SCHAEFFLER

Triple ring bearings for deflection-compensating rolls

Z-5..04.DRGL

Technical Product Information

1 Bearing design

Triple ring bearings are special bearings for deflection-compensating rolls in presses and calenders within paper machines.

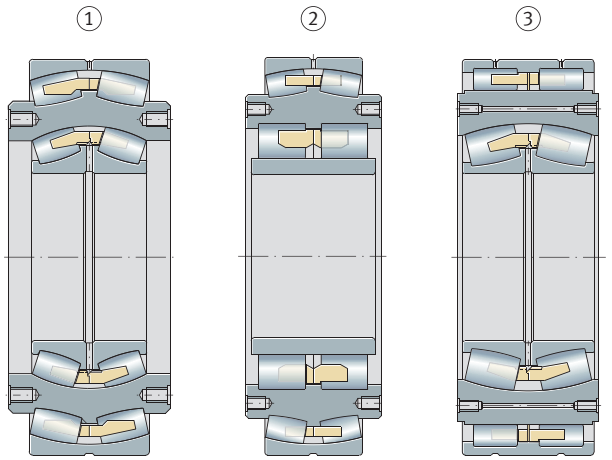
In these rolls, the roll sleeve rotates about the stationary roll axis. Triple ring bearings are frequently installed in driven rolls. The stationary axis is supported in the bearings' interior. The rotating intermediate ring connects the drive to the roll sleeve. The intermediate ring has holes in both end faces, allowing the drive force to be transmitted either directly or via a coupling. Depending on the type of deflection-compensating roll, 1 of 3 bearing designs is used.

The bearing design with 1 spherical roller bearing each as the inner and outer bearing is referred to as the Beloit design for CC rolls (controlled crown rolls).

The bearing design with 1 double row cylindrical roller bearing as the inner bearing and 1 spherical roller bearing as the outer bearing is known as the Küsters design for S rolls. S rolls are floating rolls.

The bearing design with 1 spherical roller bearing as the inner bearing and 1 double row cylindrical roller bearing as the outer bearing is described as the Farrel design.

1 Triple ring bearings Z-5..04.DRGL for deflection-compensating rolls



1	Beloit design	2	Küsters design
3	Farrel design		

1.1 Radial and axial load capacity

Spherical roller bearings can support axial loads in both directions as well as high radial loads. Designs that use a cylindrical roller bearing allow axial displacements within the bearing.

1.2 Material

The inner rings subjected to the very highest loads are made from particularly clean rolling bearing steel.

1.3 Interchangeability

The interchange designations in the product tables are taken from the product information that is readily available to us. The information is limited to identical main dimensions. Bearing designs must always be checked, as they are not always identical.

When replacing a bearing with an SKF design, note that the width of the inner ring B_1 is narrower. SKF uses bearing series 232 for the inner bearing. 2 spacer rings compensate for the gap.

Please direct any questions to your contact at Schaeffler.

2 Lubrication

Triple ring bearings are lubricated with oil. To ensure a reliable lubricant supply, the bearings are equipped with the required lubrication grooves and lubrication holes.

3 Temperature range

The following characteristics apply to bearings with metal cages.

1 Temperature range

Characteristic	Value			
	°C		°F	
	from	up to	from	up to
Dimensional stability	–	+200	–	+392
Operating temperature	–30	+200	–22	+392

4 Cages

The bearings are fitted with solid brass cages.

5 Internal clearance

The radial internal clearance corresponds to internal clearance group CN for bearings with a cylindrical bore.

The values for radial internal clearance correspond to DIN 620-4:2004 (ISO 5753-1:2009). The values are valid for bearings which are free from load and measurement forces, i.e., without elastic deformation.

2 Radial internal clearance

d		C2 (Group 2)		CN (Group N)		C3 (Group 3)		C4 (Group 4)	
mm		µm		µm		µm		µm	
>	≤	min.	max.	min.	max.	min.	max.	min.	max.
18	24	10	20	20	35	35	45	45	60
24	30	15	25	25	40	40	55	55	75
30	40	15	30	30	45	45	60	60	80
40	50	20	35	35	55	55	75	75	100
50	65	20	40	40	65	65	90	90	120
65	80	30	50	50	80	80	110	110	145

d		C2 (Group 2)		CN (Group N)		C3 (Group 3)		C4 (Group 4)	
mm		µm		µm		µm		µm	
>	≤	min.	max.	min.	max.	min.	max.	min.	max.
80	100	35	60	60	100	100	135	135	180
100	120	40	75	75	120	120	160	160	210
120	140	50	95	95	145	145	190	190	240
140	160	60	110	110	170	170	220	220	280
160	180	65	120	120	180	180	240	240	310
180	200	70	130	130	200	200	260	260	340
200	225	80	140	140	220	220	290	290	380
225	250	90	150	150	240	240	320	320	420
250	280	100	170	170	260	260	350	350	460
280	315	110	190	190	280	280	370	370	500
315	355	120	200	200	310	310	410	410	550
355	400	130	220	220	340	340	450	450	600
400	450	140	240	240	370	370	500	500	660
450	500	140	260	260	410	410	550	550	720
500	560	150	280	280	440	440	600	600	780
560	630	170	310	310	480	480	650	650	850
630	710	190	350	350	530	530	700	700	920
710	800	210	390	390	580	580	770	770	1010
800	900	230	430	430	650	650	860	860	1120
900	1000	260	480	480	710	710	930	930	1220
1000	1120	290	530	530	770	770	1050	1050	1430
1120	1250	320	580	580	840	840	1140	1140	1560
1250	1400	350	630	630	910	910	1240	1240	1700
1400	1600	380	700	700	1020	1020	1390	1390	1890
1600	1800	420	780	780	1140	1140	1550	1550	2090

6 Dimensions, tolerances

Triple ring bearings have normal tolerances for unsplit radial bearings. The dimensional tolerances correspond to tolerance class Normal (PN). However, the running accuracy is usually higher.

7 Design of the bearing arrangement

The inner rings and outer rings of triple ring bearings do not rotate. A loose fit is therefore permissible on the shaft and in the housing.

8 Application examples

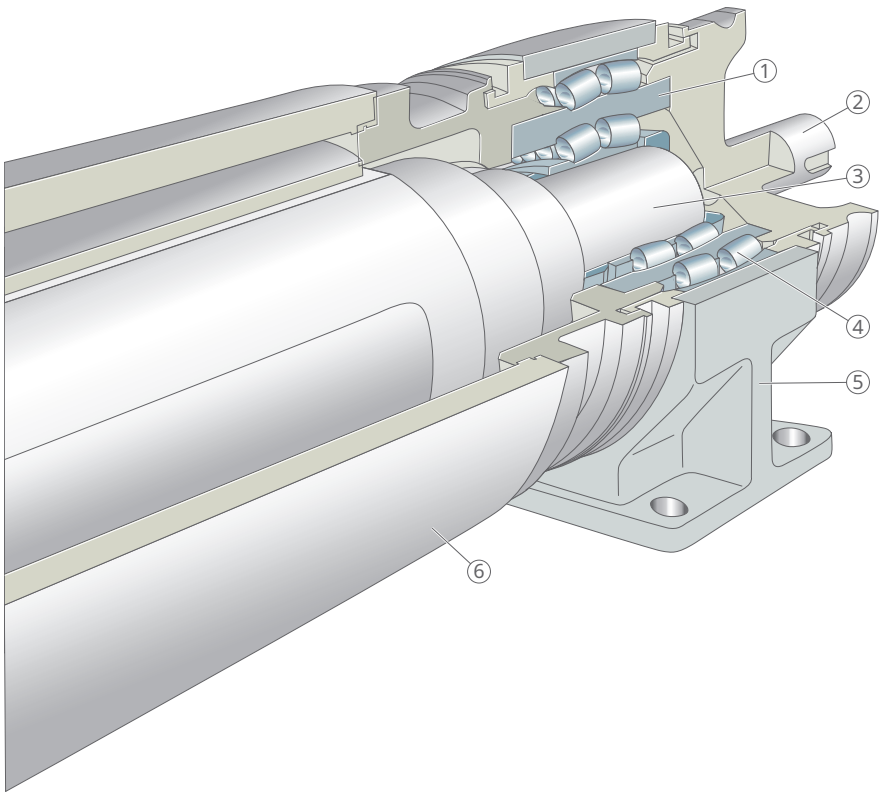
8.1 Triple ring bearings for deflection-compensating rolls

In order to achieve a constant distribution of pressure and thus uniform paper thickness over the entire web width, so-called deflection-compensating rolls are used in presses and calenders within paper machines.

In deflection-compensating rolls, the roll sleeve rotates about the stationary roll axis. Various hydraulic systems support the roll sleeve in relation to the axis. The hydraulic system influences the geometry of the roll sleeve contour, allowing the roll sleeve contour to be adjusted to the contour of the opposing roll.

The compensating rolls can either be driven or non-driven. Triple ring bearings are frequently installed in driven rolls that are based on an older design. When triple ring bearings are fitted, the stationary axis, known as the crosshead, is supported in the bearing inner ring. The rotating intermediate ring connects the drive to the roll sleeve.

2 Triple ring bearing Z-5..04.DRGL in a compensating roll



1	Rotating intermediate ring of bearing	2	Drive
3	Stationary axis	4	Barrel rollers
5	Bearing housing	6	Rotating roll sleeve

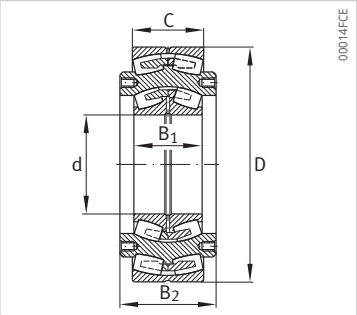
9 Product tables

9.1 Explanations

(1)	mm	Inner bearing
(2)	mm	Outer bearing
B	mm	Inner ring width
B_2	mm	Flange width
C	mm	Outer ring width
C_{0r}	N	Basic static load rating, radial
C_r	N	Basic dynamic load rating, radial
C_{ur}	N	Fatigue limit load, radial
d	mm	Bore diameter
D	mm	Outside diameter
m	kg	Mass
n_G	min^{-1}	Limiting speed

9.2 Z-5..04.DRGL

Beloit design



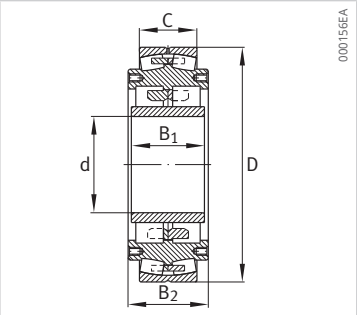
Z-5..04.DRGL

Designation	d	D	C	B_1	B_2	C_r (1)	C_{0r} (1)	C_{ur} (1)	C_r (2)	C_{0r} (2)	C_{ur} (2)
–	mm	mm	mm	mm	mm	N	N	N	N	N	N
Z-525349.04.DRGL	180	480	160	140	215.9	1470000	2470000	158000	2600000	5400000	360000
Z-531033.04.DRGL	200	520	180	160	241.3	1820000	3100000	202000	3100000	6500000	530000
Z-527870.04.DRGL	220	600	200	180	279.4	2240000	3850000	233000	3900000	8400000	670000
Z-531040.04.DRGL	240	620	200	200	279.4	2700000	4700000	360000	4050000	8800000	710000
Z-522933.04.DRGL	260	680	218	218	317.5	3250000	5700000	485000	4750000	10600000	710000
Z-525350.04.DRGL	280	720	218	218	317.5	3400000	6100000	520000	4950000	11300000	850000
Z-522401.04.DRGL	300	780	250	243	342.9	4050000	7400000	550000	5900000	13600000	910000
Z-525351.04.DRGL	320	820	258	258	368.3	4400000	8200000	610000	6400000	14600000	1050000
Z-522400.04.DRGL	340	870	272	280	393.7	5500000	10200000	820000	7100000	16700000	1200000
Z-522934.04.DRGL	380	980	308	300	431.8	6300000	11900000	930000	9000000	21500000	1460000
Z-563933.04.DRGL	400	1030	315	315	444.5	7000000	13400000	960000	9600000	23000000	1550000
Z-531796.04.DRGL	420	1090	335	335	457.2	8300000	16300000	1220000	10800000	26000000	1730000

n_G	m	Part number	Beloit	SKF	Torrington	Torrington	Standard bearing, inner	Standard bearing, outer
min^{-1}	kg	–	–	–	–	–	–	–
950	177	038474719-0000-10	O.S-20350-08	BSTB462825C	B9483G	–	24236-B-MB	24064-B-MB
850	231	038113740-0000-10	O.S-20350-12	BSTB462826C	B9484G	–	24240-B-MB	24068-B-MB
700	356	038113708-0000-10	O.S-20350-09	BSTB462827C	B9485G	–	24244-B-MB	24080-B-MB
670	370	038113759-0000-10	O.S-20350-11	BSTB462828C	B9486G	–	24248-MB	24084-B-MB
630	498	038113651-0000-10	O.S-20350-03	BSTB462606C	B9362G	B7362G	24252-B-MB	24092-B-MB
560	560	038113651-0000-10	O.S-20350-07	BSTB462829C	B9417G	–	24256-B-MB	240/500-B-MB
530	750	019065680-0000-10	O.S-20350-01	BSTB461619C	B9193G	B7193G	24260-B-MB	240/530-B-MB
500	864	038209136-0000-10	O.S-20350-04	BSTB461902C	B9194G	–	24264-B-MB	240/560-B-MB
480	1020	038208636-0000-10	O.S-20350-00	BSTB460924C	B9094G	B7094G	24268-B-MB	240/600-B-MB
450	1450	038208660-0000-10	O.S-20350-02	BSTB461903C	B9310G	B7310G	24276-B-MB	240/670-B-MB
430	1650	038213974-0000-10	O.S-20350-06	BSTB461874C	B9311G	B7311G	24280-B-MB	240/710-B-MB
400	1970	038210126-0000-10	O.S-20350-10	BSTB462862C	B9312G	–	24284-B-MB	240/750-B-MB

9.3 Z-5..04.DRGL

Küsters design



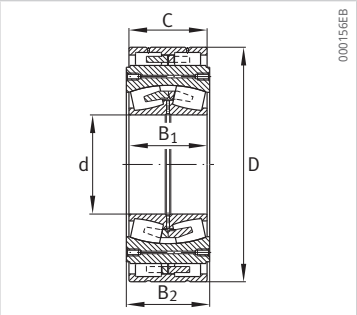
Z-5..04.DRGL

Designation	d	D	C	B_1	B_2	C_r (1)	C_{0r} (1)	C_{ur} (1)	C_r (2)	C_{0r} (2)	C_{ur} (2)
–	mm	mm	mm	mm	mm	N	N	N	N	N	N
Z-531149.04.DRGL	100	260	69	90	100	495000	730000	94000	590000	1180000	121000
Z-531150.04.DRGL	120	300	80	105	115	700000	1020000	126000	740000	1580000	117000
Z-531151.04.DRGL	140	360	100	119	129	900000	1290000	151000	1130000	2380000	218000
Z-531152.04.DRGL	160	420	118	138	148	1270000	1980000	225000	1580000	3400000	295000
Z-531153.04.DRGL	180	460	118	153	160	1430000	2290000	255000	1690000	3750000	320000
Z-531154.04.DRGL	200	520	140	175	180	1970000	3300000	355000	2270000	5200000	430000
Z-531156.04.DRGL	220	560	140	195	205	2240000	3750000	395000	2380000	5600000	450000
Z-531158.04.DRGL	240	600	160	215	225	2750000	4800000	500000	2900000	6700000	530000
Z-531159.04.DRGL	240	650	170	215	225	2900000	4750000	490000	3250000	7800000	600000
Z-531160.04.DRGL	260	680	170	233	248	3400000	6000000	610000	3450000	8400000	650000
Z-531162.04.DRGL	280	700	180	233	248	3400000	6100000	600000	3750000	9000000	680000
Z-531163.04.DRGL	300	780	200	258	273	4350000	7300000	690000	4500000	11200000	820000
Z-531177.04.DRGL	300	780	240	280	300	4750000	8300000	800000	5500000	13300000	980000
Z-531164.04.DRGL	320	820	218	273	288	4850000	8300000	750000	5200000	13400000	970000
Z-531166.04.DRGL	340	870	230	295	310	5500000	9900000	890000	5700000	14700000	1040000
Z-531165.04.DRGL	360	870	230	295	320	5300000	10200000	940000	5700000	14700000	1040000
Z-531167.04.DRGL	380	960	243	315	335	6500000	11200000	990000	6800000	16900000	1170000
Z-531168.04.DRGL	400	1010	258	330	350	6700000	12800000	1130000	7200000	18300000	1250000

n_G	m	Part number	Küsters	SKF	Standard bearing, inner	Standard bearing, outer
min^{-1}	kg	–	–	–	–	–
2000	25	064639428-0000-11	069.239.4-01	–	–	–
1500	37	038113767-0000-10	069.239.4-02	–	–	24944-B-MB
1200	58	038113775-0000-10	069.239.4-03	BVTB321656	–	24952-B-MB
1000	93	038113783-0000-10	069.239.4-04	321553A	–	24960-B-MB
950	131	038113791-0000-10	069.239.4-05	BVTB321647	–	–
800	179	038113805-0000-10	069.239.4-06	BVTB321558	–	–
700	237	038113813-0000-10	069.239.4-07	321557A	–	–
670	298	019069839-0000-10	069.239.4-08	321559A	–	–
630	380	038113821-0000-10	069.239.4-09	321561B	–	–
600	439	039628922-0000-10	069.239.4-10	–	–	–
560	453	038113830-0000-10	069.239.4-11	–	–	–
500	629	038113848-0000-10	069.239.4-12	321565B	–	–
530	727	–	–	–	–	–
500	761	–	069.239.4-13	–	–	–
480	928	–	069.239.4-14	–	–	–
480	891	019069871-0000-10	069.239.4-15	321 569B	–	–
450	1170	–	069.239.4-16	BVTB321646	–	–
430	1390	–	069.239.4-17	–	–	–

9.4 Z-5..04.DRGL

Farrel design



Z-5..04.DRGL

Designation	d	D	C	B_1	B_2	C_r (1)	C_{0r} (1)	C_{ur} (1)	C_r (2)	C_{0r} (2)	C_{ur} (2)
–	mm	mm	mm	mm	mm	N	N	N	N	N	N
Z-548685.04.DRGL	150	393.7	118	118	130.7	1040000	1700000	108000	1320000	2750000	280000
Z-562656.04.DRGL	170	444.5	140	140	152.7	1400000	2290000	197000	1370000	3450000	355000
Z-562657.04.DRGL	190	482.6	150	150	162.7	1630000	2800000	163000	1700000	4150000	405000
Z-561310.04.DRGL	220	539.75	180	180	192.7	2240000	3800000	233000	2500000	6400000	620000
Z-534669.04.DRGL	240	590.55	200	200	212.7	2700000	4700000	360000	2800000	7500000	690000
Z-562132.04.DRGL	240	615.95	200	200	212.7	2700000	4700000	360000	2850000	7700000	700000
Z-549731.04.DRGL	280	666.75	218	218	230.7	3400000	6100000	520000	3500000	9500000	850000
Z-562658.04.DRGL	300	717.55	243	243	255.7	4050000	7400000	550000	3700000	10600000	920000
Z-561702.04.DRGL	320	768.35	258	258	270.7	4400000	8200000	600000	4250000	12900000	1110000
Z-548181.04.DRGL	340	819.15	280	280	292.7	5500000	10200000	820000	4700000	15000000	1280000
Z-562659.04.DRGL	360	869.95	290	290	302.7	5900000	11100000	880000	5500000	17400000	1440000
Z-562660.04.DRGL	380	920.75	300	300	310.2	6300000	11900000	930000	6100000	18700000	1540000
Z-562661.04.DRGL	400	971.55	315	315	327.7	7000000	13400000	960000	7000000	21200000	1740000

n_G	m	Part number	Farrel	SKF	Torrington	Standard bearing, inner	Standard bearing, outer
min^{-1}	kg	–	–	–	–	–	–
1800	82	–	–	–	F-3818-C	24230-B	–
1600	121	–	–	–	F-3820-C	24234-B	–
1500	157	–	–	–	F-3822-C	24238-B	–
1300	222	–	–	–	F-3824-C	24244-B	–
1100	294	–	–	–	F-3826-C	24248-B	–
1000	327	–	236784-798-3	BVTB460228VAF	F-3828-C	24248-B	–
950	404	–	236784-803-3	BVTB460230VAF	F-3830-C	24256-B	–
850	512	–	236784-808-4	BVTB460232VAF	F-3832-C	24260-B	–
800	642	–	236784-813-0	BVTB460234VAF	F-3834-C	24264-B	–
750	796	–	236784-818-1	BVTB460236VAF	F-3836-C	24268-B	–
700	937	–	236784-823-8	BVTB460238VAF	F-3838-C	24272-B	–
670	1080	–	236784-828-9	BVTB460240VAF	F-3840-C	24276-B	–
630	1270	–	236784-833-5	BVTB460242VAF	F-3842-C	24280-B	–

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