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Features

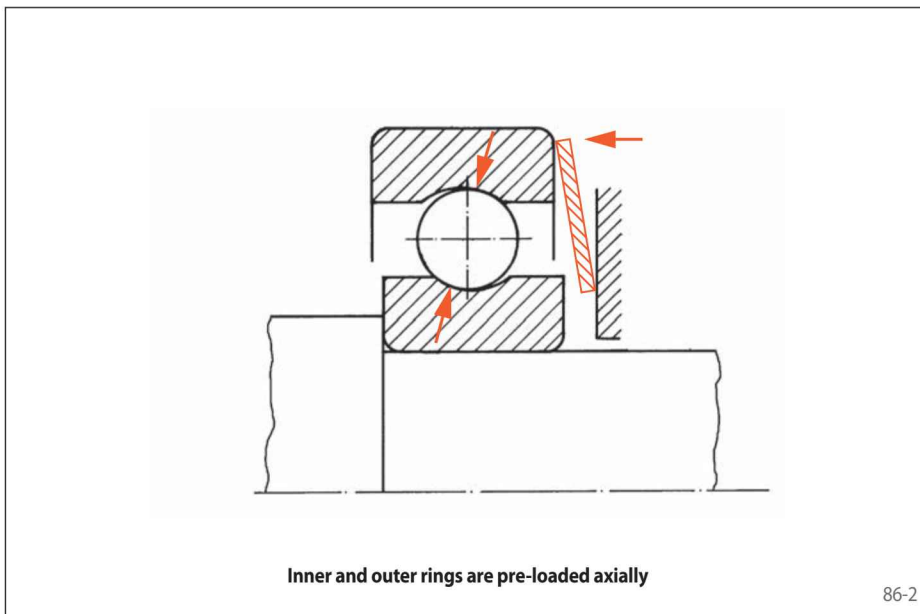
- RINGSPANN Star Spring Washers are particularly light spring elements with linear or not-linear spring characteristic. They are suitable for application as pressure elements in precision machines and as pressure springs for taking up free movement, and for reducing noise in ball bearings.
- The very large axial movement of the spring guarantees that considerable axial variations and length tolerances can be accommodated without much deviation from the nominal value of the axial force of the Star Spring Washer.
- Because of the large axial variations of the spring it is often possible to achieve the desired effect with a single Star Spring Washer.
- Their spring load corresponds with the optimum values of the relevant bearing sizes.

Service Life

Ball bearings give longer service if the inner and outer rings are pre-loaded axially (figure 86-2). This fact has been known for a long time. This axial preloading by RINGSPANN Star Spring Washers eliminates radial play in the ball bearings. This effects a better distribution of the radial load to be transmitted onto the bearing rings and therefore increases the length of service life of the bearing.

Silent Running

High speed machines, particularly small electric motors, create special problems for the designer regarding silent running. Extensive trials in this field have shown, that in the main, noise originates in the ball bearings, and that the application of the exact amount of axial pressure suitable for each job reducing noise effectively.



Inner and outer rings are pre-loaded axially

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Conditions for most favourable effect

The effect of axial pre-loading depends on certain conditions:

- The axial pressure must be applied to the whole outer race.
- Axial variations and length tolerances within the components of the machine should have only the very slightest effect on the applied spring force.
- The axial pre-loading must be done with a load suitably adapted to the size of the bearing.

Protection of Bearings subject to vibration when non-rotating

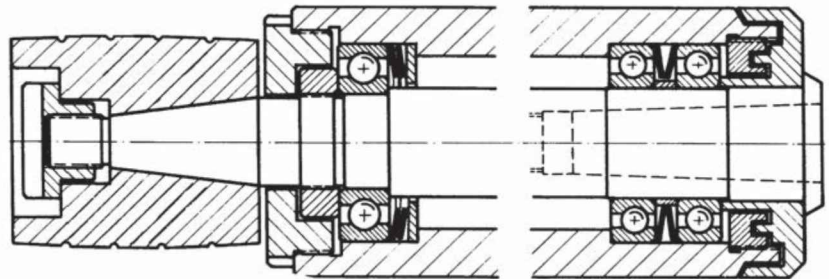
The spring axial location also eliminates damage as a result of vibration in non-rotating bearings. This type of damage is well known in electric motors for auxiliary drives in ships and vehicles. If the auxiliary drives is stationary, the rotor can vibrate in the bearing, due to the vibration of the ship or vehicle. In these conditions the balls beat in the races of the bearing rings and cause wear. This is why leading manufacturers use only ball bearings, the radial play of which is removed by Star Spring Washers, so preventing any vibration of the rotor. The reason for damage is then completely eliminated.

Bearing of an internal grinding spindle

Spindle ball bearings are used as bearing support for grinding spindles. Bearings of this kind exhibit maximum tracking accuracy at high rotation speeds.

The specific properties of these bearings can be fully exploited only if the bearings are pre-clamped with a precisely defined force.

RINGSPANN Star Springs Washers enable you to realise the required pre-clamping force of the spindle bearings with a high degree of precision.

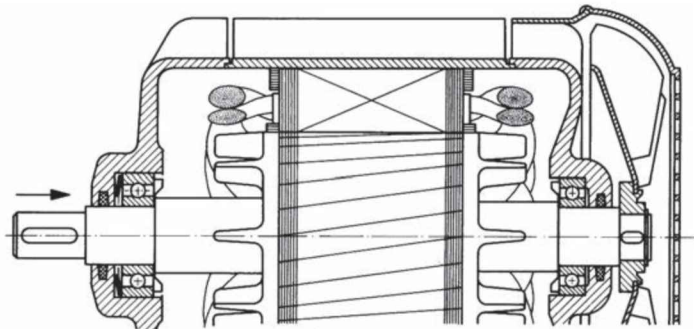


Bearing of an internal grinding spindle

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Pressure spring for ball bearing

Silent running is a particular requirement for electric motors. For this purpose a RINGSPANN Star Spring Washer acts to pre-load the outer race of the bearing as illustrated.

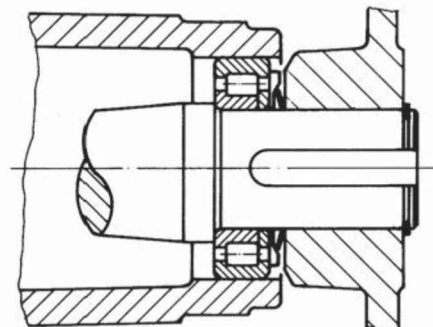


Pressure spring for ball bearing

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Accommodating length tolerances

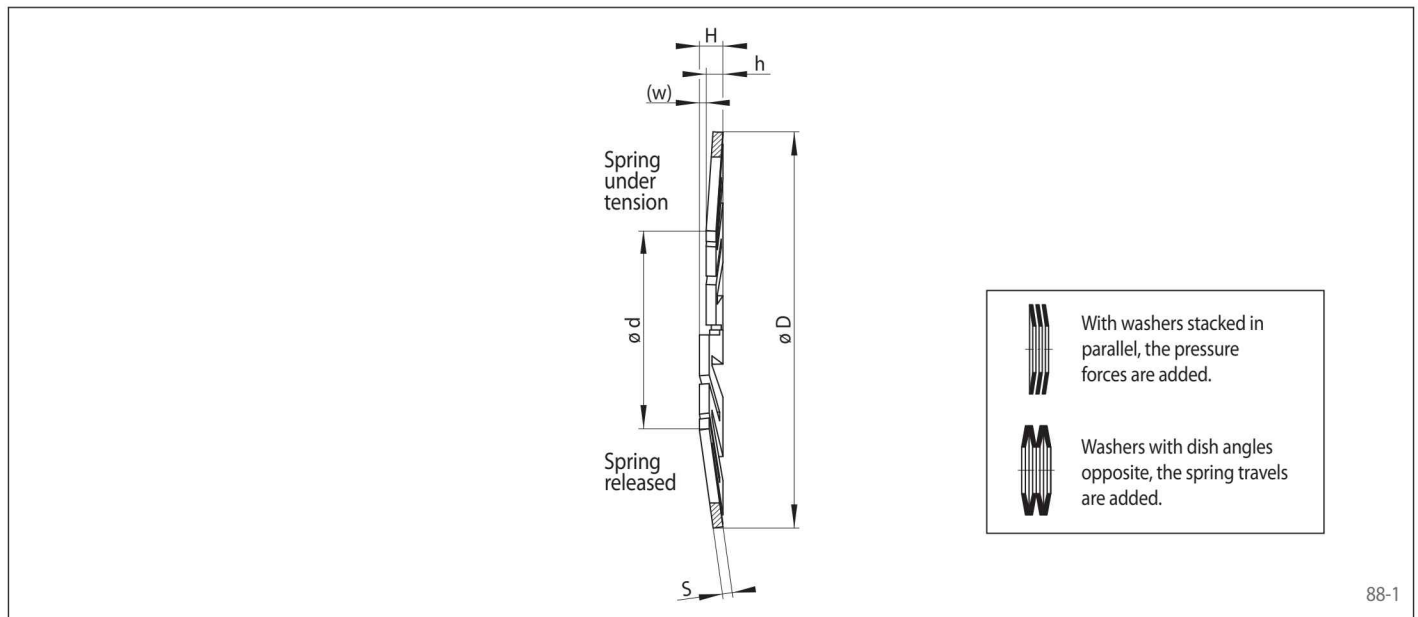
As shown in this example the RINGSPANN Star Spring Washer fitted between output shaft and NILOS sealing ring makes it possible to accommodate wide axial tolerances.



Accommodating length tolerances

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as ball bearing compensating discs for taking up free movement in bearings



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For ball bearing						Dimension			Height		Tolerance for h	Spring travel	Pressure	Spring const.	Article number
						D mm	d mm	s mm	released H mm	under pressure h mm	mm	(w) mm	F N	c N/mm	1051-
				624		12,7	5,3	0,3	1,1	0,7	$\pm 0,15$	0,4	14	35	012001
634	E 3	E 4	E 5	625		15,7	7,5	0,3	1,1	0,7	$\pm 0,15$	0,4	9	23	015001
635			626	607		18,7	7,5	0,3	1,4	0,7	$\pm 0,15$	0,7	10	14	018001
635			626	607		18,7	9,2	0,3	1,2	0,7	$\pm 0,15$	0,5	11	22	018002
	E 6					20,7	10,5	0,3	1,3	0,7	$\pm 0,15$	0,6	7	12	020001
627	E 7			608		21,7	11	0,5	1,6	0,9	$\pm 0,15$	0,7	34	49	021001
	E 8			609		23,7	11	0,5	1,8	1,0	$\pm 0,2$	0,8	33	41	023001
629			6000			25,7	11	0,5	2,0	1,0	$\pm 0,2$	1,0	31	31	025001
629			6000			25,7	13,5	0,5	1,7	1,0	$\pm 0,2$	0,7	30	43	025002
16100	E 9	E 10	6001			27,7	15	0,65	1,9	1,1	$\pm 0,2$	0,8	52	65	027001
16101	E 13			6200		29,7	15	0,66	2,1	1,1	$\pm 0,21$	1,0	38	38	029001
	E 11	E 12		6201		31,7	15	0,65	2,3	1,1	$\pm 0,2$	1,2	46	38	031001
16002			6002	6201		31,7	18	0,65	2,0	1,1	$\pm 0,21$	0,9	36	40	031002
16003	E 14	E 15	6003	6202	6300	34,7	20	0,9	2,4	1,4	$\pm 0,2$	1,0	89	89	034001
					6301	36,7	20	0,9	2,6	1,4	$\pm 0,21$	1,2	92	77	036001
	E 16					37,7	20	0,9	2,7	1,4	$\pm 0,2$	1,3	84	65	037001
	E 19	L 17a	Bo 15	6203		39,7	20	0,9	2,9	1,4	$\pm 0,2$	1,5	81	54	039001
	E 19			6203		39,7	23	0,9	2,6	1,4	$\pm 0,2$	1,2	103	86	039002
16004			6004	6302		41,7	27	0,9	2,4	1,4	$\pm 0,2$	1,0	76	76	041001
		EA 17	Bo 17			43,5	27	0,9	2,6	1,4	$\pm 0,2$	1,2	68	57	043001
16005	E 20	L 20	6005	6204	6303	46,5	27	0,9	2,9	1,4	$\pm 0,2$	1,5	74	49	046001
16005			6005			46,5	30	0,9	2,6	1,4	$\pm 0,2$	1,2	72	60	046002
	M 20	L 25	6205	6304		51,5	35	0,9	2,6	1,4	$\pm 0,2$	1,2	61	51	051001
16006			6006			54,5	35	1,15	3,1	1,7	$\pm 0,25$	1,4	98	70	054001
16007	L 30	6007	6206	6305	6403	61	40	1,15	3,3	1,7	$\pm 0,25$	1,6	110	69	061001
16008		6008				67	45	1,15	3,4	1,7	$\pm 0,25$	1,7	90	53	067001
			6207	6306	6404	71	45	1,15	3,8	1,7	$\pm 0,25$	2,1	110	52	071001
16009		6009				74	50	1,15	3,6	1,7	$\pm 0,25$	1,9	130	68	074001

Mounting

Generally it will be found most suitable for the Star Spring Washer to work on the outer ring of the ball bearing. The Star Spring Washer outside diameters given in the following table correspond therefore with the ball bearing outside diameters. The RINGSPANN design with slots and dished shape guarantees even axial pressure on the whole outer race. If an axial pressure

is applied to the shaft in one direction only, the Star Spring Washer must be mounted in such a way that there is no axial pressure on it (figure 87-2). If the axial pressures vary or are in both directions, a Star Spring Washer has to be mounted both sides of the ball bearings. In this case and in any doubtful cases we will be pleased to submit an installation proposal.