HQW

BARDEN

Value Precision Bearings

HQW Precision GmbH
HQW Aerospace (UK) Ltd

Partners in Precision

BARDENIUK

Introduction

Barden bearings have been the market leader in the super precision ball bearing sector for more than 70 years. Working together as Partners in Precision, we share best practices and knowledge, delivering high-end bearings and assemblies tailormade to the demands and requirements of our customers.

Together, Barden and HQW supply thousands of bearing variations, each manufactured in state-of-the-art facilities and designed to accommodate the performance needs of the most demanding applications.

All products in the Value Precision Bearing range are manufactured to precise standards in facilities fully certified to ISO 9001 and conform to the tolerance standards of ISO P0 to P4 (ABEC 1 to 7). They are ideally suited to a variety of applications, from microelectronics to high performance motors, and deliver accuracy, reliability and smooth performance.

The Value Precision Bearing range offers the same excellence, quality and finish you would expect from a super precision bearing, with added value.

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Nomenclature Guide

	Quality	Materials	Type	Series & Size	Closure	Cage
EXAMPLE	P0 -	C	F	608	SS	Q
	A5 -	S	ZKLN	R144	UU	TA/THB
	P4A -	30X		R3	V	

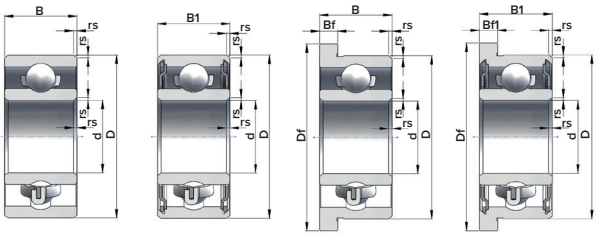
Quality		Materials		Type		Series & Size		Closure		Cage	
P0 -	ISO P0	C	Hybrid bearing Si_3N_4 Ceramic balls	F	Flanged outer ring	R..	Deep groove inch series instrument	S/SS	Single/double shields, stainless steel	Q	Standard, details supplied on request
P6 -	ISO P6										
P5 -	ISO P5	Blank	Carbon chrome steel	LE	Bearing unit	R100	Deep groove inch series miniature	RS	Single shield fitted to plain side of flanged bearing	E	Steel (not stainless) ribbon
P4 -	ISO P4										
P5A -	ISO P5A	S	Corrosion resistant steel	LR	Deep groove ball bearings with spherical outside surface (R=500mm)	R1000	Deep groove inch series extra thin			TMT	Synthetic (polyamide) snap moulded
P4A -	ISO P4A							U/UU	Single/double Synchroseal		
A1 -	ABEC1	30X	Rings X30CrMoN15-1			600/ 6000	Deep groove metric miniature & instrument			Wf	Full complement ball set
A3 -	ABEC3			QJ	Four-point-contact ball bearing			RU/-	Single Synchroseal fitted to plain side of flanged bearing		
A5 -	ABEC5	NM	Non-magnetic alloy			SCB*/ QC*	Special Customer Bearing			K	Steel snap cage
A7 -	ABEC7			LFR	Deep groove ball bearings or angular contact ball bearings with track roller surface						
A3P -	ABEC3P	See page 19						Y/YY	Single/double NBR rubber contact seal	TA/ T*HB	Machined snap cage
A5P -	ABEC5P										
A7P -	ABEC7P			ZKLN	Axial angular contact ball bearing double row			A/AA	Single/double NBR rubber non-contact seal	*cage material code	
P2 -	ISO P2									See page 18	
A9 -	ABEC9							See page 16-17			
See page 10-13											

Special designs, such as other materials, shield-and-seal combinations, cages or coatings, on request.

Notes:
T*HA/T*HB is a machine-made plastic snap cage.
The "*" stands for the material code.
Example: THA = phenolic resin; T4HA = Torlon; T15HA = PEEK.

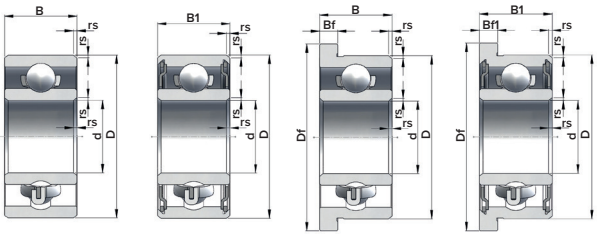
Special Features	Radial Play	Functional Test	Duplex & Preload	Calibration	Lubrication	Lubricant Quantity
Y183	ZK3	V	DB/25	C	GJ-204 BF	10 MG
YQ123	C3		DBL	C04	O-11	35-45%
			DS5		OJ-201	
					CT*	
Y.. Special feature number	**ZK2** 0.003-0.008mm (0.0001"-0.0003")	**V** Noise tested	**DB*** Back to back or "O" mounting	**C** Bore & OD in 0.0025mm (0.0001") steps	**G-.....** Grease	**Blank** Standard fill
		See page 20			**GJ-.....** Grease	***MG** Nominal lubricant quantity in MG
	ZK3 0.005 - 0.010mm (0.0002" - 0.0004")		**DF*** Face to face or "X" mounting		**O-.....** Oil	
				CX0 Bore only in 0.0025mm (0.0001") steps	**OJ-.....** Oil	***%** Lubricant quantity as % of free volume
	ZK4 0.008-0.013mm (0.0003"-0.0005")		**DT*** Tandem mounting		**Disp/ FG/ FGJ** Dispersion (film grease)	
	ZK5 0.013-0.020mm (0.0005"-0.0008")		**D*** Universal	**C0X** OD only in 0.0025mm (0.0001") steps	**DRY** No lubrication	**Special lubrication application can be supplied by use of a special feature code**
			DS* Universal single bearing		**OF** Outer surfaces dry	
	C2 Smaller than CN					
	(CN) Normal radial play - no indication		**/...** Pre-load value in N	**C4** Bore & OD in 0.00125mm (0.0005") steps	**BF** Both sides greased	
	C3 Greater than CN		**See page 22**		**CT*** Special coating; *code	
				C40 Bore only in 0.00125mm (0.00005") steps		
	C4 Greater than C3				**S0-S5** Special heat treatment	
	C5 Greater than C4			**C04** OD only in 0.00125mm (0.00005") steps	**See page 20**	
				See page 22		

Deep Groove Ball Bearings (Metric)



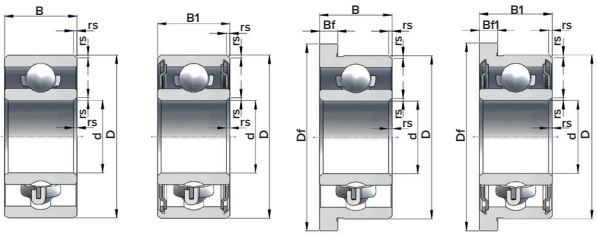
Basic Part Number	Dimensions								Load Rating		Limiting Speed	
	Bore Diameter	Outside Diameter	Width		Flange			Radius	Dynamic	Static	Oil	Grease
			Open	Shielded	Ø Df	Bf	Bf_1					
	d [mm]	D [mm]	B [mm]	B1 [mm]	[mm]	[mm]	[mm]	r_{min} [mm]	C [N]	C_0 [N]	[min^{-1}]	[min^{-1}]
681	1	3	1	-	3.8	0.3	-	0.05	80	22	150000	130000
681X	1	4	1.2	2	5	0.4	0.6	0.05	160	44	120000	100000
681X	1.5	4	1.2	2	5	0.4	0.6	0.05	160	44	120000	100000
691X	1.5	5	2	2.6	6.5	0.6	0.8	0.15	187	58	100000	85000
672	2	4	1.2	2	-	-	-	0.05	123	39	104000	91000
682	2	5	1.5	2.3	6.1	0.5	0.6	0.08	187	58	100000	85000
MR52	2	5	2	2.6	6.2	0.6	0.6	0.1	188	59	100000	85000
692WB2,3	2	6	2.3	2.3	7.5	0.6	0.8	0.15	275	89	90000	75000
692	2	6	2.3	3	7.5	0.6	0.8	0.15	275	89	90000	75000
MR62	2	6	2.5	2.5	7.2	0.6	0.6	0.15	275	89	90000	75000
MR72	2	7	2.5	3	8.2	0.6	0.6	0.15	310	109	75000	63000
602	2	7	2.8	3.5	8.5	0.7	0.9	0.15	310	109	75000	63000
68/2,35	2.35	5.5	2	2	7.5	0.6	0.8	0.15	275	89	90000	75000
682X (68/2,5)	2.5	6	1.8	2.6	7.1	0.5	0.8	0.08	280	90	80000	71000
692X (69/2,5)	2.5	7	2.5	3.5	8.5	0.7	0.9	0.15	425	149	75000	63000
MR82X	2.5	8	2.5	-	9.2	0.6	-	0.2	425	149	67000	60000
602X	2.5	8	2.8	4	9.5	0.7	0.9	0.15	425	149	71000	60000
MR63	3	6	2	2.5	7.2	0.6	0.6	0.1	208	73	80000	71000
673	3	6	2	2	7.2	0.6	0.6	0.08	255	80	78000	65000
683	3	7	2	3	8.1	0.5	0.8	0.1	310	111	75000	63000
MR83	3	8	2.5	3	9.2	0.6	-	0.15	450	154	67000	60000
693	3	8	3	4	9.5	0.7	0.9	0.15	560	179	67000	60000
MR93	3	9	2.5	4	10.2	0.6	0.8	0.2	570	188	67000	56000
603	3	9	3	5	10.5	0.7	1	0.15	570	187	67000	56000
623	3	10	4	4	11.5	1	1	0.15	630	218	60000	50000
633	3	13	5	5	15	1	1	0.2	1300	485	50000	42000
674	4	7	2	2	8.2	0.6	0.6	0.1	335	129	67000	60000
MR74	4	7	2	2.5	8.2	0.6	0.6	0.1	191	74	67000	60000
MR84	4	8	2	3	9.2	0.6	0.6	0.1	395	140	67000	56000
684	4	9	2.5	4	10.3	0.6	1	0.1	640	225	63000	53000
MR104	4	10	3	4	11.2	0.6	0.8	0.15	645	233	56000	48000
694	4	11	4	4	12.5	1	1	0.15	960	345	56000	48000
604	4	12	4	4	13.5	1	1	0.2	960	345	54000	46000
624	4	13	5	5	15	1	1	0.2	1300	485	48000	40000
634	4	16	5	5	18	1	1	0.3	1730	670	43000	36000
675	5	8	2	2	9.2	0.6	0.6	0.1	380	165	63000	53000
MR85	5	8	2	2.5	9.2	0.6	-	0.1	380	165	63000	53000
MR95	5	9	2.5	3	10.2	0.6	0.6	0.15	430	167	60000	50000
MR105	5	10	3	4	11.2	0.6	0.8	0.15	710	270	60000	50000

Deep Groove Ball Bearings (Metric)



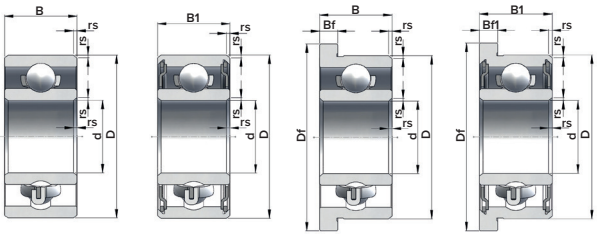
Basic Part Number	Dimensions								Load Rating		Limiting Speed	
	Bore Diameter	Outside Diameter	Width		Flange			Radius	Dynamic	Static	Oil	Grease
			Open	Shielded	Ø Df	Bf	Bf_1					
	d [mm]	D [mm]	B [mm]	B1 [mm]	[mm]	[mm]	[mm]	r_{min} [mm]	C [N]	C_0 [N]	[min^{-1}]	[min^{-1}]
MR115	5	11	-	4	12.6	-	0.8	0.15	775	315	53000	45000
685	5	11	3	5	12.5	0.8	1	0.15	715	218	53000	45000
695	5	13	4	4	15	1	1	0.2	1080	430	50000	43000
605	5	14	5	5	16	1	1	0.2	1330	505	50000	40000
625	5	16	5	5	18	1	1	0.3	1730	670	43000	36000
635	5	19	6	6	22	1.5	1.5	0.3	2340	885	40000	32000
MR106	6	10	2.5	3	11.2	0.6	0.6	0.1	495	218	53000	45000
MR126	6	12	3	4	13.2	0.6	0.8	0.15	715	290	50000	43000
686	6	13	3.5	5	15	1	1.1	0.15	1080	440	50000	40000
696	6	15	5	5	17	1.2	1.2	0.2	1470	600	45000	40000
696 D16	6	16	5	5	-	-	-	0.2	1470	600	45000	40000
606	6	17	6	6	19	1.2	1.2	0.3	2260	835	45000	38000
626	6	19	6	6	22	1.5	1.5	0.3	2340	885	40000	32000
636	6	22	7	7	25	1.5	1.5	0.3	3300	1370	37000	31000
MR117	7	11	2.5	3	12.2	0.6	0.6	0.1	455	201	50000	43000
MR137	7	13	3	4	14.2	0.6	0.8	0.15	770	335	48000	40000
687	7	14	3.5	5	16	1	1.1	0.15	1170	510	45000	40000
697	7	17	5	5	19	1.2	1.2	0.3	1610	715	43000	36000
607	7	19	6	6	22	1.5	1.5	0.3	2340	885	43000	36000
627	7	22	7	7	25	1.5	1.5	0.3	3300	1370	36000	30000
637	7	26	9	9	29	2	2	0.3	4050	1620	34000	29000
MR128	8	12	2.5	3.5	13.2	0.6	0.8	0.1	540	270	48000	40000
MR148	8	14	3.5	4	15.6	0.8	0.8	0.15	870	420	45000	38000
688	8	16	4	5	18	1	1.1	0.2	1260	590	43000	36000
698	8	19	6	6	22	1.5	1.5	0.3	2240	910	43000	36000
608	8	22	7	7	25	1.5	1.5	0.3	3300	1370	40000	34000
628	8	24	8	8	26	2	2	0.3	3350	1430	34000	28000
638	8	28	9	9	30.25	2.25	2.25	0.3	4550	1970	33000	28000
679	9	14	3	4.5	15.5	0.8	0.8	0.1	915	465	42000	36000
689	9	17	4	5	19	1	1.1	0.2	1330	665	43000	36000
699	9	20	6	6	23	1.5	1.5	0.3	1720	840	40000	34000
609	9	24	7	7	27	1.5	1.5	0.3	3350	1430	38000	32000
629	9	26	8	8	28	2	2	0.6	4550	1970	34000	28000
639	9	30	10	10	32.5	2.5	2.5	0.6	5100	2390	31000	26000
6700	10	15	3	4	16.5	0.8	0.8	0.15	855	435	17000	15000
6800	10	19	5	5	21	1	1	0.3	1720	840	45000	38000
63800	10	19	7	7	21	1.5	1.5	0.3	1720	840	40800	34000
6900	10	22	6	6	25	1.5	1.5	0.3	2700	1270	38000	32000
6000	10	26	8	8	28	2	2	0.3	4550	1970	36000	30000

Deep Groove Ball Bearings (Metric)



Basic Part Number	Dimensions								Load Rating		Limiting Speed	
	Bore Diameter	Outside Diameter	Width		Flange			Radius	Dynamic	Static	Oil	Grease
			Open	Shielded	Ø Df	Bf	Bf_1					
	d [mm]	D [mm]	B [mm]	B1 [mm]	[mm]	[mm]	[mm]	r_{min} [mm]	C [N]	C_0 [N]	[min^{-1}]	[min^{-1}]
6200	10	30	9	9	32.25	2.25	2.25	0.6	5100	2390	30000	25000
6300	10	35	11	11	37.75	2.75	2.75	0.6	8100	3450	27000	23000
6701	12	18	4	4	19.5	0.8	0.8	0.2	925	530	15000	13000
6801	12	21	5	5	23	1.1	1.1	0.3	1920	1040	40000	33000
63801	12	21	7	7	23	1.5	1.5	0.3	1920	1040	36000	30000
6901	12	24	6	6	26.5	1.5	1.5	0.3	2890	1460	36000	30000
6001	12	28	8	8	30	2	2	0.3	5100	2370	32000	28000
6201	12	32	10	10	34.5	2.5	2.5	0.6	6800	3050	28000	22000
6301	12	37	12	12	40	3	3	1	9700	4200	24000	20000
6702	15	21	4	4	22.5	0.8	0.8	0.2	935	585	13000	11000
6802	15	24	5	5	26	1.1	1.1	0.3	2080	1260	33000	28000
63802	15	24	7	7	26	1.5	1.5	0.3	2080	1260	32000	26000
6902	15	28	7	7	30.5	1.5	1.5	0.3	4350	2260	30000	26000
6002	15	32	9	9	34.25	2.25	2.25	0.3	5600	2840	28000	23000
6202	15	35	11	11	37.75	2.75	2.75	0.6	7650	3750	24000	20000
6302	15	42	13	13	45	3	3	1	11400	5450	20000	17000
6703	17	23	4	4	24.5	0.8	0.8	0.2	1000	680	11000	9500
6803	17	26	5	5	28	1.1	1.1	0.3	2230	1460	30000	26000
63803	17	26	7	7	28	1.5	1.5	0.3	2230	1460	27600	23000
6903	17	30	7	7	32.5	1.5	1.5	0.3	4600	2550	28000	24000
6003	17	35	10	10	37.5	2.5	2.5	0.3	6000	3250	24000	21000
6203	17	40	12	12	43	3	3	0.6	9550	4800	22000	17000
6303	17	47	14	14	50.5	3.5	3.5	1	13300	6650	19000	16000
6704	20	27	4	4	28.5	0.8	0.8	0.2	1040	780	10000	8500
6804	20	32	7	7	35	1.5	1.5	0.3	4000	2470	25000	21000
63804	20	32	10	10	35	2	2	0.3	4000	2470	25000	21000
6904	20	37	9	9	40	2	2	0.3	6400	3700	23000	19000
6004	20	42	12	12	45	3	3	0.6	9400	5000	20000	18000
6204	20	47	14	14	50.5	3.5	3.5	1	12800	6600	18000	15000
6304	20	52	15	15	55.75	3.75	3.75	1.1	15900	7900	17000	14000
6705	25	32	4	-	34	1	-	0.2	1390	1320	8000	7000
6805	25	37	7	7	40	1.5	1.5	0.3	4500	3150	21000	18000
63805	25	37	10	10	40	2	2	0.3	4500	3150	21000	18000
6905	25	42	9	9	45	2	2	0.3	7050	4450	19000	16000
6005	25	47	12	12	50	3	3	0.6	10100	5850	18000	15000
6205	25	52	15	15	55.75	3.75	3.75	1	14000	7850	15000	13000
6305	25	62	17	17	66	4	4	1.1	20600	11200	14000	11000

Deep Groove Ball Bearings (Inch)



Basic Part Number	Dimensions								Load Rating		Limiting Speed	
	Bore Diameter	Outside Diameter	Width		Flange			Radius	Dynamic	Static	Oil	Grease
			Open	Shielded	Ø Df	Bf	Bf_1					
	d [mm]	D [mm]	B [mm]	B1 [mm]	[mm]	[mm]	[mm]	r_{min} [mm]	C [N]	C_0 [N]	[min^{-1}]	[min^{-1}]
R1-4	1.984	6.35	2.38	3.571	7.518	0.584	0.787	0.1	275	88	80000	67000
R133	2.38	4.762	1.588	2.38	5.944	0.457	0.787	0.1	188	59	95000	80000
R1-5	2.38	7.938	2.779	3.571	9.119	0.584	0.787	0.15	555	179	71000	60000
R144	3.175	6.350	2.380	2.779	7.518	0.584	0.787	0.1	310	108	80000	67000
R2-5	3.175	7.938	2.779	3.571	9.119	0.584	0.787	0.1	560	180	67000	60000
R2-6	3.175	9.525	2.779	3.571	10.719	0.584	0.787	0.15	640	227	63000	53000
R2	3.175	9.525	3.967	3.967	11.176	0.762	0.762	0.3	640	227	67000	56000
R2A	3.175	12.7	4.366	4.366	-	-	-	0.3	640	227	67000	56000
R155	3.967	7.938	2.779	3.175	9.119	0.584	0.914	0.1	395	140	63000	53000
R156	4.762	7.938	2.779	3.175	9.119	0.584	0.914	0.1	395	140	63000	53000
R166	4.762	9.525	3.175	3.175	10.719	0.584	0.787	0.1	710	270	60000	50000
FR3	4.762	12.7	4.978	-	14.351	1.067	-	0.3	1300	485	53000	43000
R3	4.762	12.7	3.967	4.978	14.351	-	1.067	0.3	1300	485	53000	43000
R3A	4.762	15.875	4.978	4.978	-	-	-	0.3	1460	595	45000	38000
R168	6.35	9.525	3.175	3.175	10.719	0.584	0.914	0.1	370	172	56000	48000
R188	6.35	12.7	3.175	4.762	13.894	0.584	1.143	0.15	1080	435	50000	40000
R4	6.35	15.875	4.978	4.978	17.526	1.067	1.067	0.3	1470	600	45000	38000
R4A	6.35	19.05	5.558	7.142	-	-	-	0.4	2340	885	43000	36000
R1810	7.938	12.7	3.967	3.967	13.894	0.787	0.787	0.15	540	270	48000	40000
R6	9.525	22.225	5.558	7.142	24.613	1.575	1.575	0.4	3330	1400	38000	32000
R8	12.7	28.575	6.35	7.938	31.12	1.575	1.575	0.4	4320	2250	32000	27000
R10	15.875	34.925	7.142	8.733	37.846	-	1.745	0.8	6000	3250	24000	21000
R12	19.05	41.275	7.938	11.113	-	-	-	0.8	9400	5000	20000	18000

Tolerance Table - Inner Ring

Definition			Designation		A1		A3		A5	
			ISO 492		Standard		Class 6		Class 5	
			ANSI/ABMA		ABEC-1		ABEC-3		ABEC-5	
			DIN 620		P0		P6		P5	
			d [mm]		max	min	max	min	max	min
			>	≤						
Deviation of mean bore diameter in a single plane / Deviation of a single bore diameter		Δ_{dmp} / Δ_{ds}	-	18	0	-8	0	-7	0	-5
			18	25	0	-10	0	-8	0	-6
Variation of bore diameter in a single plane	Diameter Series 7 / 8 / 9	V_{dsp}	-	18	10		9		5	
			18	25	13		10		6	
	0 / 1	V_{dsp}	-	18	8		7		4	
			18	25	10		8		5	
	2 / 3 / 4	V_{dsp}	-	18	6		5		4	
			18	25	8		6		5	
Variation of mean bore diameter		V_{dmp}	-	18	6		5		3	
			18	25	8		6		3	
Radial runout of inner ring of assembled bearing		K_{ia}	-	2.5	10		5		4	
			2.5	10	10		6		4	
			10	18	10		7		4	
			18	25	13		8		4	
Perpendicularity of inner ring face with respect to the bore		S_d	-	18					7	
			18	25					8	
Axial runout of inner ring of assembled bearing		S_{ia}	-	2.5	15		10		7	
			2.5	10	20	not defined in ISO 492	15	not defined in ISO 492	7	
			10	18	20		20		7	
			18	25	25		20		8	
Deviation of a single inner ring width		Δ_{Bs} normal	-	2.5	0	-40	0	-40	0	-40
			2.5	10	0	-120	0	-120	0	-40
			10	18	0	-120	0	-120	0	-80
			18	25	0	-120	0	-120	0	-120
Deviation of the total inner ring width for duplexed bearings		Δ_{Bs} modified a	-	2.5					0	-250
			2.5	25	0	-250	0	-250	0	-250
Variation of inner ring width		V_{Bs}	-	2.5	12		12		5	
			2.5	10	15		15		5	
			10	25	20		20		5	

All figures in µm.
(1) Nominal bore value from 9mm
(2) Only for deep groove bearings
(3) Only for spindle bearings

A7 Class 4 ABEC-7 P4		A9 Class 2 ABEC-9 P2		A3P ABEC-3P		A5P ABEC-5P		A7P ABEC-7P		A9P ABEC-9P		A5T[1] ABEC-5T		P5A[2]		P4A[2]		P4S[3]	
max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
0 0	-4 -5	0 0	-2.5 -2.5	0 0	-5 -5	0 0	-5 -5	0 0	-5 -5	0 0	-2.5 -2.5	0 0	-5 -5	0 0	-5 -6	0 0	-4 -5	0 0	-4 -5
4 5						2.5 2.5		2.5 2.5		1.5 1.5				3 3		2.5 2.5			
3 4		2.5 2.5				2.5 2.5		2.5 2.5		1.5 1.5				3 3		2.5 2.5		2.5 2.5	
3 4		2.5 2.5				2.5 2.5		2.5 2.5		1.5 1.5				3 3		2.5 2.5		2.5 2.5	
2 2.5		1.5 1.5				2.5 2.5		2.5 2.5		1.5 1.5				3 3		2 2.5		1.5 1.5	
2.5 2.5 2.5 3		1.5 1.5 1.5 2.5		5 5 5 8		4 4 4 4		2.5 2.5 2.5 2.5		1.5 1.5 1.5 2.5		5 5		3.5 3.5 3.5 3.5		2.5 2.5 2.5 3		1.5 1.5 1.5 2.5	
3 4		1.5 1.5				8 8		2.5 4		1.5 1.5		8 8		7 8		3 4		1.5 1.5	
3 3 3 4		1.5 1.5 1.5 2.5				8 8 8		2.5 2.5 2.5 4		1.5 1.5 1.5 1.5		8 8 8 8		7 7 7 8		3 3 3 4		1.5 1.5 1.5 2.5	
0 0 0 0	-40 -40 -80 -120	0 0 0 0	-40 -120 -120 -120	0 0 0 0	-120 -120 -120 -120	0 0 0 0	-25 -25 -25 -25	0 0 0 0	-25 -25 -25 -25	0 0 0 0	-25 -25 -25 -25	0 0	-25 -25	0 0 0 0	-25 -25 -25 -25	0 0 0 0	-25 -25 -25 -25	0 0 0 0	-40 -40 -80 -120
0 0	-250 -250	0 0	-250 -250															0 0	-250 -250
2.5 2.5 2.5		1.5 1.5 1.5				5 5 5		2.5 2.5 2.5		1.5 1.5 1.5		5		5 5		2.5 2.5		1.5 1.5 1.5	

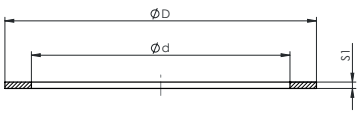
Tolerance Table - Outer Ring

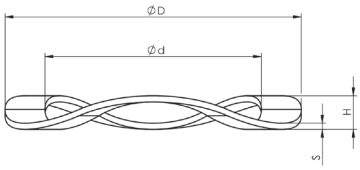
Definition			Designation		A1		A3		A5	
			ISO 492		Standard		Class 6		Class 5	
			ANSI/ABMA		ABEC-1		ABEC-3		ABEC-5	
			DIN 620		P0		P6		P5	
			D [mm]		max	min	max	min	max	min
			>	≤						
Deviation of mean outside diameter in a single plane / Deviation of a single outside diameter		Δ_{Dmp} / Δ_{Ds}	-	18	0	-8	0	-7	0	-5
			18	30	0	-9	0	-8	0	-6
			30	50	0	-11	0	-9	0	-7
			50	62	0	-13	0	-11	0	-9
Variation of outside diameter in a single plane	Diameter Series 7 / 8 / 9	V_{Dsp}	-	18	10		9		5	
			18	30	12		10		6	
			30	50	14		11		7	
			50	62	16		14		9	
	0 / 1	V_{Dsp}	-	18	8		7		4	
			18	30	9		8		5	
			30	50	11		9		5	
			50	62	13		11		7	
	2 / 3 / 4	V_{Dsp}	-	18	6		5		4	
			18	30	7		6		5	
			30	50	8		7		5	
			50	62	10		8		7	
Variation of mean outside diameter		V_{Dmp}	-	18	6		5		3	
			18	30	7		6		3	
			30	50	8		7		4	
			50	62	10		8		5	
Radial runout of outer ring of assembled bearing		K_{ea}	-	2.5	15		8		5	
			2.5	18	15		8		5	
			18	30	15		9		6	
			30	50	20		10		7	
			50	62	25		13		8	
Perpendicularity of outer ring outside surface with respect to the face		S_D	-	62					8	
Axial runout of outer ring of assembled bearing		S_{ea}	-	6	15	not defined in ISO 492	10	not defined in ISO 492	8	
			6	18	20		15		8	
			18	30	25		15		8	
			30	50	30		20		8	
			50	62	35		20		10	
Axial runout of outer ring flange back face of assembled bearing		S_{ea1}	-	18					11	
			18	50					11	
			50	62					14	
Deviation of a single outer ring width		Δ_{Cs} normal	-	18	Identical with ΔBs for inner ring of t					
			18	50						
			50	62						
Deviation of the total outer ring width for duplexed bearings		Δ_{Cs} modified b	-	62	Identical with ΔBs for inner ring of t					
Variation of outer ring width		V_{Cs}	-	18	Identical with ΔBs for inner ring of the same bearing				5	
			18	30					5	
			30	50					5	
			50	62					6	

All figures in µm.
(1) Nominal bore value from 9mm
(2) Only for deep groove bearings
(3) Only for spindle bearings

A7 Class 4 ABEC-7 P4		A9 Class 2 ABEC-9 P2		A3P ABEC-3P		A5P ABEC-5P		A7P ABEC-7P		A9P ABEC-9P		A5T[1] ABEC-5T		P5A[2]		P4A[2]		P4S[3]	
max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
0 0 0 0	-4 -5 -6 -7	0 0 0 0	-2.5 -4 -4 -4	0 0 0	-8 -8 -8	0 0 0	-5 -5 -5	0 0 0	-5 -5 -5	0 0 0	-2.5 -4 -4	0 0 0	-5 -10 -10	0 0 0	-5 -6 -7	0 0 0	-4 -5 -6	0 0 0 0	-4 -5 -6 -7
4 5 6 7						2.5 2.5 2.5		2.5 2.5 2.5		1.5 2 2				3 3 3		2.5 2.5 2.5			
3 4 5 5		2.5 4 4 4				2.5 2.5 2.5		2.5 2.5 2.5		1.5 2 2				3 3 3		2.5 2.5 2.5		2.5 4 4 4	
3 4 5 5		2.5 4 4 4				2.5 2.5 2.5		2.5 2.5 2.5		1.5 2 2				3 3 3		2.5 2.5 2.5		2.5 4 4 4	
2 2.5 3 3.5		1.5 2 2 2				2.5 2.5 2.5		2.5 2.5 2.5		1.5 2 2				3 3 4		2 2.5 3		1.5 2 2 2	
3 3 4 5 5		1.5 1.5 2.5 2.5 4		10 10 10 10		5 5 5 5		4 4 4 5		1.5 2.5 2.5 2.5		5 8 8		5 5 6 7		3 3 4 5		1.5 1.5 2.5 2.5 4	
4		1.5				8		4		1.5		8		8		4		1.5	
5 5 5 5 5		1.5 1.5 2.5 2.5 4				8 8 8 8		5 5 5 5		1.5 1.5 2.5 2.5		8 8 10		8 8 8 8		5 5 5 5		1.5 1.5 2.5 2.5 4	
7 7 7		3 4 6				8 8		8 8						10 10		7 7		3 4 6	
the same bearing				0	-120	0	-25	0	-25	0	-25	0 0	-25 -120	0	-25	0	-25	Identical with ΔBs for inner ring of the same bearing	
the same bearing																			
2.5 2.5 2.5 3		1.5 1.5 1.5 1.5				5 5		2.5 2.5		1.5 1.5		5 5 5		5 5		2.5 2.5		1.5 1.5 1.5 1.5	

Shims and Spring Washers

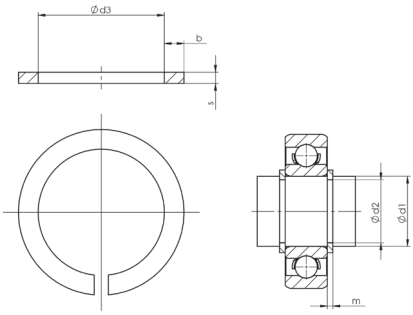




Dimensions [mm]				Applicable For	
Shims		Spring Washers			
d x D	s	d x D x H x s	Spring Constant [N/mm]	Shaft Types	Housing Types
AS 1.55 x 2.50	0.10 0.12 0.15	-	-	681X	-
-	-	WF 1.60 x 2.90 x 0.40 x 0.06	71.4	-	-
-	-	WF 1.90 x 2.80 x 0.50 x 0.08	62.5	-	-
AS 2.05 x 3.20	0.08 0.10	WF 2.15 x 3.10 x 0.50 x 0.08	47.1	-	-
AS 2.55 x 3.90	0.08 0.10	WF 2.70 x 3.80 x 0.50 x 0.08	42.7	602X, 682X, 692X, R1-5	681X, 691, R0
AS 3.20 x 4.40	0.08 0.10 0.12	WF 3.20 x 4.30 x 0.50 x 0.10	50.0	623, 683, 693, R2-5, R2, R144, R2-6, R2A	-
AS 3.80 x 4.90	0.08 0.10 0.12	WF 3.70 x 4.80 x 0.55 x 0.10	28.6	-	682, 691X
AS 4.10 x 5.85	0.10 0.12 0.15	WF 4.20 x 5.75 x 0.65 x 0.12	41.5	604, 624, 634, 684, 694, R155	682X, 692
AS 4.90 x 6.20	0.10 0.12 0.15	WF 4.80 x 6.10 x 0.60 x 0.12	30.6	R3, R156, R166	R1-4, R144
AS 5.10 x 6.85	0.10 0.12 0.15	WF 5.20 x 6.75 x 0.65 x 0.12	28.6	625, 635, 685, 695	683, 692X
AS 6.10 x 7.85	0.12 0.15 0.18	WF 6.20 x 7.75 x 0.70 x 0.15	48.7	626, 686, 696	602X, 693, R1-5, R2-5, R155, R156
AS 6.50 x 9.40	0.12 0.15 0.18	-	-	R168, R188, R4, R4A	-
AS 7.10 x 8.80	0.12 0.15 0.18	WF 7.20 x 8.70 x 0.90 x 0.15	26.2	607, 627, 687, 697	684
-	-	WF 7.20 x 12.00 x 1.40 x 0.12	16.4	607, 627	R188, R1810, R2A
AS 8.10 x 9.80	0.10 0.15 0.18 0.20	WF 8.20 x 9.70 x 0.85 x 0.18	38.0	608, 688, 698, R1810	623
AS 9.10 x 10.80	0.15 0.18. 0.20	WF 9.20 x 10.70 x 1.15 x 0.18	23.3	609, 629, 689, 699	685, 694
AS 10.20 x 11.80	0.18 0.20 0.22	WF 10.20 x 11.70 x 1.05 x 0.20	23.9	6800, 6900, R6	604
-	-	WF 10.50 x 15.80 x 1.70 x 0.20	53.8	6000	625, 634
AS 11.20. 12.80	0.18 0.20 0.22	WF 11.20 x 12.70 x 1.30 x 0.20	19.4	-	624, 686, 695
AS 12.30 x 13.80	0.20 0.22 0.25	WF 12.20 x 13.70 x 1.30 x 0.22	24.3	6801, 6901	687
AS 13.30 x 14.80	0.20 0.22 0.25	WF 13.20 x 14.70 x 1.30 x 0.22	15.0	R8	696
-	-	WF 13.20 x 18.80 x 1.60 x 0.20	32.3	-	-
AS 14.35 x 15.80	0.22 0.25 0.30	WF 14.20 x 15.65 x 1.55 x 0.25	16.2	-	625, 634, 688, R4
AS 15.35 x 16.80	0.22 0.25 0.30	WF 15.20 x 16.65 x 1.55 x 0.25	13.8	6002, 6802, 6902, R10	689, 697
AS 16.00 x 22.00	0.10 0.22 0.25	WF 15.80 x 21.80 x 1.60 x 0.20	28.5	-	R6
AS 16.40 x 18.80	0.25 0.30 0.35	WF 16.20 x 18.55 x 2.15 x 0.30	27.1	-	607, 626, 635, 6800, 698, R4A
-	-	WF 17.30 x 23.80 x 1.50 x 0.25	40	-	628, 609
-	-	WF 19.30 x 25.80 x 1.90 x 0.35	70.8	-	629, 6000

Material 1.4310
Subject to alterations.
Please enquire about availability before selecting the shims and spring washers.

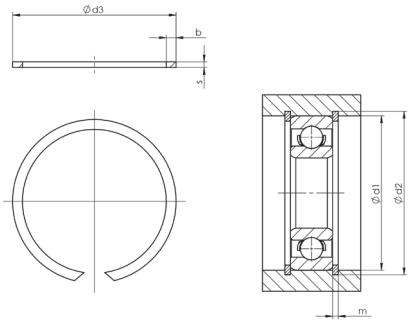
Shaft Retaining Rings



Type	Dimensions in mm					
	Shaft	Retaining Ring			Groove	
	d 1 diameter	d 3 max.	b ±0.10	s ±0.02	d 2 -0.05	m + 0.03
WSR 3	3	2.60	0.50	0.30	2.70	0.33
WSR 4	4	3.60	0.50	0.30	3.70	0.33
WSR 5	5	4.50	0.70	0.40	4.60	0.44
WSR 6	6	5.45	0.70	0.40	5.60	0.44
WSR 7	7	6.45	0.70	0.40	6.60	0.44
WSR 8	8	7.35	0.90	0.50	7.50	0.55
WSR 9	9	8.30	0.90	0.50	8.50	0.55
WSR 10	10	9.25	0.90	0.50	9.50	0.55

Material 1.4310 (AISI301).

Bore Retaining Rings



Type	Dimensions in mm					
	Bore	Retaining Ring			Groove	
	d 1 diameter	d 3 max.	b ±0.10	s ±0.02	d 2 -0.05	m + 0.03
BSR 4	4	4.40	0.50	0.30	4.30	0.33
BSR 5	5	5.45	0.50	0.30	5.30	0.33
BSR 6	6	6.45	0.50	0.30	6.30	0.33
BSR 7	7	7.50	0.50	0.30	7.30	0.33
BSR 8	8	8.60	0.70	0.40	8.40	0.44
BSR 9	9	9.60	0.70	0.40	9.40	0.44
BSR 10	10	10.65	0.70	0.40	10.40	0.44
BSR 11	11	11.65	0.70	0.40	11.40	0.44
BSR 12	12	12.75	0.90	0.50	12.50	0.55
BSR 13	13	13.75	0.90	0.50	13.50	0.55
BSR 14	14	14.80	0.90	0.50	14.50	0.55
BSR 15	15	15.80	0.90	0.50	15.50	0.55
BSR 16	16	16.85	0.90	0.50	16.50	0.55
BSR 17	17	17.85	0.90	0.50	17.50	0.55
BSR 19	19	20.00	1.10	0.60	19.60	0.66

Material 1.4310 (AISI301).

Bearing Closures

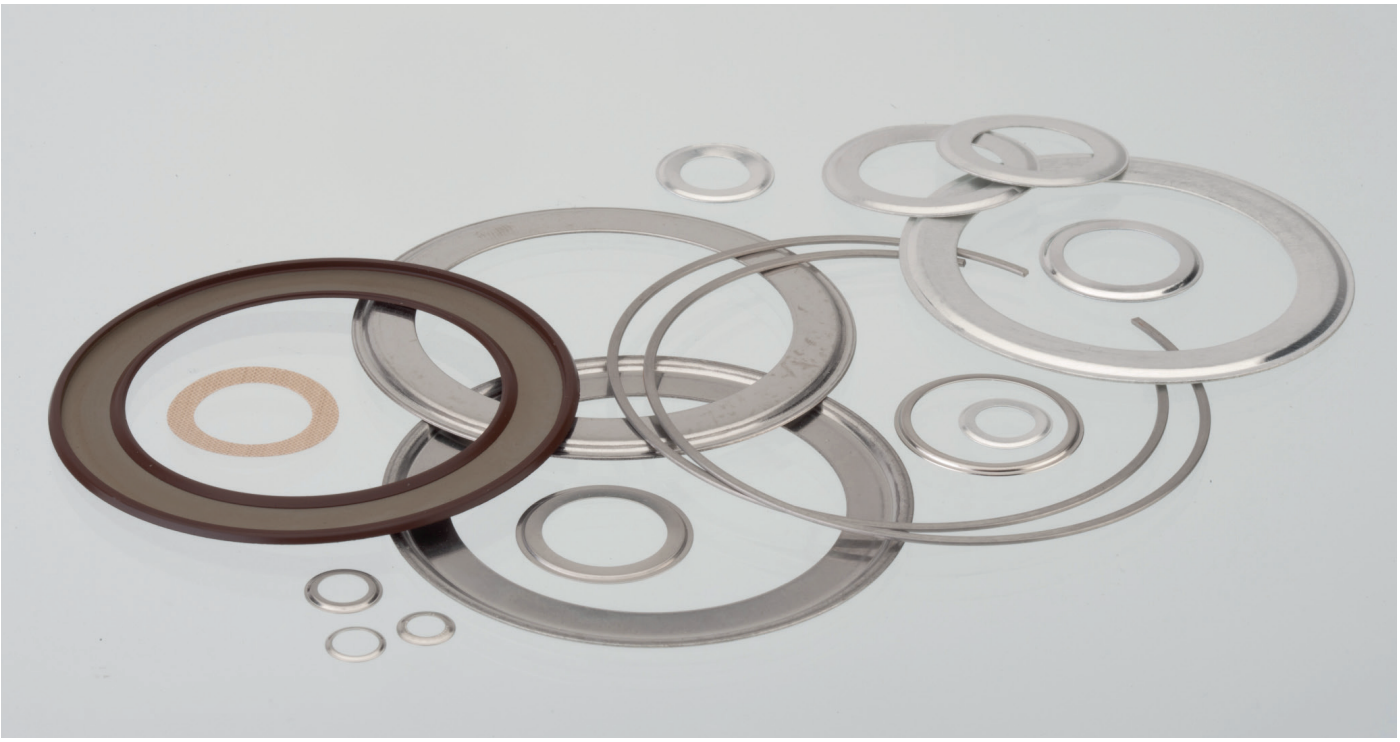
The two basic types of bearing closures are shields and seals, both of which may be ordered as integral components of deep groove bearings.

All closures serve the same purposes with varying effectiveness. They exclude contamination, retain lubricants and protect the bearing from internal damage during handling.

Closures are attached to the outer ring. If they contact the inner ring they are seals. If they clear the inner ring they are shields.

Type	Use	Material	Design	Benefits	Speed (dN Units)	Operating Temp Range	Limitations
SS	Low torque, high speed closure that can provide lubricant retention and limited contamination protection	Stainless steel	Precision stamping, held in place with circlip or pressed in	Maximum lubricant space. Resistance to vibration	Not limited by shield design	up to 315°C	Limited contamination protection
AA	High speed rubber shield that provides improved protection from contamination without reducing speeds	NBR Rubber, Metal Insert	Rubber material bonded to metal stiffener	Good exclusion of contamination without a reduction in operating speed	Not limited by shield design	-30°C to 120°C	Will not prevent ingress of gasses or fluids
UU	Specialised seal suitable for low torque applications	Glass fibre reinforced PTFE	Flat washer held in place with circlip	Low torque positive seal	100,000	-240°C to 300°C	Limited to low speed operation
YY	Where good positive sealing is required at lower speeds	NBR Rubber, Metal Insert	Rubber material bonded to metal stiffener	Excellent positive sealing to prevent the entrance of foreign contaminants	180,000	-30°C to 120°C	Requires relatively low speed operation
VV	Similar to YY seals but used for high temperature operation	FKM Rubber, Metal Insert	Rubber material bonded to metal stiffener	As 'YY' seal with greater chemical resistance and upper temperature range	180,000	-20°C to 230°C	Requires relatively low speed operation

dN definition = Bearing bore in mm x RPM



Bearing Closures

Non-Contact Closures

Because of the proximity with the inner ring land, the ball bearing closure forms an effective gap seal. It neither increases the torque nor influences the maximum speed compared with open ball bearings as the shields do not touch the inner ring. This is sufficient for most applications.

Metal Shields

For the majority of ball bearings, the shields are stamped from stainless steel. They are fastened to the outer ring with a circlip and thus can be removed. Ball bearings can also be fitted with pressed-in shields made of deep drawing steel sheet.

Rubber Closures

The 'AA' closure is made of moulded NBR rubber with a metal stiffener and can be used at temperatures from -30°C to 120°C. This closure is fastened in the outer ring by the rubber border.

Seal with Inner Ring Contact

The ball bearing seals touch the inner ring land. This causes an increase in torque.

Synchroseal

The 'UU' seal is made of glass-fibre reinforced PTFE which is fastened in the outer ring by a circlip. PTFE seals can be used at working temperatures of -240°C to 300°C. They prevent contamination. However, a hermetic seal cannot be achieved.

The torque is lower than for rubber seals due to the favourable low friction combination (PTFE on steel) and the low contact force of the sealing lip.

'UU' seals are universally resistant to chemicals. The ball bearings are normally made of stainless steel, chrome steel can also be provided in appropriately large quantities.

Rubber Seal

The 'YY' seal is made of moulded NBR rubber with metal stiffener and can be used at temperatures of -30°C to 120°C.

The 'VV' seal is made of moulded FKM rubber with a metal stiffener and is suitable for temperatures of -20°C to 230°C. Both seals are fastened in the outer ring by the rubber border.

Please note that certain lubricants cannot be used with rubber. Please consult us directly to discuss difficult operating conditions.

Special Closures

In addition to standard closures we also manufacture special closures and combinations of different closures.

Cages

The material and design of the cage can be selected to suit the application operating conditions. Our two-piece ribbon retainer is sufficient in the majority of cases.

The following table shows the different types:

Code	Picture	Description/Material	Application Range/Purpose
Q[1]		Two-piece ribbon cage made of: Steel sheet Stainless steel sheet Brass sheet	For deep groove ball bearings. For stainless steel ball bearings: cage from stainless steel sheet. This cage can also be clinched loosely to reduce torque. Code W. Please note that whilst a tightly clinched cage is standard, occasionally a riveted variant may be used.
Q[1]		One-piece stainless steel snap type cage.	For deep groove ball bearings. Mainly used for small ball bearings at low and medium speeds.
TMT		One-piece moulded synthetic snap type cage.	For deep groove ball bearings. Good running and torque characteristics for medium speed range. Working temperature -30°C to 80°C (short term 100°C).
TA/THB		Machined one-piece snap type cage made from reinforced phenolic resin.	For high-speed deep groove ball bearings. High rigidity and emergency running characteristics. Working temperature -50°C to 140°C. Can be vacuum impregnated with oil.

1) Where Q is specified in the nomenclature, cage type may be of either crown or ribbon design.

Materials for Rings and Balls

Our ball bearings are made from chrome steel or stainless steel. Typically the bearing rings and balls are of the same base material. Ceramic balls can be used in all versions if required (hybrid ball bearings).

The chrome steel used is high quality, heat treatable and maintains a high level of strength when hardened. Ball bearings made from this kind of steel have an excellent service life at working temperatures up to 120°C.

The stainless steels used are martensitic steels and can be used at working temperatures up to 150°C without noticeable hardness loss. Improvements in steel production and heat treatment allow the load ratings of the chrome steel and the stainless steels to be the same.

The specific grade of steel used may vary between bearing types, the possible grades of stainless and chrome steel are shown in the table below. If you require a specific grade of material please contact us.

Characteristics	Unit	Stainless Steel			30X	Carbon Chrome Steel			Ceramic
		X65Cr13	AISI440C	9Cr18	X30CrMoN15-1	100Cr6	SAE52100	GCr15	Si_3N_4
Density	g/cm³	7.75			7.85	7.85			3.2
Hardness	HRc	>58			>58	>58			>75
E-modulus	GPa	200			218	201			320
Poissons Coefficient	-	0.28			0.3	0.29			0.26
Expansion Coefficient	$X10^{-6}$ 1/°C	10.1			10.1	12.1			2.9
Top Temperature Limit	°C	150			180/450*	120			1000
Corrosion Resistance		Good			Very Good	Poor			Very Good
Electrical Conductivity		Conductor			Conductor	Conductor			Isolator
Magnetism		Magnetic			Magnetic	Magnetic			Not Magnetic

* Temperature dependent on heat treatment process. Contact Engineering Dept. for further details.

Additional heat treatments are available on request for specific customer requirements. Contact Engineering Dept. for further details.

Limiting Speeds

The maximum speed for a ball bearing in operation is limited by various mechanical and kinematic criteria. Narrow tolerances of bearings and surrounding parts, special measures regarding lubrication and type of lubricant as well as special retainer materials and designs generally have a beneficial effect on the speed limit.

The typical values for speed given in the tables only apply to specially set reference conditions. They therefore only give an indication of the relative speed suitability of the ball bearing. Ask our technical support for more information if operating conditions are different.

Functional Test

Functional tests on the assembled bearing include noise and torque tests. These tests ensure the consistency of the production run and guarantee compliance with customer requirements. The functional tests allow the parts to be constantly monitored for good roundness and surface finish.

Noise Test

The abbreviation 'V' given in our numbering system stands for 100% noise-tested ball bearings. We test the amplitude of the vibration generated by the ball bearings at set speeds and frequencies.

Torque Test

Typically starting torque testing is performed on bearings which are intended for low torque applications. For these low torque applications we recommend that bearings are lubricated with an instrument oil with a viscosity of ≤ 14mm²/s at 40°C.

Torque-tested ball bearings are tested under cleanroom conditions in laminar flow cabinets.

The starting torque is the torque required to start the rotation of one ring with the other ring stationary. The measurements made with the tester provide exact and reliable values, generally in accordance with MIL-STD-206A. The torque is tested on a vertical shaft with axial loading.

During the test, the inner ring is driven and the outer ring loaded with the standard load according to the bearing size. In this test the axial loading of the inner ring is 75g for ball bearings with an outside diameter up to 10mm. Ball bearings with a greater outside diameter are tested with a 400gm load.

Due to the lack of generally accepted standard torque, comparisons of bearings of the same type can only be made in identical measuring conditions on the same measuring equipment.

Torque values are measured as standard without closures and bearings lubricated with instrument oil having a viscosity of <=14mm²/s at 40°C. The torque value can be 10 to 40 times greater for ball bearings with grease lubrication.

Lubrication

Selecting the right lubricant type and method is just as important for the bearing function as selecting the bearing itself and designing the mating parts. The decision on a specific lubricant is made according to the operating conditions and the torque demands of the application.

Lubricating Oils

Lubricating oils are mainly used where minimum torque is required.

Code	Brand Name	Manufacturer	Composition	Operating Temperature Range °C		Viscosity (mm²/s)		Specification
				Min	Max	40°C	100°C	
O-11	Winsorlube L245x	Fuchs	Ester	-55	80	12.7	3.6	MIL-PRF-6085D
O-59	Brayco Micronic 815Z	Castrol Inc.	PFPE	-72	204	141.0	44.3	
OJ-201	Aeroshell Fluid 12	Shell	Synthetic Ester	-54	150	12.4	3.2	MIL-PRF-6085D
OJ-257	Klubersynth MZ 4-17	Kluber	Ester/Hydrocarbon Oil	-54	150	18.0	4.0	

Lubricating Greases

Code	Brand Name	Manufacturer	Composition	Operating Temperature Range °C		Viscosity (mm²/s)		Specification
				Min	Max	40°C	100°C	
G-44	Braycote 601EF	Castrol	PFPE/PTFE	-80	204	141.0	44.3	
GJ-204	Aeroshell Grease 7	Shell	Diester/Microgel	-73	149	10.3	3.1	MIL-PRF-23827C (Type II)
GJ-231	Multemp SRL	Kyodo Yushi	Ester/Lithium Soap	-50	150	26.0	5.1	
GJ-248	Tribol GR 100-2 PD	Castrol	Mineral oil/Lithium	-35	140	95.0	9.0	
GJ-372	Multemp SB-M	Kyodo Yushi	Synthetic Hydrocarbon/Diurea	-40	200	47.6	7.9	
GJ-378	Rivolta F.L.G.HF-2	Bremer & Leguil GmbH	Synthetic/Al Complex	-40	140	280.0	35.4	NSF-H1

dN definition = Bearing bore in mm x RPM

We would advise that lubricating greases with EP additives are not suitable for low-noise ball bearings.

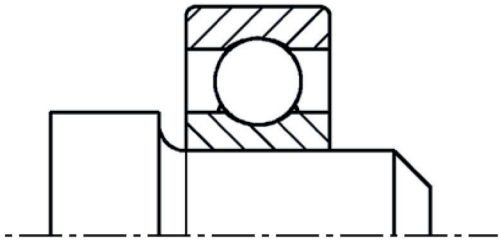
The ball bearings can be lubricated with oils and greases other than those listed in the tables upon request and in quantities agreed upon. We have around 300 lubricants to choose from and can review any specific requirements not already in our portfolio.

Shaft and Housing Shoulders

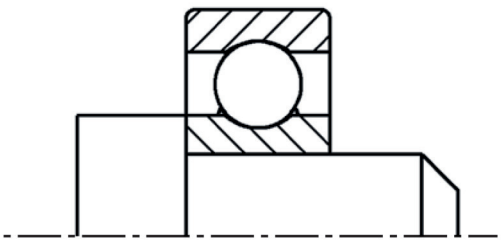
The assembly conditions are very important for all bearings to function correctly. The shoulders for the inner and outer ring should allow the axial load to be transferred safely without allowing the rings to tilt against each other.

The following specifications should be taken into consideration:

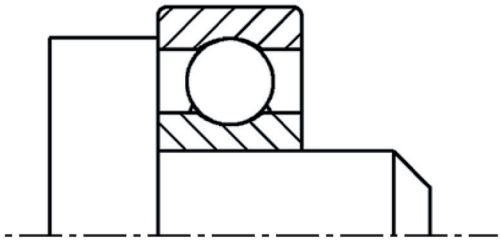
- The radius on the shaft and housing must not be larger than the corner radius r_{min} of the ball bearing. An undercut is preferable here. The edge radii of the ball bearings are not suitable for locating the ball bearing in any way.
- The axial runout of the mating surfaces should not be greater than the maximum axial runout of the ball bearing used. The performance of the ball bearing could otherwise be influenced.



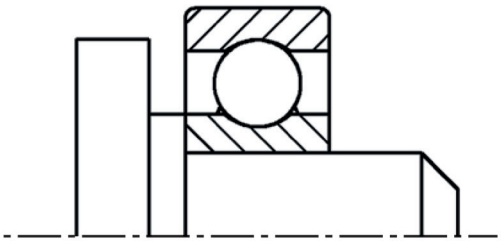
Wrong, shaft radius greater than r_{min}



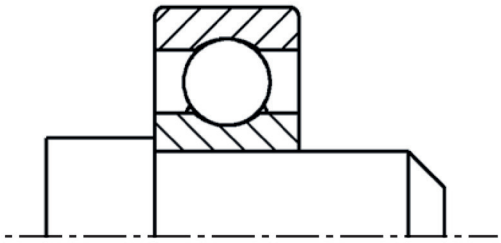
Correct, shaft radius smaller than r_{min}



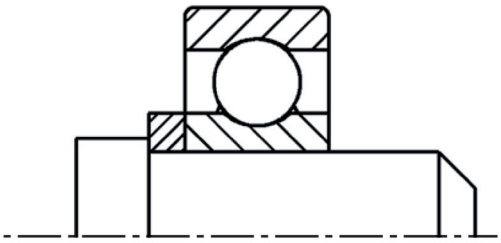
Wrong, shaft shoulder may foul outer ring



Correct, shaft shoulder dia. relieved



Wrong, shaft shoulder dia. insufficient



Correct, back-up ring added

The principles applied in the above diagrams can equally be applied to the bearing housing.

Calibration

In order to achieve a uniform fit of the bearing on the shaft and in the housing it is necessary to limit the diameter tolerances of the bearings. As it is difficult to control very small tolerances in series production, selective grading may be necessary. Only bearings in the quality grades P5 or ABEC5 or better can be graded into groups of 2.5µm (.0001 inch) or 1.25µm (.00005 inch). The diameter of the housings and shafts should be graded to allow matching.

Due to technical reasons, it is not always possible to supply bearings in only one specific group when selecting 4-step coding of 1.25µm groups.

The following symbols are used for the classification of calibrated bearings:

Calibration	In groups of 2.5 µm or .0001 inch	In groups of 1.25 µm or .00005 inch
Bore d and outside diameter D	C	C44
Bore d only	CXO	C40
Outside diameter D only	COX	C04

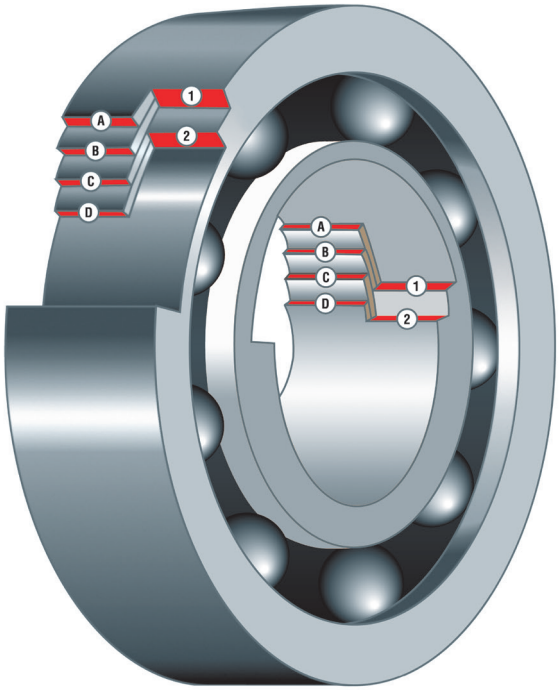
Classification of calibrated ball bearings.

Example:

C40 = bore calibrated in groups of 1.25 µm. The outside diameter is not calibrated.

The relevant group is indicated on the packaging of the bearing, according to the following code:

Bore and OD Specific Calibration Codes (inch)		
Size Tolerance (from nominal)	.00005” Calib.	.0001” Calib.
Nominal to -.00005”	A	1
-.00005” to -.0001”	B	
-.0001” to -.00015”	C	2
-.00015” to -.0002”	D	



This drawing, grossly exaggerated for clarity, illustrates specific calibration options (inch) for bore and OD.

Examples:

Code 21

Bore: -0.0025 to -0.0050 mm
OD: 0 to -0.0025 mm

Code BC

Bore: -0.00125 to -0.0025 mm
OD: -0.0025 to -0.00375 mm

Code A0

Bore: 0 to -0.00125 mm
OD: not calibrated

Code 02

Bore: not calibrated
OD: -0.0025 to -0.005 mm

Method of group classification:

Bore diameter: the smallest measured diameter determines the class.
Outside diameter: the largest measured diameter determines the class.

Duplex Bearings

Duplex bearings are matched bearings which, depending on the requirements, provide the following characteristics:

- Accurate bearing positioning in radial and axial directions, which can vary from defined clearance to controlled rigidity.
- Limitation of systems yield.
- Higher load capacity compared to single bearings.

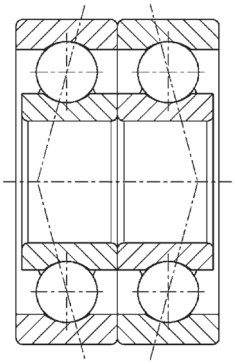
The matching of the bearings is achieved by loading each single bearing with the desired preload and then grinding the inner or outer rings until the surfaces of both rings are flush with each other.

Two of the bearings treated in this manner are assembled according to the diagrams below and loaded axially until the ground faces meet, this repeats the preload previously set in manufacture. Depending on the matching used either the inner rings or the outer rings or possibly both are preloaded against each other.

Unless specified otherwise ball bearings will be supplied with our standard preload level for that size, however this can be altered to suit operating conditions and requirements. The preload should not be set higher than necessary as it will unnecessarily increase the torque. This has a direct influence on the life of the ball bearing.

In order to achieve optimum fit, duplex bearings are always calibrated into two groups on the bore and outside diameter and supplied packaged with the same code. They should also, if possible, be fitted with calibrated shafts and housings (see page 22).

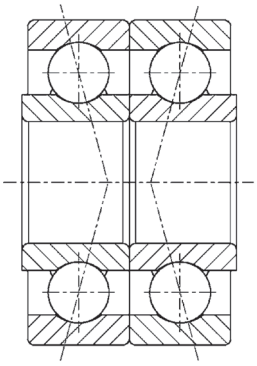
The ball bearing fits should therefore be selected carefully as an interference fit on the inner or outer ring would change the preload.



Back to back (DB)

O arrangement

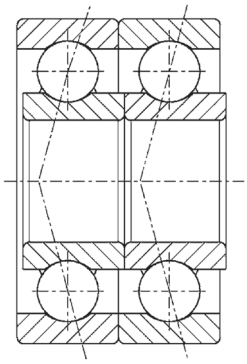
With the ‘back to back’ bearing pair the inner rings are clamped together. The contact angle between the outer ring raceway, ball and inner raceway diverge. This results in a maximum spread giving high rigidity. This is the reason why this type of duplex bearing is most commonly used.



Face to face (DF)

X arrangement

With the “face to face” bearing pair the outer rings are clamped together. The contact lines converge resulting in a smaller spread and more elasticity.



Tandem (DT)

While duplex bearings mounted back to back or face to face are suitable to accommodate axial loading in both directions, a tandem mounted bearing pair can accept a very high axial load in one direction only. With this type of bearing pair, preloading and reduction of play can only be achieved by preloading against another bearing or bearing pair.

HQW Precision GmbH
Wachtelberg 23
97273 Kürnach
Germany

Phone: +49 (0) 9367 98408-0
Email: info@hqw.gmbh
Web: www.hqw.gmbh

HQW Aerospace (UK) Ltd
Plymbridge Road, Estover
Plymouth PL6 7LH
United Kingdom

Phone: +44 (0) 1752 735555
Email: info@hqw-aerospace.com
Web: www.bardenbearings.co.uk

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