not far off but when you start measuring in microns (thousandths of a millimetre) you realise the measurements vary. Lets take the bore of a 688 bearing (8 x 16 x 5mm) as an example. Depending on where in the inner ring you take your measurement, you may get a reading of anywhere, say, between 8mm and 7.991 mm so what do you take as the bore size? This is where Mean Deviation comes in. This involves taking a number of measurements in a single radial plane (we'll come to that in a minute) across the bore or OD to average out the diameter of that ring.



This drawing represents an inner bearing ring. The arrows represent various measurements taken across the bore in different directions to help discover the mean size. This set of measurements have correctly been taken in a single radial plane i.e. at the same point along the length of the bore. Sets of measurements should also be taken in different radial planes to make sure the bore is within tolerances along its length. The same applies to outer ring measurements.

This diagram shows how NOT to do it. Each measurement has been taken at a different point along the length of the bearing ring, in other words, each measurement has been taken in a different radial plane.



Quite simply, the mean bore size is calculated as follows:

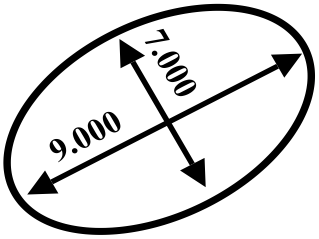
(Largest bore size + smallest bore size) divided by 2

This is far more useful when calculating the shaft tolerance than a single bore measurement which might be misleading. Let's say that a mean bore deviation tolerance for a P0 bearing is +0/-8 microns. This means that the mean bore can be between 7.992mm and 8.000mm. The same principle applies to the outer ring.

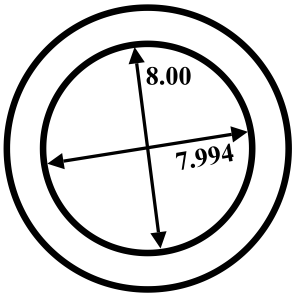
Width Deviation

... or deviation of the single inner or outer ring width from the nominal dimension. Not much explanation needed here. As with bore and OD dimensions, the width must be controlled within certain tolerances. Since the width is usually less critical, the tolerances are wider than for the bearing bore or OD. A width deviation of +0/-120 means that if you measure the inner or outer ring width at any single point around, say, a 688 (4mm wide) bearing, it should not be wider than 4mm (the nominal dimension) or narrower than 3.880mm.

Variation



Variation tolerances ensure roundness. In this drawing of a badly out-of-round 688 inner ring, the largest measurement is 9.000mm and the smallest 7.000mm. If we calculate mean bore size (9.000 + 7.000 ÷ 2) we come up with 8.000mm. We are within the mean bore deviation tolerance but the bearing would clearly be unusable so you see that deviation and variation can be useless without each other.

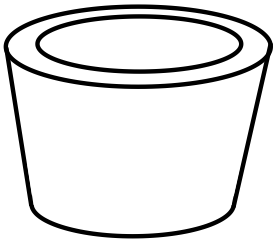


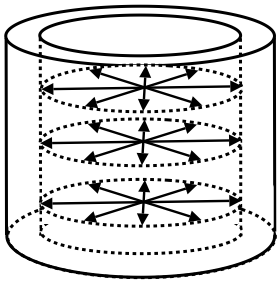
Single Bore/OD Variation

..or more accurately, Bore/OD Diameter Variation in a Single Radial Plane (of course, now you know all about single radial planes!). Assume we have taken several measurements in a single radial plane but the largest is 8.00mm and the smallest is 7.994mm. The difference between the largest and smallest is 0.006mm. This figure is the bore diameter variation in this single radial plane.

Mean Bore/OD Diameter Variation

Ok, thanks to mean bore/OD deviation and single bore/OD variation, we are happy that our bearing is close enough to the correct size and is round enough but what if there is too much of a taper on the bore or OD as per the diagram on the right (yes, it is greatly exaggerated!). This is why we also have mean bore and OD variation limits.



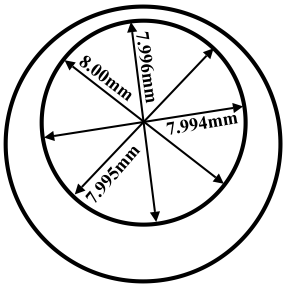


To obtain mean bore or OD variation, we record the mean bore or OD in different radial planes and then check the difference between the largest and smallest. Assume that on the left here, the top set of measurements gives a mean bore size of 7.999mm, the middle is 7.997mm and the bottom is 7.994mm. Take the smallest away from the largest (7.999 - 7.994) and the result is 0.005mm. Our mean bore variation is 5 microns.

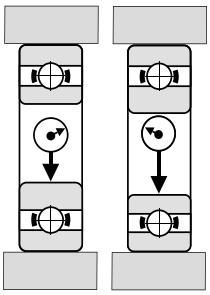
Width Variation

Again, very straightforward. Let's assume, for a particular bearing, the permitted width variation is 15 microns. If you were to measure the inner or outer ring width at various different points, the largest measurement should not be more than 15 microns greater than the smallest measurement.

Radial Runout

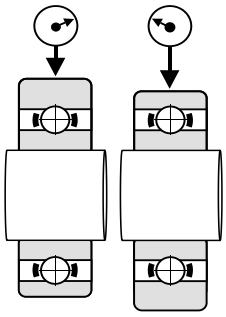


...of assembled bearing inner/outer ring is yet another important aspect of bearing tolerances. Suppose the mean deviation for both inner ring and outer ring is within limits and the roundness is within the allowed variance, surely that's all we need to worry about? Look at this diagram of a bearing inner ring. The bore deviation is OK and so is the bore variation but look at how the ring width varies. Like everything else, ring width is not exactly the same at every point around the circumference but radial runout tolerances dictate how much this can vary.



Inner Ring Runout

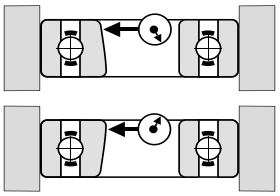
... is tested by measuring all points on one circle of the inner ring during one revolution while the outer ring is stationary and taking the smallest measurement away from the largest. This radial runout figures given in the tolerance tables show the maximum variation allowed. The difference in ring thickness here is exaggerated to illustrate the point more clearly.



Outer Ring Runout

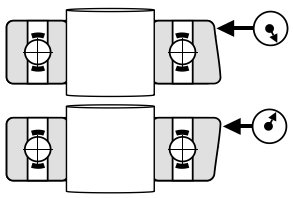
... is tested by measuring all points on one circle of the outer ring during one revolution while the inner ring is stationary and taking the smallest measurement away from the largest.

Face Runout/Bore



This tolerance ensures the bearing inner ring surface is close enough to a right angle with the inner ring face. Tolerance figures for face runout/bore are only given for bearings of P5 and P4 precision grades. All points on one circle of the inner ring bore close to the face are measured during one revolution while the outer ring is stationary. The bearing is then turned over and the other side of the bore is checked. Take the largest measurement away from the smallest to get the face runout/bore tolerance.

Face Runout/Bore



... or variation of outside surface generatrix inclination with face. This tolerance ensures the bearing outer ring surface is close enough to a right angle with the outer ring face. Tolerance figures for face runout/OD are given for P5 and P4 precision grades. All points on one circle of the outer ring bore next to the face are measured during one revolution while the inner ring is stationary. The bearing is then turned over and the other side of the outer ring is checked. Take the largest measurement away from the smallest to get the face runout/OD tolerance.

Face Runout/Raceway tolerances are very similar but, instead, compare the inclination of the inner or outer ring raceway surface with the inner or outer ring face.

9. Frictional Torque

This affects the free-running of the bearing. Spin a bearing containing stiff grease with your finger and not much happens. This indicates high frictional torque. Try a bearing with no lubrication and it will spin freely meaning low frictional torque. The effort required to rotate a bearing depends greatly on the roundness of the bearing, the load applied, the lubrication and the closures. Better roundness and surface finish of the balls and raceways means less effort is needed to rotate the bearing. The greater the load, the greater the deformation of the bearing components leading to increased resistance.

As for lubrication, instrument oils will often produce lower torque levels especially at very low speeds but the difference between these and many low torque greases is actually very small, particularly if a low grease fill is used. A standard low torque grease such as Multemp SRL grease may give an increase of only 20% over an Aeroshell 12 oil. This can drop to under 5% for very low torque greases if a low (e.g 10% to 20%) fill is used. High viscosity lubricants can significantly increase bearing torque due to greater lubricant drag.

Torque levels for a greased bearing are briefly higher to start with as the grease takes a short time to "run in" or be distributed inside the bearing. Contact seals will greatly increase the torque figures. The effort required to rotate a bearing from rest (starting torque) is slightly greater than the effort required to keep it rotating (running torque).

Approximate figures for frictional torque for can be calculated using a simple formula. This is only valid if the bearing has low torque lubrication and is open, shielded or has non-contact seals. It should also be subjected to low speed and low load. For radial ball bearings, the axial load should be less than 20% of the radial load while the load should be purely axial for thrust bearings. Contact us if you need more accurate figures.

The measurements are in Newton millimetres (Nmm). This is a compound unit of torque corresponding to the torque from a force of one newton (approx 0.1 Kgf) applied over a distance arm of one millimetre.

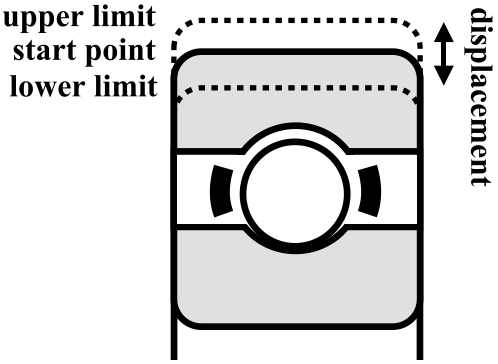
Frictional torque measured in Nmm. 10 Newtons = 1 Kgf

Radial ball bearings:	**0.5 x 0.0015 x radial load in Newtons* x bearing bore (mm)**
Axial ball bearings:	**0.5 x 0.0013 x axial load in Newtons* x bearing bore (mm)**

10. Noise Rating

Bearing rings and balls are not perfectly round and the balls and raceways, even after extensive fine grinding and polishing, are not perfectly smooth. Any surface roughness will cause one ring to move or oscillate radially in relation to other. The amount and speed of this movement contributes to the amount of *bearing vibration and bearing noise*. As a precision manufacturer, EZO, apply a standard noise test to their bearings. Lower noise levels, such as EMQ or EMQ2, require additional testing.

The smoothness or quietness of a bearing can be checked by accelerometers which measure bearing vibration at the outer ring, usually with the inner ring rotating at 1800 rpm. When measuring bearing vibration, we need to take into account both displacement and frequency as these two factors together tell us far more.



The amount of oscillation in a vibrating object is called **displacement**. When a bearing outer ring vibrates, the outer surface will move upwards to the upper limit, then down to the lower limit and then back to the start point. The measurement between upper and lower limit is called peak to peak displacement. The whole oscillation movement from start point through upper and lower limits and back to start point is called a **cycle.** This vibration cycle will repeat as long as the bearing is rotating. We can also measure the number of these cycles in a given time. This gives us the **frequency**. Frequency is most commonly expressed as cycles per second (CPS) or Hertz (Hz) which is the same thing.

Vibration is potentially damaging to a bearing and the equipment it is used in, increasing the rate of fatigue and shortening bearing life. Displacement measurements do not tell us enough. Vibration in a bearing or a machine will usually occur at many different frequencies and they all contribute to fatigue so we need to take all frequencies of vibration into account in our measurements of vibration. We can achieve this by measuring vibration velocity.

Vibration velocity (displacement x frequency) gives us a good indication of the severity of the vibration. If a bearing component is moving a particular distance (displacement) at a particular rate (frequency) it must be moving at a certain speed. The higher the vibration velocity measurement, the noisier the bearing. Vibration velocity is measured on a Bearing Vibration Tester in microns per second or an Anderon Meter in Anderons. One Anderon equals 7.5 microns per second. The readings are separated into three frequency bands: low (50 to 300 Hz); medium (300 to 1800 Hz) and high (1800 to 10000 Hz). Although vibration velocity shows the fatigue potential, *vibration force* can cause deformation to balls and rings and can be very damaging at high frequencies where velocity readings may be quite low. For this reason we also measure vibration acceleration.

Vibration acceleration is an indication of vibratory force (force = mass x acceleration) and since force is damaging at higher frequencies, vibration acceleration is a useful measurement where a bearing will experience vibration frequencies above 2000 Hz. Vibration acceleration is measured in G (9.81 m/s²) but you will often see these measurements converted to decibels (dB).

A low noise/vibration rating is achieved by paying particular attention to the surface finish of the raceways and balls, the roundness of the rings and balls and correct cage design.

To help reduce noise levels even further, low noise greases are available and the choice is now greater as improved manufacturing techniques mean these greases are more finely filtered and contain fewer, smaller solid particles. These particles generate noise when they pass between the balls and raceway.

External factors such as surrounding vibration can affect bearing noise. Another problem, particularly with smaller and thin-section bearings, is ring distortion caused by poor shaft or housing roundness. Dirt or dust contamination will also increase noise and vibration levels. Poor fitting practice or incorrect handling is sometimes to blame, causing shock loads which, in turn, create scratches or dents in the raceway.

11. Lubricants

Correct lubrication is critical to bearing performance. It provides a thin film between the contact areas in a bearing to reduce friction, dissipate heat and inhibit corrosion on balls and raceways. The lubricant will affect maximum running speed and temperature, torque level, noise level and, ultimately, bearing life. There are a range of options depending on the application.

Mineral or synthetic based lubricants are the most commonly used and are designed for general and high speed use. Finely filtered versions are used for low noise applications. There are versions that are water resistant, offer low or high temperature capabilities,
Silicon lubricants have wide temperature ranges and change viscosity less with temperature. They also have good water-resistance and are safe to use with most plastics. They are not suitable for high loads and speeds.
Perfluorinated lubricants are non-flammable, oxygen compatible and highly resistant to many chemicals. They do not react with plastics or elastomers. Many have low vapour pressure and are suitable for vacuum or clean-room applications. Some can also withstand temperatures of up to 300°C.
Dry lubricants are often specified where standard lubricants may cause contamination such as vacuum environments. Dry coatings such as molybdenum disulphide or tungsten disulphide are often burnished on to the balls and raceways of bearings to give smooth operation and higher running speeds than unlubricated bearings. These coatings are also resistant to water and dilute acids.
Dampening greases are widely used in automotive parts to prevents rattles and squeaks. They are also used to give a "quality" feel to switches, slides, threads and gears. They can be used in slow rotating bearings in, for example, potentiometers for the same reason.
Food grade lubricants are required for the food and beverage industries to conform with strict hygiene regulations. HI approved lubricants are required for bearings were there may be incidental contact with food and H2 approved greases are used where there is no contact. These greases are also designed to be highly resistant to being washed out by cleaning processes.

Lubricant viscosity
Low viscosity oils and greases are used where low lubricant resistance is required such as sensitive instruments. Higher viscosity lubricants may be specified for high load, high speed or vertical shaft applications. Low viscosity oils (or greases with low viscosity base oils) are preferred for high speed applications as they generate less heat. Although greases often provide much greater resistance than oils, many modern low torque greases can produce torque figures that are similar to some oils, particularly where a low grease fill is used.

Oils
Most oils maintain their consistency well over a wide temperature range and are easy to apply. For very low torque applications, a light instrument oil should be specified. Higher running speeds are possible with oil but, as it tends not to stay in place, continuous lubrication must be applied by oil jet, oil bath or oil mist unless speeds are low or rotation is for short periods. An oil-impregnated phenolic retainer or a synthetic retainer made from a material with a very low coefficient of friction such as Torlon do not need continuous external lubrication. These types of retainer are often used in high speed, low torque dental bearings.

Greases
Greases are simply oils mixed with a thickener to so that they stay inside the bearing. Greases are generally more suitable for heavy loads and have the obvious advantage of giving constant lubrication over a long period without maintenance.

Surprisingly, too much grease can be bad for a bearing. A high fill will mean greater rolling resistance (higher torque) which may not be suitable for many applications but worse still is the risk of heat build-up. The free space inside a bearing is important in allowing the heat to radiate away from contact area between balls and raceway. As a result, too much grease can lead to premature failure unless speeds are low. The standard fill is 25% – 35% of the internal space but this may be varied if required. A smaller percentage may be specified for a high speed, low torque application while a much higher fill may be advisable for a low speed, high load application.

For more information on our standard oils and greases, please see the lubricant tables on the following page. We stock many more than are listed here and have access to lubricants from a large number of manufacturers.

STANDARD OILS

Code	Product Manufacturer	Type	Temp range C (F)	Viscosity CS	MIL Spec	Comments
AF2	Aeroshell 12 (Shell)	Diester	-50/+130 (-58/+266)	14/3.5	L-6085A D/Stan 91-49	General purpose aircraft / instrument
AF3	Aeroshell 3 (Shell)	Mineral	-55/+115 (-67/+239)	11/2.3	L-7870	General purpose aircraft / instrument
DC200/ 100	DC200/100 (Dow Corning)	Silicon	-40/+204 (-40/+400)	100/38		Wide temp, high torque, low speed/load. Safe with most plastics
K143	Krytox 143AZ (Du Pont)	Pefluor-inated	-53/+162 (-63/+324)	40/7		High temp, chemically inert, high torque at low temp, plastic / elastomer safe
PDP38	Isoflex PDP38 (Kluber)	Ester	-65/+100 (-85/+212)	12/3.2		General purpose aircraft / instrument

STANDARD GREASES

Code	Product Manufacturer	Base oil	Thickener	Temp range C (F)	MIL Spec	Comments
AG5	Aeroshell 5 (Shell Oil)	Mineral	Microgel	-40/+177 (-40/+350)	G-3545C	High load
AG7	Aeroshell 7 (Shell Oil)	Diester	Microgel	-73/+149 (-100/+300)	G-23827A G287/G354 D/Stan 91-53	Good water-resistance, high load, wide temp. range
AG22	Aeroshell 22 (Shell Oil)	Hydro-carbon	Microgel	-65/+204 (-85/+400)	Mil-PRF81322F XG293/G395 D/Stan 91-52	Good water-resistance, high load/speed, wide temp range
AG33	Aeroshell 33 (Shell Oil)	Diester	Microgel	-73/+121 (-100/+251)	Mil-PRF23827 XG287/G354 D/Stan 91-53	Good water-resistance, high load, low temp.
AKC	Andok C (Exxon Corp)	Mineral	Sodium	-30/+120 (-22/+250)		DISCONTINUED (see R374C)
AQUA 2	Sapphire AQUA 2 (Rocol)	Mineral	Alum Complex	-20/+150 (-4/+302)		Highly water resistant
B32	Beacon 325 (Mobil/Exxon)	Diester	Lithium	-55/+120 (-67/+248)	G-3278A DTD825B	Low torque, quiet running
B4272	Kluberelectric (Kluber)	Hydro-carbon	Lithium	-40/+140 (-40/+284)		Conductive grease
B601	Braycote 601 (Castrol)	Perfluor	Tetrafluoro-ethylene	-80/+204 (-112/+400)		Chemically inert, instrument & aerospace vacuum grease
FLEX	Foodlube Extreme (Rocol)	Polyalpha -olefin	Clay	-30/+160 (-22/+320)		H1 food grade grease Highly washout resistant

STANDARD GREASES (...continued)

Code	Product Manufacturer	Base oil	Thickener	Temp range C (F)	MIL Spec	Comments
FL2	Foodlube 2 (Rocol)	Ester Glyceride	Calcium Soap	-50/+160 (-58/+320)		H1 food grade grease Washout resistant
FLHT2	Foodlube Hi-temp (Rocol)	Silicon	Silica + PTFE	-20/+200 (-4/+392)		High temp, H1 food grade grease. Washout resistant
GHY72	Asonic GHY72 (Kluber)	Ester	Polyurea	-40/+180 (-40/+356)		Low noise
GPL202	Krytox GPL202 (Du Pont)	Fluoro-carbon	PFPE	-63/+132 (-81/+270)		Low temp, chemically inert, plastic/elastomer safe
GPL203	Krytox GPL203 (Du Pont)	Fluoro-carbon	PFPE	-60/+154 (-76/+310)		Wide temp range, chemically inert, plastic/elastomer safe
GPL204	Krytox GPL204 (Du Pont)	Fluoro-carbon	PFPE	-51/+179 (-60/+355)		Wide temp range, chemically inert, plastic/elastomer safe
GPL205	Krytox GPL205 (Du Pont)	Fluoro-carbon	PFPE	-36/+204 (-33/+400)		High temp, chemically inert, plastic/elastomer safe
GPL207	Krytox GPL207 (Du Pont)	Fluoro-carbon	PFPE	-34/+288 (-29/+550)		High temp, chemically inert, plastic/elastomer safe
KAC	Krytox 240AC (Du Pont)	Fluoro-carbon	PFPE	-34/+288 (-29/+550)	G-27617A	High temp, chemically inert, plastic/elastomer safe, food grade
L55/2	Barrierta L55/2 (Kluber)	Fluoro-carbon	PFPE	-40/+260 (-40/+500)		High temp, chemically inert, plastic/elastomer safe, food grade
LDS18A	LDS18 Spec.A (Kluber)	Synthetic	Lithium	-60/+130 (-76/+266)	G-23827A DTD844B	Low noise, high speed
M44	Molycote 44M (Dow Corning)	Silicon	Lithium	-40/+204 (-40/+400)	G-15719A	High temp. low load
MG28	Grease 28 (Mobil Oil)	Hydro-carbon	Clay	-54/+177 (-65/+350)	G-81322	Wide temp. range
PEM	Polyrex EM (Mobil)	Mineral	Polyurea	-40/+180 (-40/+356)		Good water resistance, wide temp range, low noise
PS2	Multemp PS2 (Kyodo Yushi)	Diester	Lithium	-55/+130 (-67/+266)		Low torque, low temp.
R374C	Rheolube 374C (Nye)	Polyalpha -olefin	Lithium	-40/+150 (-40/+302)		High speed, non migratory, good for vertical shaft use
SRI-2	Chevron SRI-2 (Caltex)	Mineral	Urea	-30/+175 (-22/+347)	G-3545G	Good water resistance, wide temp range
SRL	Multemp SRL (Kyodo Yushi)	Ester	Lithium	-40/+150 (-40/+302)		Low torque, quiet running, wide temp range

Conversion table mm to inch

Inch Fraction	Inch Decimal	Milli-metres	Inch Fraction	Inch Decimal	Milli-metres	Inch Fraction	Inch Decimal	Milli-metres
1/64	0.0156	0.397	–	0.2756	7.0	–	0.6299	16.0
1/32	0.0312	0.794	9/32	0.2813	7.144	41/64	0.6406	16.272
–	0.0394	1.0	19/64	0.2969	7.541	21/32	0.6563	16.669
3/64	0.0469	1.191	5/16	0.3125	7.938	–	0.6693	17.0
–	0.0472	1.2	–	0.315	8.0	43/64	0.6719	17.066
–	0.0591	1.5	21/64	0.3281	8.334	11/16	0.6875	17.463
1/16	0.0625	1.588	11/32	0.3438	8.731	45/64	0.7031	17.859
–	0.0629	1.6	–	0.3543	9.0	–	0.7087	18.0
–	0.0709	1.8	23/64	0.3594	9.128	23/32	0.7188	18.256
5/64	0.0781	1.984	3/8	0.375	9.525	47/64	0.7344	18.653
–	0.0787	2.0	25/64	0.3906	9.922	–	0.748	19.0
–	0.0906	2.3	–	0.3937	10.0	3/4	0.75	19.05
3/32	0.0938	2.381	13/32	0.4063	10.319	49/64	0.7656	19.447
–	0.0984	2.5	27/64	0.4219	10.716	35/32	0.7813	19.844
–	0.1024	2.6	–	0.4331	11.0	–	0.7874	20.0
7/64	0.1094	2.778	7/16	0.4375	11.112	51/64	0.7969	20.241
–	0.1181	3.0	29/64	0.4531	11.509	13/16	0.8125	20.638
1/8	0.125	3.175	15/32	0.4688	11.906	–	0.8268	21.0
–	0.1378	3.5	–	0.4724	12.0	53/64	0.8281	21.034
9/64	0.1406	3.572	31/64	0.4844	12.303	27/32	0.8438	21.431
5/32	0.1562	3.969	1/2	0.50	12.7	55/64	0.8594	21.828
–	0.1575	4.0	–	0.5118	13.0	–	0.8661	22.0
11/64	0.1719	4.366	33/64	0.5156	13.097	7/8	0.875	22.225
–	0.1772	4.5	17/32	0.5313	13.494	57/64	0.8906	22.622
3/16	0.1875	4.762	35/64	0.5469	13.891	–	0.9055	23.0
–	0.1969	5.0	–	0.5512	14.0	29/32	0.9063	23.019
13/64	0.2031	5.159	9/16	0.5625	14.288	59/64	0.9219	23.416
7/32	0.2188	5.556	37/64	0.5781	14.684	15/16	0.9375	23.813
15/64	0.2344	5.953	–	0.5906	15.0	–	0.9449	24.0
–	0.2362	6.0	19/32	0.5938	15.081	61/64	0.9531	24.209
1/4	0.25	6.35	39/64	0.6094	15.478	31/32	0.9688	24.606
17/64	0.2656	6.747	5/8	0.625	15.875	–	0.9843	25.0

Notes

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