

High-Precision Ball Bearings

Spindle Ball Bearings



Contents

Our company	4
GRW quality	5
GRW - Spindle ball bearings	
Tolerance and runout tables – inner ring	6
Tolerance and runout tables – outer ring	8
Designation system of spindle ball bearings	10
Spindle ball bearing program	12
Spindle / angular contact bearings	20
Duplex bearings	21
Installation and configuration of duplex bearings	22
Calibration of bore and outside diameters	24
Packaging	25
Proper handling of GRW high-precision miniature bearings	25
Service	26

Our company

As a global corporation with more than 500 employees, GRW is headquartered in Rimpfing near Würzburg with assembly facilities in Prachatice (Czech Republic) and two direct sales offices in the USA.

GRW is the premier developer and manufacturer of miniature precision ball bearings, assemblies and accessory parts utilizing state of the art equipment and manufacturing processes. We specialise in production of high precision, small, miniature and instrument bearings as well as spindle bearings and bearing units. GRW also welcomes the opportunity to design, develop and produce customised applications using customer specifications.

Our radial ball bearings range in bores from 1 mm to 35 mm with outer diameters from 3 mm to 47 mm meeting any condition from low to high volume standard applications.

GRW bearings are produced in both metric and inch dimensions making them truly applicable to any customer in the world. Whether your application requires high or low quantities or customised specifications, you can always rely upon GRW to meet any requirement or challenge.

GRW complies with the highly recognised standard ISO certification, DIN EN ISO 9001:2008 for quality in process and performance.

GRW quality: Internationally certified DIN EN ISO 9001

GRW is an international enterprise specialising in development and production of high-precision miniature ball bearings. Ensuring our customers' complete satisfaction is our top priority. By continually improving our products and processes, we ensure the long-term success of our company.

To achieve these goals we introduced a management system that evolves with the future requirements of each market. Our corporate strategy, based on growth and innovation, is the basis for a successful partnership with our customers and suppliers.

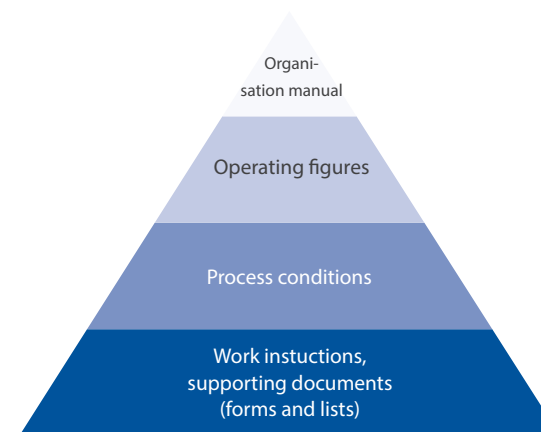
Our integrated management system is based on DIN EN ISO 9001:2008 and is certified in four specific areas:

1. Organisational Manual
2. Key Performance Indicators (KPI)
3. Process Definitions and defined Responsibilities
4. Process Control Documentation (work and test instructions) including supporting documents (e.g. quality checklists, forms)



Headquarter and production site at Rimpfing

We can do even better - just challenge us.
 Our sales engineers will be happy to advise you.
 We are looking forward to your call: +49 (0) 93 65/819 - 482



The Organisational Manual includes a Management section addressing our customers, employees and suppliers. It contains our corporate principles and corporate policy. Special sections contain job descriptions and Key Performance Indicators. These critical areas of measurement contain the controlling documentation for organisational process and product quality as well as continuous improvement.



Tolerance and runout tables – inner ring

GRW bearings conform to the applicable ISO (International Organization for Standardisation) and ABEC standards (Annular Bearing Engineering Committee). For metric size bearings, tolerances comply with ISO

quality P0 to P2 (P2 = highest tolerance). For inch size bearings according to ABEC quality standards ABEC1 to ABEC9 (ABEC9 = highest tolerance).

GRW manufactures miniature ball bearings according to the highest quality standards for both inch and metric sizes.

GRW's sales engineers will be happy to help you choosing the suitable quality for your application, including tolerances of mating parts, such as shafts and housings, to create a bearing friendly environment.

Definition:	Diameter series	d [mm]		P0 [µm]		P6 [µm]		P5 [µm]		P4 [µm]		P2 [µm]		P5A ⁽⁴⁾ [µm]		P4A ⁽⁴⁾ [µm]		P4S ⁽⁵⁾ [µm]		ABEC1 [.0001 inch]		ABEC3 [.0001 inch]		ABEC5 [.0001 inch]		ABEC7 [.0001 inch]		ABEC9 [.0001 inch]		ABEC3P [.0001 inch]		ABEC5P [.0001 inch]		ABEC7P [.0001 inch]		ABEC9P [.0001 inch]		ABEC5T ⁽⁶⁾ [.0001 inch]					
		above	to	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.						
				max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.						
Single plane mean bore diameter deviation	Δdmp	0,6	18	0	-8	0	-7	0	-5	0	-4	0	-2,5	0	-5	0	-4	0	-4		0	-3	0	-3	0	-2	0	-1,5	0	-1	0	-2	0	-2	0	-2	0	-1	0	-2			
		18	30	0	-10	0	-8	0	-6	0	-5	0	-2,5	0	-6	0	-5	0	-5		0	-4	0	-3	0	-2,5	0	-2	0	-1	0	-2	0	-2	0	-2	0	-1	0	-2			
		30	50	0	-12	0	-10	0	-8	0	-6	0	-2,5					0	-6		0	-4,5	0	-4	0	-3	0	-2,5	0	-1									0	-3			
Bore diameter variation in a single radial plane (out of roundness)	7/8/9	0,6	18	10		9		5		4		2,5		3		2,5		2,5																									
		18	30	13		10		6		5		2,5		3		2,5		2,5																									
		30	50	15		13		8		6		2,5						2,5																									
	0	0,6	18	8		7		4		3		2,5		3		2,5		2,5																									
		18	30	10		8		5		4		2,5		3		2,5		2,5																									
		30	50	12		10		6		5		2,5						2,5																									
2/3	0,6	18	6		5		4		3		2,5		3		2,5		2,5																										
	18	30	8		6		5		4		2,5		3		2,5		2,5																										
	30	50	9		8		6		5		2,5						2,5																										
Mean bore diameter variation (conicity)	Vdmp	0,6	18	6		5		3		2		1,5		3		2		1,5																									
		18	30	8		6		3		2,5		1,5		3		2,5		1,5																									
		30	50	9		8		4		3		1,5						1,5																									
Variation of a single inner ring width from nominal dimension	ΔBs ⁽¹⁾	0,6	2,5	0	-40	0	-40	0	-40	0	-40	0	-40	0	-25	0	-25	0	-100																								
		0,6	10																																								
		2,5	10	0	-120	0	-120	0	-40	0	-40	0	-40	0	-25	0	-25	0	-100																								
		10	18	0	-120	0	-120	0	-80	0	-80	0	-80	0	-25	0	-25	0	-100																								
		18	30	0	-120	0	-120	0	-120	0	-120	0	-120	0	-25	0	-25	0	-120																								
Variation in width of the inner ring	VBs	0,6	2,5	12		12		5		2,5		1,5						1,5																									
		0,6	10																																								
		2,5	10	15		15		5		2,5		1,5		5		2,5		1,5																									
		10	18	20		20		5		2,5		1,5		5		2,5		1,5																									
		18	30	20		20		5		2,5		1,5		5		2,5		1,5																									
Radial runout of inner ring in assembled bearing (dynamic imbalance)	Kia	0,6	2,5	10		5		4		2,5		1,5		3,5		2,5		1,5																									
		2,5	10	10		6		4		2,5		1,5		3,5		2,5		1,5																									
		10	18	10		7		4		2,5		1,5		3,5		2,5		1,5																									
		18	30	13		8		4		3		2,5		3,5		3		2,5																									
		30	50	15		10		5		4		2,5						2,5																									
Face runout with bore (lateral runout)	Sd	0,6	18					7		3		1,5		7		3		1,5																									
		18	30					8		4		1,5		8		4		1,5																									
		30	50					8		4		1,5						1,5																									
Assembled bearing inner ring face runout with raceway (axial runout)	Sia	0,6	18					7		3		1,5		7		3		1,5																									
		18	30					8		4		2,5		8		4		2,5																									
		30	50					8		4		2,5						2,5																									

Subject to change due to technical improvement.

⁽¹⁾ Tolerance for matched bearings is 0/-200 µm

⁽²⁾ Applicable before assembly of bearing and after removal of the inner and/ or outer circlips

⁽³⁾ For flanged ball bearings the inner side of the flange

⁽⁴⁾ For deep groove radial bearings only

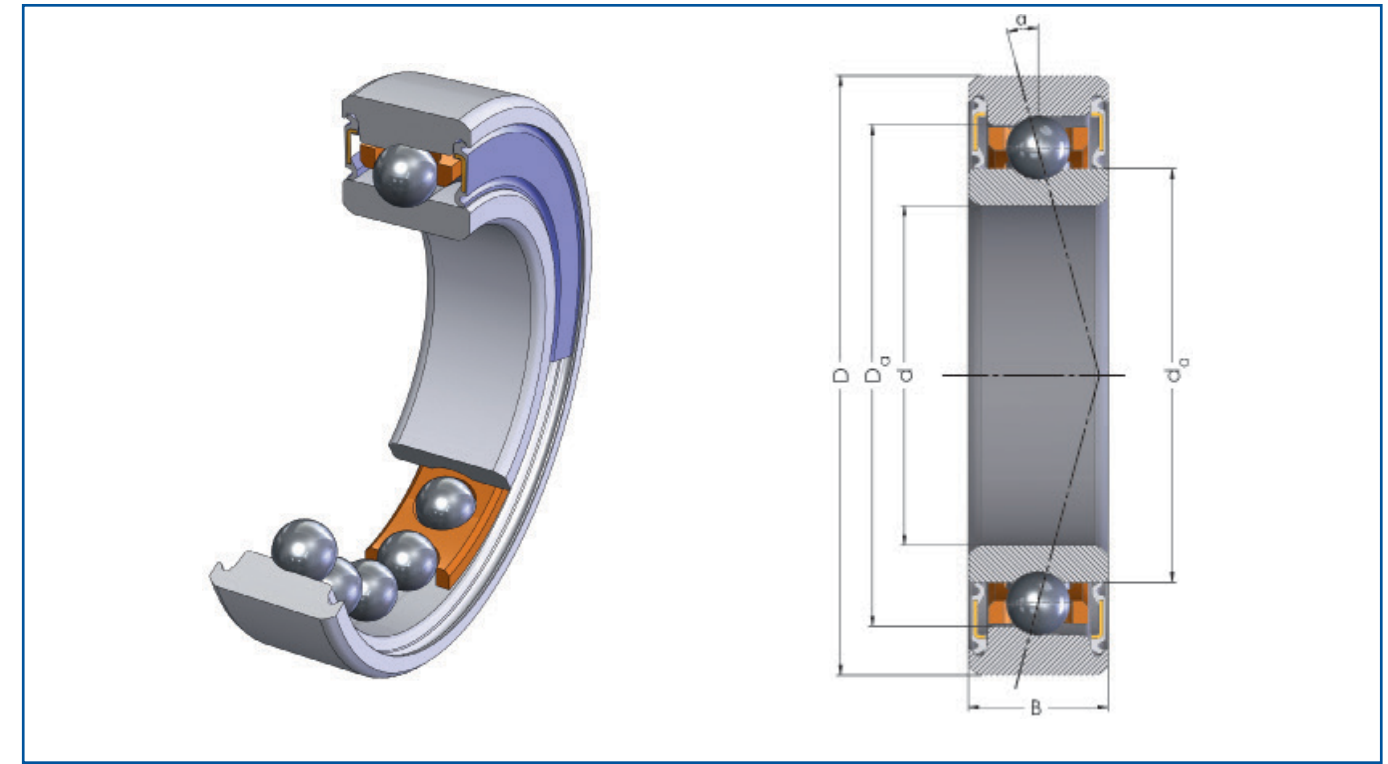
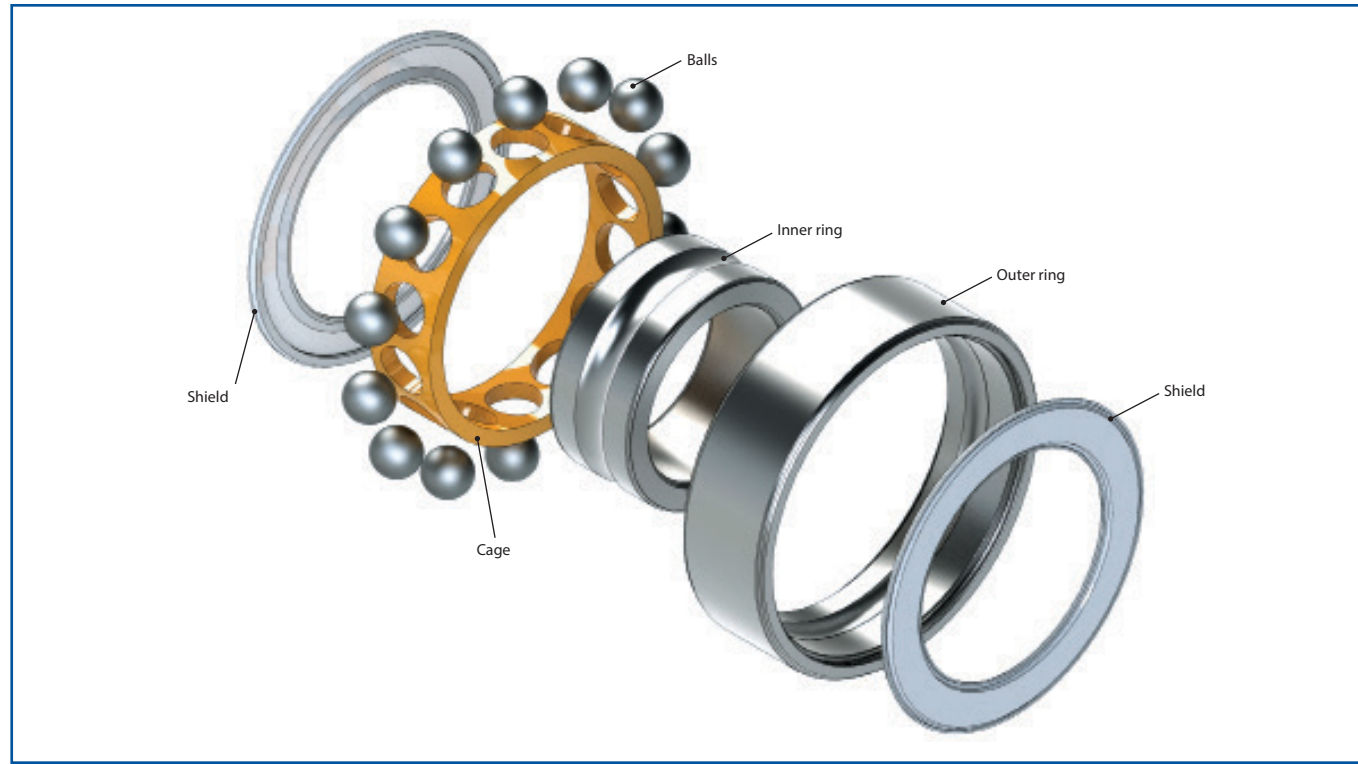
⁽⁵⁾ For spindle ball bearings only

⁽⁶⁾ Nominal value for bores of 9 mm and bigger

Tolerance and runout tables – outer ring

Definition:	Diameter series	D [mm]		P0 [µm]		P6 [µm]		P5 [µm]		P4 [µm]		P2 [µm]		P5A ⁽⁴⁾ [µm]		P4A ⁽⁴⁾ [µm]		P4S ⁽⁵⁾ [µm]		ABEC1 [.0001 inch]		ABEC3 [.0001 inch]		ABEC5 [.0001 inch]		ABEC7 [.0001 inch]		ABEC9 [.0001 inch]		ABEC3P [.0001 inch]		ABEC5P [.0001 inch]		ABEC7P [.0001 inch]		ABEC9P [.0001 inch]		ABEC5T ⁽⁶⁾ [.0001 inch]			
		above	to	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.		
Single plane mean outside diameter deviation	ΔDmp	2,5	18	0	-8	0	-7	0	-5	0	-4	0	-2,5	0	-5	0	-4	0	-4		0	-3	0	-3	0	-2	0	-2	0	-1	0	-3	0	-2	0	-2	0	-1	0	-2	
		18	30	0	-9	0	-8	0	-6	0	-5	0	-4	0	-6	0	-5	0	-5		0	-4	0	-3	0	-2	0	-2	0	-1,5	0	-3	0	-2	0	-2	0	-1,5	0	-2	
		30	50	0	-11	0	-9	0	-7	0	-6	0	-4	0	-7	0	-6	0	-6		0	-5	0	-4	0	-3	0	-2,5	0	-1,5	0	-3	0	-2	0	-2	0	-1,5	0	-4	
		50	80	0	-13	0	-11	0	-9	0	-7	0	-4					0	-7		0	-5	0	-4,5	0	-3,5	0	-3	0	-1,5					0	-2			0	-4	
Outside diameter variation in a single radial plane (out of roundness)	7/8/9	2,5	18	10		9		5		4	2,5		3		2,5		2,5																								
		18	30	12		10		6		5	4		3		2,5		4																								
		30	50	14		11		7		6	4		3		2,5		4																								
		50	80	16		14		9		7	4		3		2,5		4																								
	0	2,5	18	8		7		4		3	2,5		3		2,5		2,5																								
		18	30	9		8		5		4	4		3		2,5		4																								
		30	50	11		9		5		5	4		3		2,5		4																								
		50	80	13		11		7		5	4		3		2,5		4																								
2/3	2,5	18	6		5		4		3	2,5		3		2,5		2,5																									
	18	30	7		6		5		4	4		3		2,5		4																									
	30	50	8		7		5		5	4		3		2,5		4																									
	50	80	10		8		7		5	4		3		2,5		4																									
Mean outside diameter variation (conicity)	VDmp ⁽²⁾	2,5	18	6		5		3		2	1,5		3		2		1,5																								
		18	30	7		6		3		2,5	2		3		2,5		2																								
		30	50	8		7		4		3	2		4		3		2																								
		50	80	10		8		5		3,5	2						2																								
Variation of a single outer ring width from nominal dimension	ΔCs ⁽¹⁾	2,5	18	identical with ΔBs for inner ring of the same bearing						0	-25	0	-25	0	-120						0	-50	0	-50	0	-50	0	-50	0	-50	0	-50	0	-10	0	-10	0	-10	0	-10	
		18	30	identical with ΔBs for inner ring of the same bearing						0	-25	0	-25	0	-120						0	-50	0	-50	0	-50	0	-50	0	-50	0	-50	0	-10	0	-10	0	-10	0	-10	
		30	50	identical with ΔBs for inner ring of the same bearing						0	-25	0	-25	0	-120						0	-50	0	-50	0	-50	0	-50	0	-50	0	-50	0	-10	0	-10	0	-10	0	-10	
		50	80	identical with ΔBs for inner ring of the same bearing						0	-25	0	-25	0	-150						0	-60	0	-60	0	-60	0	-60	0	-60	0	-60	0	-10	0	-10	0	-10	0	-50	
Variation in width	VCs	2,5	18	identical with VBs for inner ring of the same bearing						5		2,5		1,5							8		8		2		1		.5						2		1		.5		2
		18	30	identical with VBs for inner ring of the same bearing						5		2,5		1,5						8		8		2		1		.5						2		1		.5		2	
		30	50	identical with VBs for inner ring of the same bearing						5		2,5		1,5						10		10		2,5		1		.5						2		1		.5		2	
		50	80	identical with VBs for inner ring of the same bearing						5		2,5		1,5						10		10		2,5		1		.5						2		1		.5		2	
Radial runout of outer ring in assembled bearing (dynamic imbalance)	Kea	2,5	18	15		8		5		3	1,5		5		3		1,5			6		4		2		1,5		.5		4		2		1,5		.5		2			
		18	30	15		9		6		4	2,5		6		4		2,5			6		4		2		1,5		1		4		2		1,5		1		2			
		30	50	20		10		7		5	2,5		7		5		2,5			8		4		3		2		1		4		2		2		1		3			
		50	80	25		13		8		5	4		7		5		4			10		5		3		2		1,5				4		2		2		1,5		3	
Variation of outside surface generatrix inclination with face ⁽³⁾ (lateral runout)	SD	2,5	80							8		4	1,5		8		4		1,5				3		1,5		.5				3		1,5		.5		3				
										8		5	1,5		8		5		1,5					3		2		.5				3		2		.5		3			
Assembled bearing outer ring face flange back face runout with raceway (axial runout)	Sea	2,5	18							8		5	1,5		8		5		1,5					3		2		.5				3		2		.5		3			
		18	30							8		5	2,5		8		5		2,5					3		2		1				3		2		1		3			
		30	50							8		5	2,5		8		5		2,5					3		2		1				3		2		1		3			
		50	80							10		5	4		8		5		4					5		2		1,5				3		2		1,5		4			
Assembled bearing outer ring face flange back face runout in the assembled bearing	Sea1	2,5	18							11		7	3		10		7															3		3							
		18	30							11		7	4		10		7														3		3								
		30	50							11		7	4		10		7														3		3								
		50	80							11		7	4		10		7														3		3								
Variation of a single outside diameter of outer ring. Flange diameter is used for positioning	ΔFD	2,5	10	0	-36	0	-36	0	-36	0	-36	0	-36	0	-25	0	-25																								
		10	18	0	-43	0	-43	0	-43	0	-43	0	-43	0	-25	0	-25																								
		18	30	0	-52	0	-52	0	-52	0	-52	0	-52	0	-25	0	-25																								
		30	50	0	-62	0	-62	0	-62	0	-62	0	-62	0	-25	0	-25																								
Variation of a single width outer ring flange from nominal dimension	ΔFB	2,5	10	0	-120	0	-120	0	-40	0	-40	0	-40	0	-40	0	-40																								
		10	18	0	-120	0	-120	0	-80	0	-80	0	-80	0	-50	0	-50																								
		18	30	0	-120	0	-120	0	-120	0	-120	0	-120	0	-50	0	-50																								
		30	50	0	-120	0	-120	0	-120	0	-120	0	-120	0	-50	0																									

Designation system of spindle ball bearings



Ball material	Material	Basic Symbol	Closure	Contact angle	Tolerance class
-	-	705	-	C	P4
HY	SS	7000	-Z	E	P4S
ZO	SV	795	-2Z	D = ... °	
		7900	-VZ		
		705B	-2VZ		
			-TZF		
			-2TZF		
- steel balls	- 100Cr6	70.. Series 10	- open ball bearing	C 15°	P4 acc. to DIN 620-2
HY ceramic balls made of Si ₃ N ₄	SS X65Cr13	79.. Series 19	-Z one metal shield	E 25°	P4S dimension accuracy P4, running accuracy P2, acc. to DIN 620-2
ZO ceramic balls made of ZrO ₂	SV X30CrMoN15-1 Standard	705B Modified internal design	-2Z two metal shields	other contact angles available on request, e.g. D = 20°	
			-VZ one Viton shield		
			-2VZ two Viton shields		
			All Variants are non-contact closures		

Retainer design	Diameter grading	Duplexing type	Preload value	Lubricant quantity	Lubricants
TA	-	-	-	-	-
TB	X	U	L	... %	L...
AC2TA	XB	DB	M		G...
L2TA	XD	DF	S		L299
	X4	DT	/X		
	X4B				
	X4D				
TA solid retainer made of fiber-reinforced phenolic resin guided by outer ring	- without diameter grading	- single bearing not duplexed	- without preload	- Standard grease quantity 20 % of free bearing volume with spindle bearing	- open bearings are preserved with oil L001, closed bearings are greased with 20% grease
TB same as TA, guided by inner ring	X bore and outside diameter graded in 2 classes	U universally duplexed	L light	... % adjusted lubricant quantity in [%] of free bearing volume	
TXA other retainer materials available on request	XB bore graded in 2 classes	Bearing pair:	M medium		
-TA angular contact shoulder on outer ring (standard)	XD outside diameter graded in 2 classes	DB 2 bearings in O-arrangement	S heavy/strong	/X preload value in [N], if other than L, M, S.	L... Oil
-TB angular contact shoulder on inner ring	X4 bore and outside diameter graded in 4 classes	DF 2 bearings in X-arrangement		Example: Spindle ball bearing U/10 (= universally paired with 10 N preload)	G... Grease
AC2 angular contact shoulder on inner ring	X4B bore graded in 4 classes	DT 2 bearings in Tandem arrangement			L299 dry bearing
L2TA inner ring can be dismantled, solid retainer keeps the balls	X4D outside diameter graded in 4 classes				

Spindle ball bearings

GRW designation	Main dimensions in [mm] [inch]			Load ratings acc. to DIN ISO		Ball set		Limiting speeds*		Preload		
	d	D	B	C _{0r} [N]	C _r [N]	Z	Dw [mm] [inch]	Oil [min ⁻¹]	Grease [min ⁻¹]	(L) light [N]	(M) medium [N]	(S) heavy [N]
AC bearings, open, metric												
SV723 C TA	3,00 .1181	10,00 .3937	4,00 .1575	170	506	8	1,588 .0625	254000	209000	5	8	16
HYSV723 C TA	3,00 .1181	10,00 .3937	4,00 .1575	119	506	8	1,588 .0625	373000	269000	5	8	16
SV774 C TA	4,00 .1575	7,00 .2756	2,00 .0787	77	223	10	1,000 .0394	309000	255000	5	7	10
HYSV774 C TA	4,00 .1575	7,00 .2756	2,00 .0787	54	223	10	1,000 .0394	455000	327000	5	7	10
SV724 C TA	4,00 .1575	13,00 .5118	5,00 .1969	364	1037	8	2,381 .0937	195000	161000	5	16	32
HYSV724 C TA	4,00 .1575	13,00 .5118	5,00 .1969	255	1037	8	2,381 .0937	287000	206000	5	16	32
SV734 C TA	4,00 .1575	16,00 .6299	5,00 .1969	721	1594	9	2,500 .0984	157000	130000	8	24	49
HYSV734 C TA	4,00 .1575	16,00 .6299	5,00 .1969	504	1594	9	2,500 .0984	231000	167000	8	24	49
SV725 C TA	5,00 .1969	16,00 .6299	5,00 .1969	721	1594	9	2,500 .0984	157000	130000	8	24	49
HYSV725 C TA	5,00 .1969	16,00 .6299	5,00 .1969	504	1594	9	2,500 .0984	231000	167000	8	24	49
SV735 C TA	5,00 .1969	19,00 .7480	6,00 .2362	1277	2612	10	3,175 .1250	127000	105000	13	40	80
HYSV735 C TA	5,00 .1969	19,00 .7480	6,00 .2362	894	2612	10	3,175 .1250	187000	135000	13	40	80
SV786 C TA	6,00 .2362	13,00 .5118	3,50 .1378	354	895	10	1,984 .0781	175000	144000	5	14	28
HYSV786 C TA	6,00 .2362	13,00 .5118	3,50 .1378	247	895	10	1,984 .0781	258000	186000	5	14	28
SV786 E TA	6,00 .2362	13,00 .5118	3,50 .1378	332	856	10	1,984 .0781	149000	123000	5	14	28
HYSV786 E TA	6,00 .2362	13,00 .5118	3,50 .1378	232	856	10	1,984 .0781	219000	158000	5	14	28
SV786/001 C TA	6,00 .2362	13,00 .5118	5,00 .1969	354	895	10	1,984 .0781	175000	144000	5	14	28
HYSV786/001 C TA	6,00 .2362	13,00 .5118	5,00 .1969	247	895	10	1,984 .0781	258000	186000	5	14	28
SV726 C TA	6,00 .2362	19,00 .7480	6,00 .2362	1277	2612	10	3,175 .1250	127000	105000	13	40	80
HYSV726 C TA	6,00 .2362	19,00 .7480	6,00 .2362	894	2612	10	3,175 .1250	187000	135000	13	40	80
SV707 C TA	7,00 .2756	19,00 .7480	6,00 .2362	1277	2612	10	3,175 .1250	127000	105000	13	40	80
HYSV707 C TA	7,00 .2756	19,00 .7480	6,00 .2362	894	2612	10	3,175 .1250	187000	135000	13	40	80
SV727 C TA	7,00 .2756	22,00 .8661	7,00 .2756	1693	3511	9	3,969 .1563	116000	95000	18	54	108
HYSV727 C TA	7,00 .2756	22,00 .8661	7,00 .2756	1185	3511	9	3,969 .1563	170000	122000	18	54	108
SV788 C TA	8,00 .3150	16,00 .6299	4,00 .1575	569	1377	10	2,500 .0984	142000	117000	7	21	42

GRW designation	Main dimensions in [mm] [inch]			Load ratings acc. to DIN ISO		Ball set		Limiting speeds*		Preload		
	d	D	B	C _{0r} [N]	C _r [N]	Z	Dw [mm] [inch]	Oil [min ⁻¹]	Grease [min ⁻¹]	(L) light [N]	(M) medium [N]	(S) heavy [N]
AC bearings, open, metric												
HYSV788 C TA	8,00 .3150	16,00 .6299	4,00 .1575	398	1377	10	2,500 .0984	208000	150000	7	21	42
SV788 E TA	8,00 .3150	16,00 .6299	4,00 .1575	534	1317	10	2,500 .0984	120000	99000	7	21	42
HYSV788 E TA	8,00 .3150	16,00 .6299	4,00 .1575	374	1317	10	2,500 .0984	177000	128000	7	21	42
SV798 C TA	8,00 .3150	19,00 .7480	6,00 .2362	593	1468	11	2,500 .1563	154000	123000	8	23	45
HYSV798 C TA	8,00 .3150	19,00 .7480	6,00 .2362	415	1468	11	2,500 .1563	231000	154000	8	23	45
SV708 C TA	8,00 .3150	22,00 .8661	7,00 .2756	1693	3511	9	3,969 .1563	116000	95000	18	54	108
HYSV708 C TA	8,00 .3150	22,00 .8661	7,00 .2756	1185	3511	9	3,969 .1563	170000	122000	18	54	108
SV708 E TA	8,00 .3150	22,00 .8661	7,00 .2756	1589	3358	9	3,969 .1563	98000	81000	18	54	108
HYSV708 E TA	8,00 .3150	22,00 .8661	7,00 .2756	1112	3358	9	3,969 .1563	145000	104000	18	54	108
SV789 C TA	9,00 .3543	17,00 .6693	4,00 .1575	642	1471	11	2,500 .0984	131000	108000	8	23	45
HYSV789 C TA	9,00 .3543	17,00 .6693	4,00 .1575	450	1471	11	2,500 .0984	192000	138000	8	23	45
SV709 C TA	9,00 .3543	24,00 .9449	7,00 .2756	1974	3844	10	3,969 .1563	105000	86000	20	59	118
HYSV709 C TA	9,00 .3543	24,00 .9449	7,00 .2756	1382	3844	10	3,969 .1563	154000	111000	20	59	118
SV729 C TA	9,00 .3543	26,00 1.0236	8,00 .3150	2737	5137	10	4,763 .1875	94000	78000	26	79	158
HYSV729 C TA	9,00 .3543	26,00 1.0236	8,00 .3150	1916	5137	10	4,763 .1875	139000	100000	26	79	158
SV780 C TA	10,00 .3937	19,00 .7480	5,00 .1969	724	1556	12	2,500 .0984	117000	97000	8	24	48
HYSV780 C TA	10,00 .3937	19,00 .7480	5,00 .1969	507	1556	12	2,500 .0984	172000	124000	8	24	48
SV780 E TA	10,00 .3937	19,00 .7480	5,00 .1969	680	1488	12	2,500 .0984	100000	82000	8	24	48
HYSV780 E TA	10,00 .3937	19,00 .7480	5,00 .1969	476	1488	12	2,500 .0984	147000	106000	8	24	48
SV790 C TA	10,00 .3937	22,00 .8661	6,00 .2362	1500	2824	11	3,175 .1250	107000	88000	15	44	88
HYSV790 C TA	10,00 .3937	22,00 .8661	6,00 .2362	1050	2824	11	3,175 .1250	157000	113000	15	44	88
SV7900A E TA	10,00 .3937	22,00 .8661	6,00 .2362	1407	2700	11	3,175 .1250	90000	74000	15	44	88
HYSV7900A E TA	10,00 .3937	22,00 .8661	6,00 .2362	985	2700	11	3,175 .1250	133000	96000	15	44	88

* The indicated speed limits are guide values for spring-loaded single bearings with low load; depending on the respective application, higher or lower speed limits may apply in practice.

** For use with oil lubrication, these bearings are also available without shields. Subject to change due to technical improvement. Other types on request!

Spindle ball bearings

GRW designation	Main dimensions in [mm] [inch]			Load ratings acc. to DIN ISO		Ball set		Limiting speeds*		Preload		
	d	D	B	C _{0r} [N]	C _r [N]	Z	Dw [mm] [inch]	Oil [min ⁻¹]	Grease [min ⁻¹]	(L) light [N]	(M) medium [N]	(S) heavy [N]

AC bearings, open, metric

SV7000 C TA	10,00 .3937	26,00 1.0236	8,00 .3150	2737	5137	10	4,763 .1875	94000	78000	26	79	158
HYSV7000 C TA	10,00 .3937	26,00 1.0236	8,00 .3150	1916	5137	10	4,763 .1875	139000	100000	26	79	158
SV7000 E TA	10,00 .3937	26,00 1.0236	8,00 .3150	2568	4913	10	4,763 .1875	80000	66000	26	79	158
HYSV7000 E TA	10,00 .3937	26,00 1.0236	8,00 .3150	1798	4913	10	4,763 .1875	118000	85000	26	79	158
SV7200 C TA	10,00 .3937	30,00 1.1811	9,00 .3543	3192	5597	11	4,763 .1875	83000	68000	29	86	172
HYSV7200 C TA	10,00 .3937	30,00 1.1811	9,00 .3543	2235	5597	11	4,763 .1875	122000	88000	29	86	172
SV7200 E TA	10,00 .3937	30,00 1.1811	9,00 .3543	2995	5353	11	4,763 .1875	71000	58000	29	86	172
HYSV7200 E TA	10,00 .3937	30,00 1.1811	9,00 .3543	2097	5353	11	4,763 .1875	104000	75000	29	86	172
SV7801 C TA	12,00 .4724	21,00 .8268	5,00 .1969	794	1543	14	2,381 .0937	103000	84000	8	24	48
HYSV7801 C TA	12,00 .4724	21,00 .8268	5,00 .1969	556	1543	14	2,381 .0937	151000	109000	8	24	48
SV7801 E TA	12,00 .4724	21,00 .8268	5,00 .1969	745	1476	14	2,381 .0937	87000	72000	8	24	48
HYSV7801 E TA	12,00 .4724	21,00 .8268	5,00 .1969	521	1476	14	2,381 .0937	128000	92000	8	24	48
SV7901 C TA	12,00 .4724	24,00 .9449	6,00 .2362	1700	2992	12	3,175 .1250	94000	78000	15	46	92
HYSV7901 C TA	12,00 .4724	24,00 .9449	6,00 .2362	1190	2992	12	3,175 .1250	139000	100000	15	46	92
SV7901 E TA	12,00 .4724	24,00 .9449	6,00 .2362	1595	2861	12	3,175 .1250	80000	66000	15	46	92
HYSV7901 E TA	12,00 .4724	24,00 .9449	6,00 .2362	1117	2861	12	3,175 .1250	118000	85000	15	46	92
SV7001 C TA	12,00 .4724	28,00 1.1024	8,00 .3150	2590	4423	12	3,969 .1563	82000	68000	23	68	136
HYSV7001 C TA	12,00 .4724	28,00 1.1024	8,00 .3150	1813	4423	12	3,969 .1563	121000	87000	23	68	136
SV7001 E TA	12,00 .4724	28,00 1.1024	8,00 .3150	2430	4230	12	3,969 .1563	70000	58000	23	68	136
HYSV7001 E TA	12,00 .4724	28,00 1.1024	8,00 .3150	1701	4230	12	3,969 .1563	103000	74000	23	68	136
SV7201C C TA	12,00 .4724	32,00 1.2598	10,00 .3937	3806	7652	9	5,953 .2344	77000	64000	39	118	235
HYSV7201C C TA	12,00 .4724	32,00 1.2598	10,00 .3937	2664	7652	9	5,953 .2344	114000	82000	39	118	235
SV7201C E TA	12,00 .4724	32,00 1.2598	10,00 .3937	3571	7318	9	5,953 .2344	66000	54000	39	118	235
HYSV7201C E TA	12,00 .4724	32,00 1.2598	10,00 .3937	2500	7318	9	5,953 .2344	97000	70000	39	118	235
SV7802 C TA	15,00 .5906	24,00 .9449	5,00 .1969	1054	1784	18	2,381 .0937	87000	72000	9	27	55

GRW designation	Main dimensions in [mm] [inch]			Load ratings acc. to DIN ISO		Ball set		Limiting speeds*		Preload		
	d	D	B	C _{0r} [N]	C _r [N]	Z	Dw [mm] [inch]	Oil [min ⁻¹]	Grease [min ⁻¹]	(L) light [N]	(M) medium [N]	(S) heavy [N]

AC bearings, open, metric

HYSV7802 C TA	15,00 .5906	24,00 .9449	5,00 .1969	738	1784	18	2,381 .0937	128000	92000	9	27	55
SV7802 E TA	15,00 .5906	24,00 .9449	5,00 .1969	989	1706	18	2,381 .0937	74000	61000	9	27	55
HYSV7802 E TA	15,00 .5906	24,00 .9449	5,00 .1969	692	1706	18	2,381 .0937	109000	78000	9	27	55
SV7902 C TA	15,00 .5906	28,00 1.1024	7,00 .2756	2841	4666	13	3,969 .1563	79000	65000	24	72	143
HYSV7902 C TA	15,00 .5906	28,00 1.1024	7,00 .2756	1989	4666	13	3,969 .1563	116000	84000	24	72	143
SV7902 E TA	15,00 .5906	28,00 1.1024	7,00 .2756	2665	4463	13	3,969 .1563	67000	55000	24	72	143
HYSV7902 E TA	15,00 .5906	28,00 1.1024	7,00 .2756	1866	4463	13	3,969 .1563	99000	71000	24	72	143
SV7002 C TA	15,00 .5906	32,00 1.2598	9,00 .3543	3970	6327	13	4,763 .1875	72000	60000	32	97	194
HYSV7002 C TA	15,00 .5906	32,00 1.2598	9,00 .3543	2779	6327	13	4,763 .1875	106000	77000	32	97	194
SV7002 E TA	15,00 .5906	32,00 1.2598	9,00 .3543	3725	6051	13	4,763 .1875	62000	51000	32	97	194
HYSV7002 E TA	15,00 .5906	32,00 1.2598	9,00 .3543	2607	6051	13	4,763 .1875	90000	65000	32	97	194
SV7202 C TA	15,00 .5906	35,00 1.3780	11,00 .4331	4090	6970	13	4,763 .1875	97000	63000	30	60	120
SV7202 E TA	15,00 .5906	35,00 1.3780	11,00 .4331	3930	6650	13	4,763 .1875	85000	55000	45	90	180
SV7803 C TA	17,00 .6693	26,00 1.0236	5,00 .1969	1071	1754	18	2,381 .0937	79000	65000	9	27	54
HYSV7803 C TA	17,00 .6693	26,00 1.0236	5,00 .1969	750	1754	18	2,381 .0937	116000	84000	9	27	54
SV7803 E TA	17,00 .6693	26,00 1.0236	5,00 .1969	1005	1677	18	2,381 .0937	67000	55000	9	27	54
HYSV7803 E TA	17,00 .6693	26,00 1.0236	5,00 .1969	704	1677	18	2,381 .0937	99000	71000	9	27	54
SV7903 C TA	17,00 .6693	30,00 1.1811	7,00 .2756	3137	4888	14	3,969 .1563	72000	60000	25	75	150
HYSV7903 C TA	17,00 .6693	30,00 1.1811	7,00 .2756	2196	4888	14	3,969 .1563	106000	77000	25	75	150
SV7903 E TA	17,00 .6693	30,00 1.1811	7,00 .2756	2944	4675	14	3,969 .1563	61000	51000	25	75	150
HYSV7903 E TA	17,00 .6693	30,00 1.1811	7,00 .2756	2061	4675	14	3,969 .1563	90000	65000	25	75	150
SV7003 C TA	17,00 .6693	35,00 1.3780	10,00 .3937	4571	6817	14	4,763 .1875	65000	54000	34	102	205
HYSV7003 C TA	17,00 .6693	35,00 1.3780	10,00 .3937	3200	6817	14	4,763 .1875	96000	69000	34	102	205

* The indicated speed limits are guide values for spring-loaded single bearings with low load; depending on the respective application, higher or lower speed limits may apply in practice.

** For use with oil lubrication, these bearings are also available without shields. Subject to change due to technical improvement. Other types on request!

Spindle ball bearings

GRW designation	Main dimensions in [mm] [inch]			Load ratings acc. to DIN ISO		Ball set	Limiting speeds*	Preload				
	d	D	B	C _{0r} [N]	C _r [N]			(L) light [N]	(M) medium [N]	(S) heavy [N]		
AC bearings, open, metric												
SV7003 E TA	17,00 .6693	35,00 1.3780	10,00 .3937	4571	6817	14	4,763 .1875	56000	46000	34	102	205
HYSV7003 E TA	17,00 .6693	35,00 1.3780	10,00 .3937	3200	6817	14	4,763 .1875	82000	59000	34	102	205
SV7203 C TA	17,00 .6693	40,00 1.5748	12,00 .4724	5090	8730	12	5,556 .2187	85000	55000	35	70	140
SV7203 E TA	17,00 .6693	40,00 1.5748	12,00 .4724	4860	8340	12	5,556 .2187	75000	49000	60	120	240
SV7804 C TA	20,00 .7874	32,00 1.2598	7,00 .2756	2772	3772	18	3,175 .1250	65000	54000	19	58	115
HYSV7804 C TA	20,00 .7874	32,00 1.2598	7,00 .2756	1941	3772	18	3,175 .1250	96000	69000	19	58	115
SV7804 E TA	20,00 .7874	32,00 1.2598	7,00 .2756	2870	3865	18	3,175 .1250	56000	46000	19	58	115
HYSV7804 E TA	20,00 .7874	32,00 1.2598	7,00 .2756	2009	3772	18	3,175 .1250	82000	59000	19	58	115
SV7904 C TA	20,00 .7874	37,00 1.4567	9,00 .3543	4854	7543	15	4,763 .1875	60000	49000	39	116	232
HYSV7904 C TA	20,00 .7874	37,00 1.4567	9,00 .3543	3398	7543	15	4,763 .1875	88000	63000	39	116	232
SV7904 E TA	20,00 .7874	37,00 1.4567	9,00 .3543	4554	7214	15	4,763 .1875	51000	42000	39	116	232
HYSV7904 E TA	20,00 .7874	37,00 1.4567	9,00 .3543	3188	7214	15	4,763 .1875	75000	54000	39	116	232
SV7004 C TA	20,00 .7874	42,00 1.6535	12,00 .4724	6090	9660	14	5,556 .2187	75000	49000	35	70	140
SV7004 E TA	20,00 .7874	42,00 1.6535	12,00 .4724	5810	9210	14	5,556 .2187	66000	43000	55	110	220
SV7204 C TA	20,00 .7874	47,00 1.8504	14,00 .5512	7320	11700	13	6,350 .2500	72000	47000	45	90	180
SV7204 E TA	20,00 .7874	47,00 1.8504	14,00 .5512	7010	11100	13	6,350 .2500	63000	41000	70	140	280
SV7805 C TA	25,00 .9843	37,00 1.4567	7,00 .2756	2335	3397	19	3,175 .1250	55000	45000	17	52	104
HYSV7805 C TA	25,00 .9843	37,00 1.4567	7,00 .2756	1634	3397	19	3,175 .1250	81000	58000	17	52	104
SV7005 C TA	25,00 .9843	47,00 1.8504	12,00 .4724	6918	11769	12	6,747 .2656	47000	39000	59	177	353
HYSV7005 C TA	25,00 .9843	47,00 1.8504	12,00 .4724	4843	11769	12	6,747 .2656	69000	50000	59	177	353
SV7005 E TA	25,00 .9843	47,00 1.8504	12,00 .4724	6890	9920	16	5,556 .2187	57000	37000	55	110	220
(SV)7205 C TA	25,00 .9843	52,00 2.0472	15,00 .5906	8710	12800	15	6,350 .2500	63000	41000	50	100	200
(SV)7205 E TA	25,00 .9843	52,00 2.0472	15,00 .5906	8330	12100	15	6,350 .2500	55000	36000	80	160	320
(SV)7006 C TA	30,00 1.1811	55,00 2.1654	13,00 .5118	9010	12100	17	5,953 .2344	55000	36000	40	80	160
(SV)7006 E TA	30,00 1.1811	55,00 2.1654	13,00 .5118	8560	11500	17	5,953 .2344	48000	31000	65	130	260

GRW designation	Main dimensions in [mm] [inch]			Load ratings acc. to DIN ISO		Ball set	Limiting speeds*	Preload				
	d	D	B	C _{0r} [N]	C _r [N]			(L) light [N]	(M) medium [N]	(S) heavy [N]		
AC bearings, open, inch												
SV3/16 C TA	4,763 .1875	12,700 .5000	3,967 .1562	312	913	8	2,381 .0937	195000	161000	5	14	28
HYSV3/16 C TA	4,763 .1875	12,700 .5000	3,967 .1562	218	913	8	2,381 .0937	287000	206000	5	14	28
SV3/16 D TA	4,764 .1876	12,800 .5039	3,967 .1562	293	873	8	2,381 .0937	166000	136000	5	14	28
HYSV3/16 D TA	4,765 .1876	12,900 .5079	3,967 .1562	205	873	8	2,381 .0937	244000	175000	5	14	28
SV1/4A C TA	6,350 .2500	15,875 .6250	4,978 .1960	421	1114	9	2,500 .0984	153000	126000	6	17	34
HYSV1/4A C TA	6,350 .2500	15,875 .6250	4,978 .1960	295	1114	9	2,500 .0984	225000	162000	6	17	34
SV1/2/001 C TA	12,700 .5000	28,575 1.1250	7,938 .3125	2063	4066	12	3,969 .1563	82000	68000	20	61	121
HYSV1/2/001 C TA	12,700 .5000	28,575 1.1250	7,938 .3125	1444	4066	12	3,969 .1563	121000	87000	20	61	121
AC bearings, dismountable, metric and inch												
SV784 D L2T	4,00 .1575	9,00 .3543	3,00 .1181	172	514	7	1,588 .0625	242000	199000	5	8	15
HYSV784 D L2T	4,00 .1575	9,00 .3543	3,00 .1181	94	457	7	1,588 .0625	355000	256000	5	8	15
SV725 C L2T	5,00 .1969	16,00 .6299	5,00 .1969	737	1626	9	2,500 .0984	157000	130000	8	24	49
HYSV725 C L2T	5,00 .1969	16,00 .6299	5,00 .1969	515	1626	9	2,500 .0984	231000	167000	8	24	49
SV725 E L2T	5,00 .1969	16,00 .6299	5,00 .1969	721	1594	9	2,500 .0984	134000	110000	8	24	49
HYSV725 E L2T	5,00 .1969	16,00 .6299	5,00 .1969	504	1594	9	2,500 .0984	197000	142000	8	24	49
SV707 C L2T	7,00 .2756	19,00 .7480	6,00 .2362	1183	2617	10	3,175 .1250	127000	105000	13	40	80
HYSV707 C L2T	7,00 .2756	19,00 .7480	6,00 .2362	828	2617	10	3,175 .1250	187000	135000	13	40	80
SV7000 C L2T	10,00 .3937	26,00 1.0236	8,00 .3150	2550	4906	10	4,763 .1875	94000	78000	28	85	170
HYSV7000 C L2T	10,00 .3937	26,00 1.0236	8,00 .3150	1785	4906	10	4,763 .1875	139000	100000	28	85	170
SV1/8A D20 L2T	3,175 .1250	7,938 .3125	2,779 .1094	207	609	7	1,588 .0625	266000	219000	5	8	16
HYSV1/8A D20 L2T	3,175 .1250	7,938 .3125	2,779 .1094	144	609	7	1,588 .0625	392000	282000	5	8	16
SV1/8B D20 L2T	3,175 .1250	9,525 .3750	3,967 .1562	134	461	8	1,588 .0625	228000	188000	5	10	20
HYSV1/8B D20 L2T	3,175 .1250	9,525 .3750	3,967 .1562	95	461	8	1,588 .0625	336000	242000	5	10	20

* The indicated speed limits are guide values for spring-loaded single bearings with low load; depending on the respective application, higher or lower speed limits may apply in practice.

** For use with oil lubrication, these bearings are also available without shields. Subject to change due to technical improvement. Other types on request!

Spindle ball bearings

GRW designation	Main dimensions in [mm] [inch]			Load ratings acc. to DIN ISO		Ball set		Limiting speeds*		Preload		
	d	D	B	C _{0r} [N]	C _r [N]	Z	Dw [mm] [inch]	Oil [min ⁻¹]	Grease [min ⁻¹]	(L) light [N]	(M) medium [N]	(S) heavy [N]
AC bearings, sealed, metric												
SV725A-2VZ C TA	5,00 .1969	16,00 .6299	5,00 .1969	647	1305	12	1,984 .0781	194000**	155000	7	20	40
HYSV725A-2VZ C TA	5,00 .1969	16,00 .6299	5,00 .1969	453	1305	12	1,984 .0781	290000**	194000	7	20	40
SV725A-2VZ E TA	5,00 .1969	16,00 .6299	5,00 .1969	607	1248	12	1,984 .0781	165000**	132000	7	20	40
SV788B-2VZ C TA	8,00 .3150	16,00 .6299	4,00 .1575	723	1374	13	1,984 .0781	174000**	139000	7	21	42
HYSV788B-2VZ C TA	8,00 .3150	16,00 .6299	4,00 .1575	506	1374	13	1,984 .0781	261000**	174000	7	21	42
SV708B-2VZ C TA	8,00 .3150	22,00 .8661	7,00 .2756	1298	2625	10	3,175 .1250	144000**	115000	13	40	80
HYSV708B-2VZ C TA	8,00 .3150	22,00 .8661	7,00 .2756	909	2625	10	3,175 .1250	216000**	144000	13	40	80
SV708B-2VZ E TA	8,00 .3150	22,00 .8661	7,00 .2756	1218	2510	10	3,175 .1250	122000**	98000	13	40	80
HYSV708B-2VZ E TA	8,00 .3150	22,00 .8661	7,00 .2756	853	2510	10	3,175 .1250	183000**	122000	13	40	80
SV709A-2VZ C TA	9,00 .3543	24,00 .9449	7,00 .2756	1493	2822	11	3,175 .1250	128000**	102000	14	43	86
HYSV709A-2VZ C TA	9,00 .3543	24,00 .9449	7,00 .2756	1045	2822	11	3,175 .1250	191000**	128000	14	43	86
SV7800A-2VZ C TA	10,00 .3937	19,00 .7480	5,00 .1969	876	1487	15	1,984 .0781	143000**	114000	8	23	46
HYSV7800A-2VZ C TA	10,00 .3937	19,00 .7480	5,00 .1969	613	1487	15	1,984 .0781	215000**	143000	8	23	46
SV7900B-2VZ C TA	10,00 .3937	22,00 .8661	6,00 .2362	1173	2047	13	2,500 .0984	128000**	102000	11	33	66
HYSV7900B-2VZ C TA	10,00 .3937	22,00 .8661	6,00 .2362	821	2047	13	2,500 .0984	192000**	128000	11	33	66
SV7000A-2VZ C TA	10,00 .3937	26,00 .10236	8,00 .3150	2030	3879	10	3,969 .1563	115000**	92000	20	60	120
SV7000A-2VZ E TA	10,00 .3937	26,00 .10236	8,00 .3150	1905	3710	10	3,969 .1563	98000**	78000	20	60	120
HYSV7000A-2VZ E TA	10,00 .3937	26,00 .10236	8,00 .3150	1334	3710	10	3,969 .1563	147000**	98000	20	60	120
SV7901A-2VZ C TA	12,00 .4724	24,00 .9449	6,00 .2362	1478	2329	16	2,500 .0984	115000**	92000	12	35	71
HYSV7901A-2VZ C TA	12,00 .4724	24,00 .9449	6,00 .2362	1035	2329	16	2,500 .0984	173000**	115000	12	35	71
SV7901A-2VZ E TA	12,00 .4724	24,00 .9449	6,00 .2362	1387	2227	16	2,500 .0984	98000**	79000	12	35	71
HYSV7901A-2VZ E TA	12,00 .4724	24,00 .9449	6,00 .2362	971	2227	16	2,500 .0984	147000**	98000	12	35	71
SV7001B-2VZ C TA	12,00 .4724	28,00 .11024	8,00 .3150	2328	3603	16	3,175 .1250	101000**	80000	18	55	111
HYSV7001B-2VZ C TA	12,00 .4724	28,00 .11024	8,00 .3150	1141	3603	16	3,175 .1250	151000**	101000	18	55	111
SV7001B-2VZ E TA	12,00 .4724	28,00 .11024	8,00 .3150	2184	3446	16	3,175 .1250	85000**	68000	18	55	111

GRW designation	Main dimensions in [mm] [inch]			Load ratings acc. to DIN ISO		Ball set		Limiting speeds*		Preload		
	d	D	B	C _{0r} [N]	C _r [N]	Z	Dw [mm] [inch]	Oil [min ⁻¹]	Grease [min ⁻¹]	(L) light [N]	(M) medium [N]	(S) heavy [N]
AC bearings, sealed, metric												
HYSV7001B-2VZ E TA	12,00 .4724	28,00 .11024	8,00 .3150	1070	3446	16	3,175 .1250	128000**	85000	18	55	111
SV7201B-2VZ E TA	12,00 .4724	32,00 .12598	10,00 .3937	3034	5373	11	4,763 .1875	80000**	64000	29	86	173
HYSV7201B-2VZ E TA	12,00 .4724	32,00 .12598	10,00 .3937	1487	5373	11	4,763 .1875	120000**	80000	29	86	173
SV7902A-2VZ C TA	15,00 .5906	28,00 .11024	7,00 .2756	2359	3586	16	3,175 .1250	95000**	76000	18	55	110
HYSV7902A-2VZ C TA	15,00 .5906	28,00 .11024	7,00 .2756	1651	3586	16	3,175 .1250	143000**	95000	18	55	110
SV7902A-2VZ E TA	15,00 .5906	28,00 .11024	7,00 .2756	2213	3430	16	3,175 .1250	81000**	65000	18	55	110
HYSV7902A-2VZ E TA	15,00 .5906	28,00 .11024	7,00 .2756	1549	3430	16	3,175 .1250	121000**	81000	18	55	110
SV7002A-2VZ C TA	15,00 .5906	32,00 .12598	9,00 .3543	3337	5125	15	3,969 .1563	87000**	70000	26	79	158
HYSV7002A-2VZ C TA	15,00 .5906	32,00 .12598	9,00 .3543	2336	5125	15	3,969 .1563	131000**	87000	26	79	158
SV7002A-2VZ E TA	15,00 .5906	32,00 .12598	9,00 .3543	3131	4902	15	3,969 .1563	74000**	59000	26	79	158
HYSV7002A-2VZ E TA	15,00 .5906	32,00 .12598	9,00 .3543	2192	4902	15	3,969 .1563	111000**	74000	26	79	158
SV7903A-2VZ C TA	17,00 .6693	30,00 .11811	7,00 .2756	2402	3554	16	3,175 .1250	88000**	70000	18	55	110
HYSV7903A-2VZ C TA	17,00 .6693	30,00 .11811	7,00 .2756	1682	3554	16	3,175 .1250	132000**	88000	18	55	110
SV7903A-2VZ E TA	17,00 .6693	30,00 .11811	7,00 .2756	2254	3399	16	3,175 .1250	75000**	60000	18	55	110
HYSV7903A-2VZ E TA	17,00 .6693	30,00 .11811	7,00 .2756	1578	3399	16	3,175 .1250	112000**	75000	18	55	110
SV7003-2VZ C TA	17,00 .6693	35,00 .13780	10,00 .3937	4415	6654	14	4,763 .1875	65000**	54000	34	102	205
HYSV7003-2VZ C TA	17,00 .6693	35,00 .13780	10,00 .3937	3091	6654	14	4,763 .1875	96000**	69000	34	102	205
SV7003-2VZ E TA	17,00 .6693	35,00 .13780	10,00 .3937	4143	6363	14	4,763 .1875	56000**	46000	34	102	205
HYSV7003-2VZ E TA	17,00 .6693	35,00 .13780	10,00 .3937	2900	6363	14	4,763 .1875	82000**	59000	34	102	205
SV7904A-2VZ C TA	20,00 .7874	37,00 .14567	9,00 .3543	3868	5394	16	3,969 .1563	70000	56000	27	81	162
HYSV7904A-2VZ C TA	20,00 .7874	37,00 .14567	9,00 .3543	2708	5394	16	3,969 .1563	105000	70000	27	81	162
SV7005A-2VZ C TA	25,00 .9843	47,00 .18504	12,00 .4724	7909	10661	17	5,556 .2187	56000	44000	53	160	320
HYSV7005A-2VZ C TA	25,00 .9843	47,00 .18504	12,00 .4724	5536	10661	17	5,556 .2187	83000	56000	53	160	320

* The indicated speed limits are guide values for spring-loaded single bearings with low load; depending on the respective application, higher or lower speed limits may apply in practice.

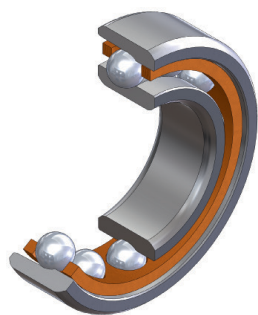
** For use with oil lubrication, these bearings are also available without shields. Subject to change due to technical improvement. Other types on request!

Spindle / angular contact bearings

Spindle bearings are single-row angular contact bearings with a nominal contact angle of 15° (C) or 25° (E). They can be subjected to both radial and (in one direction) axial loads. The direction of the axial load is shown by a "V" marking on the outer ring. GRW spindle ball bearings are suitable for applications requiring precision while carrying high load combined with high speed.

GRW spindle ball bearings are characterised by following properties:

- Manufactured quality of P4 (or ABEC7) or better.
- Rings mostly made of corrosion-resistant SV 30 high-grade steel (other materials on request).
- Steel or ceramic balls.
- Solid retainer made from fiber-reinforced phenolic resin or special materials, for special applications, speed, etc. .
- 15° (C) or 25° (E) contact angles as standard.
- Optionally, bearings can be paired and ground to three pre-defined preload classes (L, M, S) or to a specific preload.
- Oil or grease lubrication.
- Open and shielded versions available.
- Cleanroom assembly, lubrication and packaging.



Open spindle ball bearings

- Standard configuration has large balls for optimum utilisation of bearing geometries and a solid retainer for higher bearing capacities.
- The outer ring has only one partial shoulder remaining. This partial shoulder is necessary to prevent the bearing from separation.
- Solid outer ring guided retainer with a low profile cross-section is particularly well suited for oil injection lubrication or oil mist.

Shielded spindle ball bearings

- Non-contact shields do not cause any additional torque caused by the shields.
- Standard shields made of Viton (VZ) coupled with a stainless steel support shield offer excellent temperature and contamination resistance.
- A very small, closely toleranced sealing gap provides protection against dust particles.
- GRW recommends using a grease lubricant for longer life and reliability.
- Dimensionally identical to non-shielded spindle bearings but sometimes different inner geometry.
- This type of design often requires use of smaller balls that results in a lower load capacity but higher axial stiffness and speed limits (usually signified by an 'A', 'B', ... after the base type).
- Also available without shields for high-speed applications.

Handling

- GRW recommends to keep the bearing in its airtight packaging until it is ready for assembly.
- Extreme cleanliness during assembly is recommended.
- Avoid to drop or to subject the bearing to any kind of impact loading.
- Spindle bearings are designed to withstand axial loads in only one direction. This direction is identified by the "V" laser marking on the outer ring.
- Using the proper assembly tooling will prevent damage of the bearing.
- Duplex bearings labeled (DB), (DF), or (DT) are always packed in pairs and can only be used as pair in the specified configuration.
- Universally matched duplex bearings can be used in every combination of configurations, i.e. you can combine bearings from different packages or lots. These bearings may be assembled in any duplex arrangement.
- Prior to running bearings at high speed a run in period helps to distribute lubricant and is beneficial for the bearing!

Duplex bearings

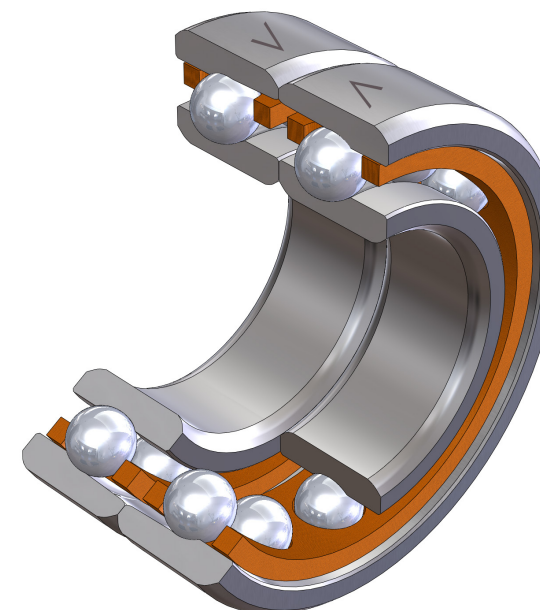
Duplex bearings are two matched bearings that provide following performance benefits:

- Accurate bearing alignment in radial and axial directions including defined clearances and controlled stiffness.
- Increased system reliability.
- Higher load capacity.

Duplexing of these bearings is performed by loading each bearing with a specified preload and accurately grinding the inner and/or outer rings until the bearing faces of both rings are flush.

Paired bearings processed this way are designed to be assembled in following configurations: back-to-back (DB), face-to-face (DF) or tandem (DT) and axially loaded to the specified or required force. Duplexed bearings are designed to provide the specified preload when the ground surfaces are accurately pressed together.

The ball bearings must be mounted according to the designation on the packaging labels or "V" markings on the outer rings.



Spindle ball bearings:

Preload and contact angle are generally standardised for spindle bearings. GRW's standard contact angles are 15° (C) or 25° (E), preload is specified as light (L), medium (M) or heavy (S). If necessary, preload and contact angles can be customised to each customer's individual operating requirements.

	By default, GRW uses for:	
	Deep groove radial bearings	Spindle bearings
Contact angle α	15° (C)	15° (C) or 25° (E)
Preload FV	5 N	L, M, S

However, the preload should not be specified higher than necessary as this would result in an increase of start up and running torque, which in turn would directly affect the expected life of the bearing.

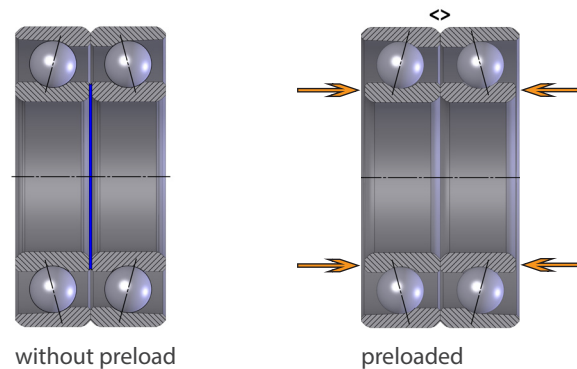
To achieve an identical fit for both bearings, Duplex bearings are sorted into two groups. The bore and outer diameters are packaged in pairs with bearings from the same group. To take full advantage of these duplexed pairs, they should also be mounted with calibrated shafts and housings (see the chapter "Calibration of bore and outside diameters").

Bearing fits should be carefully selected because an interference fit on the inner or outer ring will change the preload.

Installation and configuration of duplexed bearings

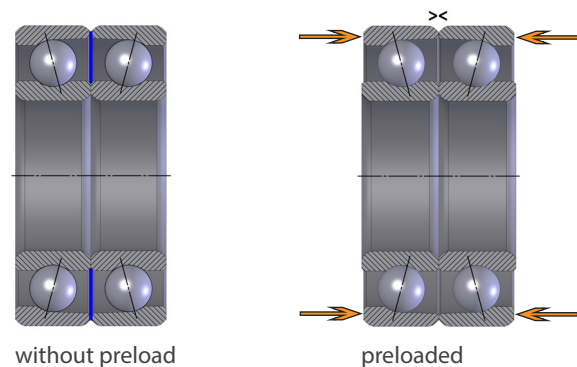
O (<>) arrangement: Back to back (designation DB)

With this bearing configuration the inner rings are designed to be clamped together. The contact angle load path between the outer ring raceway, the ball and the inner ring curvature diverge, which results in maximum stability and stiffness against any moment loading. Radial and axial loads can be taken in both directions.



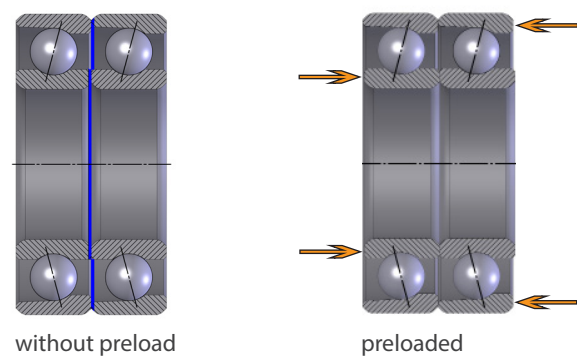
X (><) arrangement: Face to face (designation DF)

With this bearing configuration, the outer rings are designed to be clamped together. The load path converges resulting in less stability and a lower stiffness against moment loading. This design more easily compensates any misalignment of the assembly. Radial and axial loads can likewise be taken in both directions.



Tandem-arrangement (designation DT)

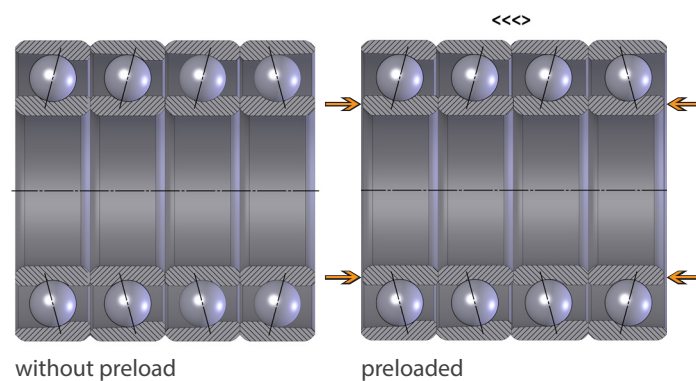
The tandem-mounted bearing design is capable of taking a significantly higher axial load, but only in one direction. With this type of bearing, preloading and control of axial play can only be achieved by preloading against another bearing.



General: Bearings of these pairing types are packed in pairs or sets and must not be mixed.

Universal (designation U)

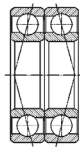
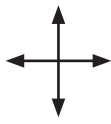
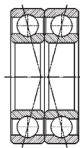
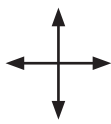
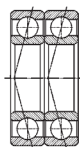
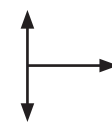
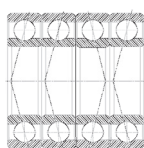
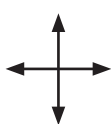
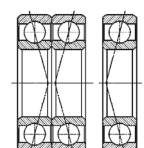
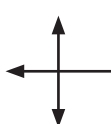
Universally matched bearing pairs have a significant advantage compared to the duplexed designs described above. They are individually ground in such a way that they can be assembled in various pairing configurations, e.g. X, O, or tandem; without any loss in performance. With the same preload, these single bearings can be interchanged without any problems.



Bearing sets

When a higher stiffness is specified, multiple duplexed bearing configurations may be used together to get the desired results. Depending on the application, these bearing sets can be made up of

universally paired bearings in X, O, or tandem configurations. The table below shows some examples of possible configurations in more detail.

	Usual designation	Mark/ arrangement	Permissible load direction	Rigidity
	O-arrangement DB	<>	 axial radial	axial radial rigidity against tilting torques
	X-arrangement DF	><	 axial radial	axial radial
	Tandem arrangement DT	<< or >>	 radial and unilaterally axial	unilaterally axial radial
	Universal U	<<<>>> Examples: >< or <> or >> or >>>	 axial radial	depending on the arrangement
	Set of bearings assembled from universally matched bearings	>><< Examples: <>>	 axial radial	depending on the arrangement

Calibration of bore and outside diameters

To guarantee a uniform fit of bearings on the shaft and in the housing, it is imperative to control diameter tolerances of the bearings. It is very difficult to control very small tolerances in a production run; therefore, sorting of the rings may be necessary. Only bearings in quality grades P5 and ABEC5 or better can be sorted into groups of 2.5 µm (.0001 inch) or 1.25 µm (.00005 inch). The diameters of shaft and housing must also be accurately measured and sorted to match.

For technical reasons it is not possible to supply bearings in only one specific tolerance group. This means that grading to X4, only 3 of 4 possible groups can be contained in the shipment lot, i.e. the final group distribution is subject to production machining variances.

The following symbols are used for the classification of graded ball bearings:

Classification of graded bearings

Grading	in classes of 2,5 µm or .0001 inch	in classes of 1,25 µm or .00005 inch	in classes of 1 µm or .00004 inch
Bore d and outside diameter D	X	X4	X5
Bore d only	XB	X4B	X5B
Outside diameter D only	XD	X4D	X5D

Examples:

SV724 C P4 TA X4B UL L001

X4B = bore graded in 4 groups of 1,25 µm.

The outside diameter is not graded.

Key to tolerance groups

Tolerance field in 0,001 mm		Outside diameter D												not graded			
		Tolerance field in .0001 inch		0/-2,5	-2,5/-5	0/-1,25	-1,25/-2,5	-2,5/-3,75	-3,75/-5	0/-1	-1/-2	-2/-3	-3/-4		-4/-5		
		Code	1	2	A	B	C	D	E	F	G	H	I				
Bore d	0/-2,5	0/-1	1	11	12										10	XB	
	-2,5/-5	-1/-2	2	21	22										20		
	0/-1,25	0/-5	A			AA	AB	AC	AD							A0	X4B
	-1,25/-2,5	-5/-1	B			BA	BB	BC	BD							B0	
	-2,5/-3,75	-1/-1,5	C			CA	CB	CC	CD							C0	
	-3,75/-5	-1,5/-2	D			DA	DB	DC	DD							D0	
	0/-1	0/-4	E							EE	EF	EG	EH	EI	E0	X5B	
	-1/-2	-4/-8	F							FE	FF	FG	FH	FI	F0		
	-2/-3	-8/-1,2	G							GE	GF	GG	GH	GI	G0		
	-3/-4	-1,2/-1,6	H							HE	HF	HG	HH	HI	H0		
-4/-5	-1,6/-2	I							IE	IF	IG	IH	II	I0			
not graded			01	02	0A	0B	0C	0D	0E	0F	0G	0H	0I		no Symbol		
			XD		X4D				X5D								

Different tolerance groups are defined by grading. On the package of the ball bearing, the relevant group is indicated by means of the following code:

Examples:

Code 21:	Bore-Ø -2,5/-5 µm	Code BC:	Bore-Ø -1,25/-2,5 µm	Code A0:	Bore-Ø 0/-1,25 µm	Code 02:	Bore-Ø not graded
	Outside-Ø 0/-2,5 µm		Outside-Ø -2,5/-3,75 µm		Outside-Ø not graded		Outside-Ø -2,5/-5 µm

Method of group classification:

Bore diameter: The smallest measured diameter defines the class.

Outer diameter: The largest measured diameter defines the class.

Packaging

Correct packaging protects bearings from contamination, corrosion and damage during transport and storage. We recommend the package to open just prior to mounting and to use bearings with opened packages as soon as possible.

Spindle bearing Packaging CP1P

Spindle bearings are sealed in a separate envelope marked "GRW" (CP1) and boxed individually (CP1P) to avoid damage.

Each bearing package is labeled with the exact design specification and the respective product lot number, factory batch number, and the packaging date of the bearing.

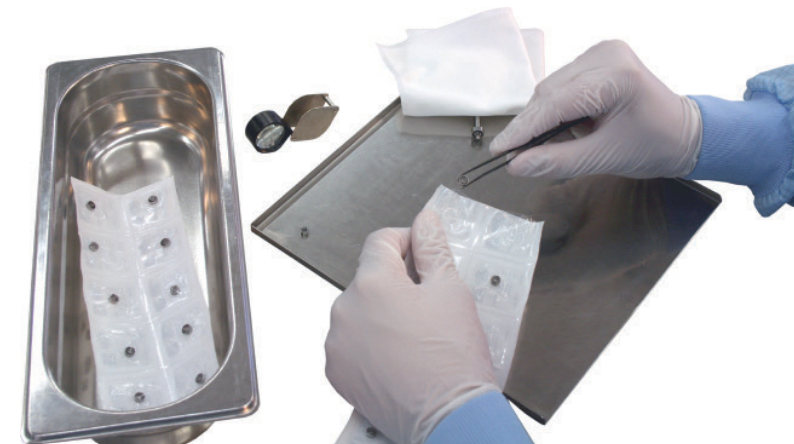


Correct handling of GRW high-precision miniature bearings

GRW ball bearings are manufactured and packaged with extreme care to avoid contamination, corrosion, and other external influences on the bearings. When mounting the ball bearings, please mind:

- Bearings should be stored in their original package in clean, dry rooms under constant temperature conditions.
- Bearings should only be removed from their original package shortly before they are mounted. Usage of gloves, finger cots, and tweezers are recommended.
- Assembly location has to be clean and bright. All mating parts also have to be clean. A hard surface is preferred.
- When mounting a ball bearing, the assembly force must not be applied over the balls. Suitable mounting tools must be used. Non-compliance with these instructions may easily result in damage of balls or raceways, for example ball indentations may occur in the raceway.
- If glued interfaces are used, ensure that any excess glue does not enter the bearing.
- Re-lubrication should only be carried out with a lubricant of the same type and purity.

- We recommend to have the bearings lubricated by GRW, as this is executed in a clean room shortly before packaging.
- Selective sorting of all mating parts will help to guarantee the proper fit of the bearing to the shaft or housing.
- We recommend a run-in process for grease-lubricated bearings prior to use at low speed to achieve optimum distribution of the lubricant.
- Electrical current running through the bearing should be avoided.



Removal from package

Service

External and In-house training

- GRW modular system
- GRW designation system
- Principles of ball bearing design
- Handling of miniature ball bearings



Customized labels

- Integration of your logo
- Special packaging
- Customized designation system



Lubrication service

- First-time lubrication
- Re-lubrication
- Lubrication change
- Determination of lubrication weight



Laboratory service

- General analytics
- Lubricant analysis
- Surface treatment
- Condensation and salt spray test (DIN ISO 9227)
- Chemical deburring
- Examinations by microscope, spectroscopy and various analysis



Handling of miniature ball bearings

- Tutorial



Get more information about our services:

phone: +49 (0) 93 65/819 - 482
 fax: +49 (0) 93 65/819 - 100 · e-mail: vmi@grw.de

About us:

GRW
 Gebr. Reinfurt GmbH & Co. KG
 Niederhoferstraße 105
 D-97222 Rimpar
 P.O. Box 142
 D-97219 Rimpar

phone: +49 (0) 93 65/819 - 0
 fax: +49 (0) 93 65/819 - 100
 e-mail: info@grw.de
 web: www.grw.de

Kommanditgesellschaft (Limited Partnership)
 headquartered in Würzburg
 Register Court: Würzburg HRA 467
 Personally liable partner:
 Verwaltungsgesellschaft Reinfurt mbH
 headquartered in Würzburg
 Register Court: Würzburg HRB 196
 Sales tax ID: DE 811118985
 Managing Director:
 Michael Ludwig (Speaker), Klaus Bonaventura
 For our current General Terms and Conditions,
 please see: www.grw.de
 Subject to errors and change without notice.
 All rights reserved.

Stand: 05/2014



HIGH-PRECISION BALL BEARINGS

**GEBR. REINFURT GMBH & CO. KG
HOCHPRÄZISIONSKUGELLAGER**

Niederhoferstr. 105
97222 Rimpar
Germany

phone: +49 (0) 93 65/819 - 482
fax: +49 (0) 93 65/819 - 100
e-mail: vmi@grw.de
web: www.grw.de

**GRW
HIGH PRECISION BALL BEARINGS**

530 Eastpark Court Suite H
Sandston, Virginia 23150
USA

phone: +1 (804) 328 0900
fax: +1 (801) 495 7839
e-mail: info@grwbearings.com
web: www.grwbearings.com

**GRW
HIGH PRECISION BALL BEARINGS**

12660 South Ford Street, Suite 201
Draper, Utah 84020
USA

phone: +1 (801) 495 3216
fax: +1 (801) 495 7839
e-mail: info@grwbearings.com
web: www.grwbearings.com