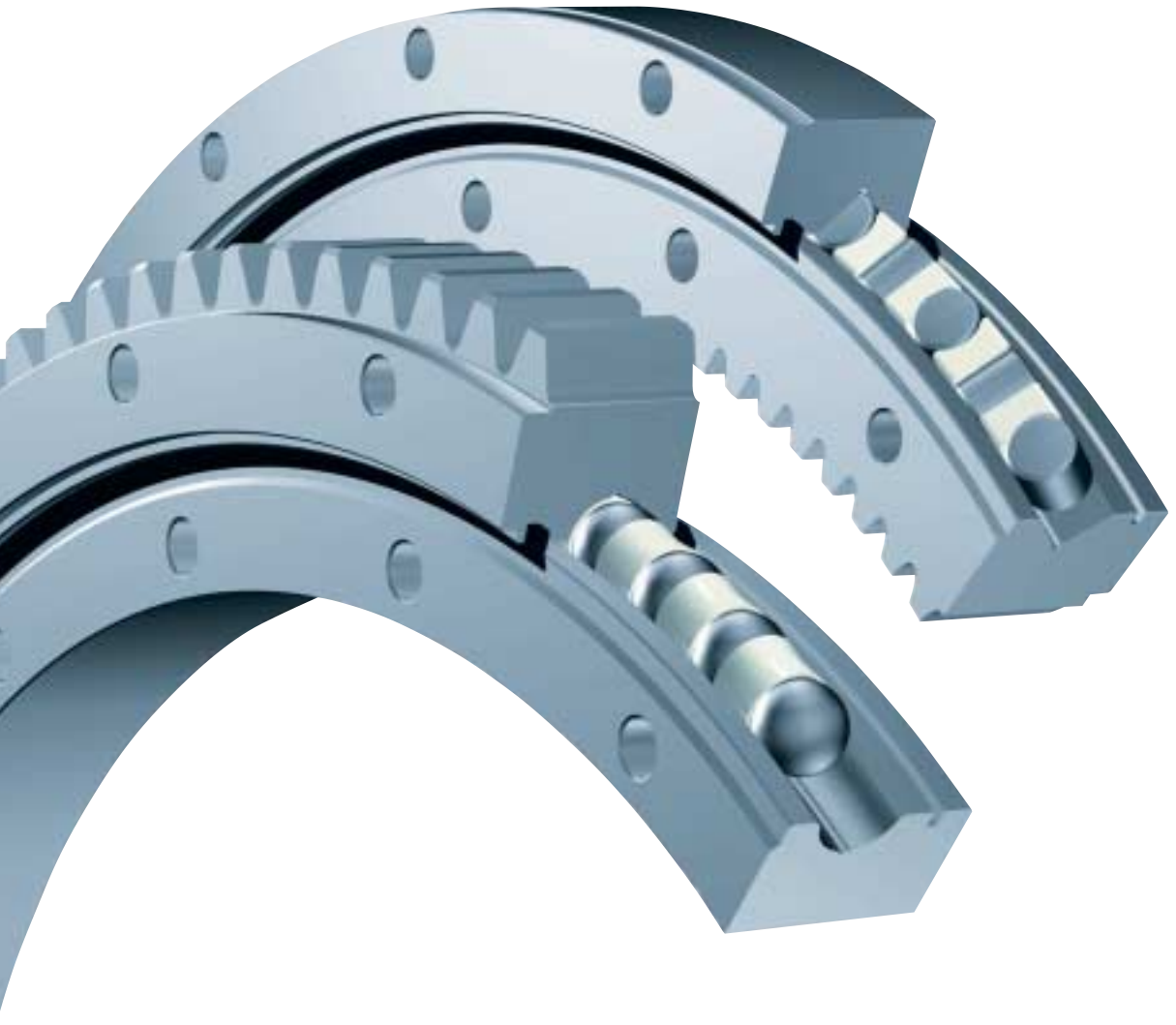


SLEWING RING CHARACTERISTICS, APPLICATIONS

Slewing rings are large-sized bearings which are able to accommodate combined load, i.e. axial, radial loads and tilting moment. They are usually provided with holes for fixing bolts, internal or external gear, lubrication holes and seals, which allow a compact and economical arrangement. They often enable elimination of many components necessary in the classical bearing arrangement.

PSL slewing rings have proven ability in the following applications
- construction, mobile and pillar cranes,
- shovel, digging-wheel excavators,
- revolving grabs and winches,
- graders,
- logging industry machines,
- loaders, vehicles for waste removal, hydraulic grippers,
- axles and undercarriages,
- assembly and access platforms,
- robots, manipulators and positioners,
- machine tools,
- special equipment (rescue vehicles, aerials, feller bunchers and tunnel machines, drilling equipment, wind-power plants, cleaning and bottle filling machines).

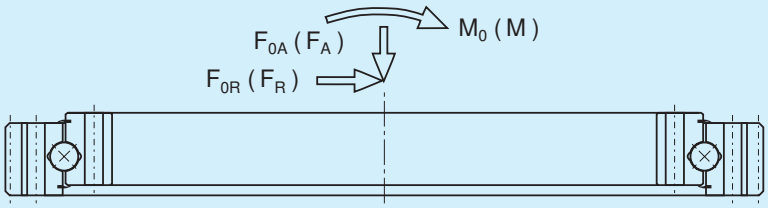
Compactness, accuracy and smooth operation with relatively high rigidity, together with simple mounting and reliability in operation are qualities that allow the use of these bearings in all industrial branches.

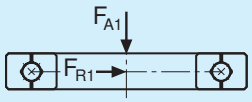
SELECTION OF SLEWING RING TYPE AND SIZE

Selection of a suitable slewing ring for common applications can be carried out from the point of view of the static load rating by means of the diagrams (curves) for the limiting static load of the raceways and fixing bolts (pages 32 - 62 of this publication) based on the calculated equivalent axial and moment static load.

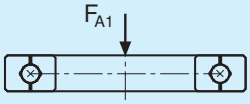
Slewing rings allow accomodation of combined loads, i.e. both axial and radial forces and tilting moments including eccentric loads. Typical examples of loading are shown in the following table.

Loading - Typical Examples

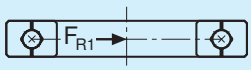




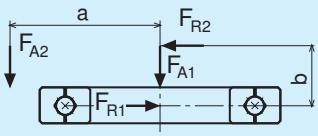
$F_A = F_{A1}$
$F_R = F_{R1}$
$M = 0$



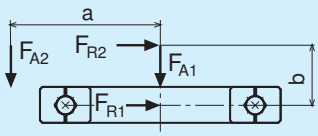
$F_A = F_{A1}$
$F_R = 0$
$M = 0$



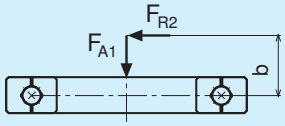
$F_A = 0$
$F_R = F_{R1}$
$M = 0$



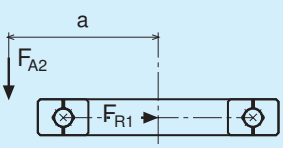
$F_A = F_{A1} + F_{A2}$
$F_R = |F_{R2} - F_{R1}|$
$M = F_{A2} . a + F_{R2} . b$



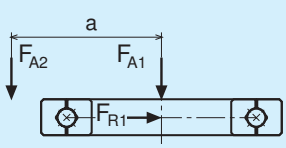
$F_A = F_{A1} + F_{A2}$
$F_R = F_{R1} + F_{R2}$
$M = |F_{A2} . a - F_{R2} . b|$



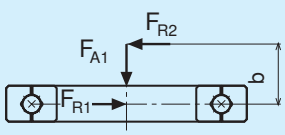
$F_A = F_{A1}$
$F_R = F_{R2}$
$M = F_{R2} . b$



$F_A = F_{A2}$
$F_R = F_{R1}$
$M = F_{A2} . a$



$F_A = F_{A1} + F_{A2}$
$F_R = F_{R1}$
$M = F_{A2} . a$



$F_A = F_{A1}$
$F_R = |F_{R2} - F_{R1}|$
$M = F_{R2} . b$

Calculation of Equivalent Axial and Moment Static Load

Slewing Rings	Formula	Valid if
Four-Point Contact Ball Slewing Rings	$F'_{OA} = (F_{OA}+5.05.F_{OR}).s_O$ $M'_{OK} = M_{OK}.s_O$	$0.1 < \frac{F_{OR}}{F_{OA}} < 8$ $\quad e > 2$
	$F'_{OA} = (1.23.F_{OA}+2.68.F_{OR}).s_O$ $M'_{OK} = 1.23.M_{OK}.s_O$	$0.1 < \frac{F_{OR}}{F_{OA}} < 8$ $\quad e \leq 2$
Crossed Roller Slewing Rings	$F'_{OA} = (F_{OA}+2.05.F_{OR}).s_O$ $M'_{OK} = M_{OK}.s_O$	$0.1 < \frac{F_{OR}}{F_{OA}} < 8$

Where: F_{OA} - Σ of axial static forces for slewing ring [kN]
F_{OR} - Σ of radial static forces for slewing ring [kN]
M_{OK} - Σ of tilting moments for slewing ring (static) [kNm]
s_O - coefficient of static safety (values - see Table 3) [–]
$e = \frac{2000.M_{OK}}{F_{OA}.D_S}$ - parameter of the load eccentricity [–]
D_S - slewing ring mean diameter [mm]

Note: - if: $\frac{F_{OR}}{F_{OA}} < 0.1$ - when calculating the equivalent load, radial force need not be taken into account.

The calculated values of the axial and moment static load define the coordinates of the working point in the diagram for the limiting static load of the slewing ring. The working point must lie under the curve for the bolt static load. Example - see chapter DIAGRAMS FOR LIMITING STATIC LOAD, page 31.

Suitability for a given application from the point of view of gear dimensioning can be evaluated by comparison of the real nominal and maximal circumferential forces with allowed circumferential forces for the gear. Allowed nominal and maximal circumferential forces - Slewing Ring Tables.

Calculation of the nominal and maximal circumferential force:

$$F_{Tmen} = \frac{2000.M_{Tmen}}{m.(z+2x)}$$

$$F_{Tmax} = \frac{2000.M_{Tmax}}{m.(z+2x)}$$

Where:
F_{Tmen} - nominal circumferential force [kN]
F_{Tmax} - maximal circumferential force [kN]
M_{Tmen} - nominal rotating moment [kNm]
M_{Tmax} - maximal rotating moment [kNm]
m - gear module [mm]
z - number of teeth [–]
x - unit displacement of the basic profile (unit correction) [–]

The main criteria for evaluating of the gear suitability is the fatigue resistance of bending and max. static load transmission. Following conditions must be fulfilled:

$F_{Tmen} \leq F_{TDov}$ - for fatigue resistance of bending (values - see Slewing Ring Tables)
$F_{Tmax} \leq F_{TmaxDov}$ - for max. static load transmission (values - see Slewing Ring Tables)

Figure 1

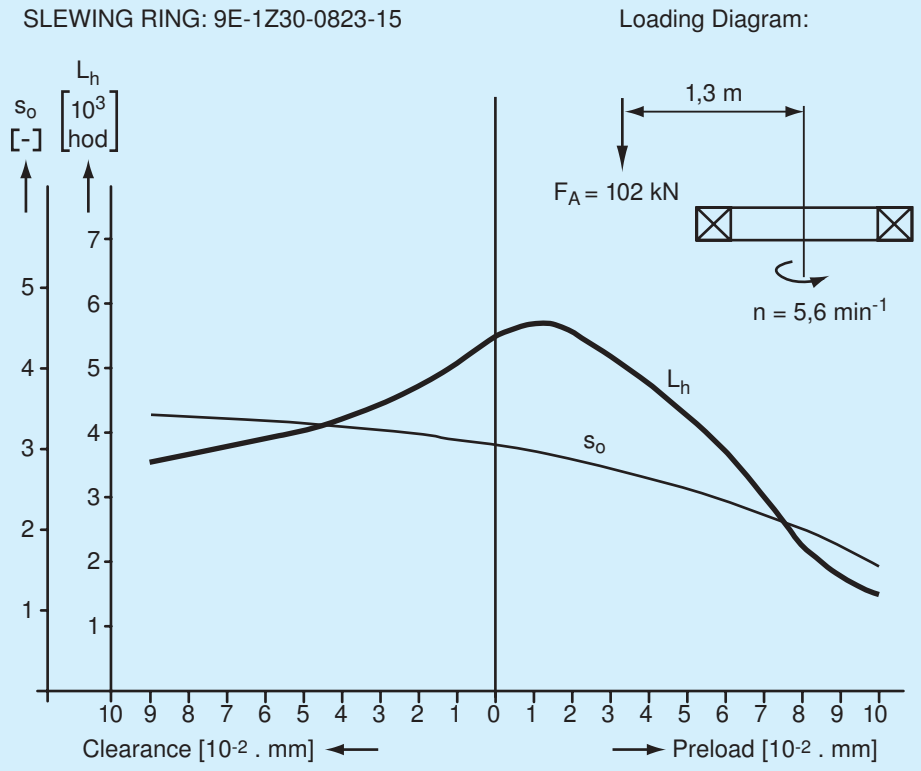
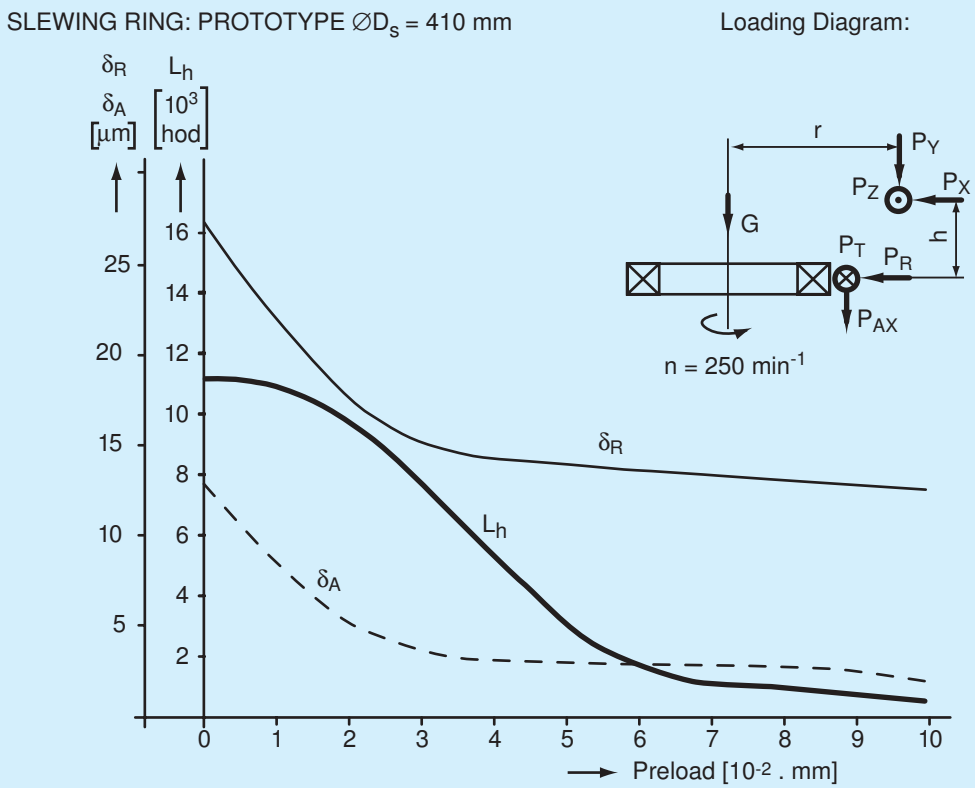


Figure 2



Mouting Procedure

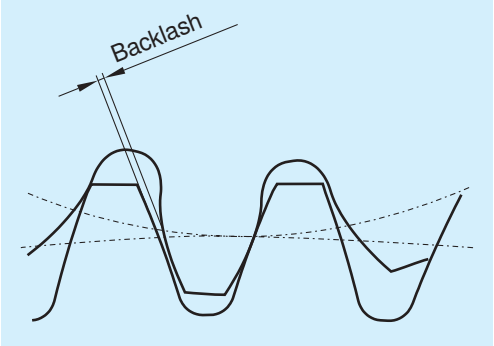
Before assembling it is necessary to clean all surfaces thoroughly from burrs, paint residues, etc. Seating surfaces should be dry, without lubricant. Furthermore it is necessary to inspect flatness of the seating surfaces. Feeler gauges are used to check slewing ring adaptation.

The unhardened area of the non rotating ring should be mounted so that it is positioned in the least loaded zone - i.e. in the plane perpendicular to the main load plane.

The unhardened area is marked on the respective ring non-functional surface with symbol "X" by stamping or with a red line.

When assembling a geared slewing ring it is important to adjust the backlash in the gear correctly. It is adjusted with a feeler gauge or with another suitable method in the zone of maximum radial gear runout. The extent of the backlash should be in the range of (0.035-0.04).m, where "m" means the gear module. The backlash should be inspected again after the slewing ring is finally fixed on the machine. The zone of the maximum radial gear runout is marked with a blue line in the gap between teeth.

Slewing rings are fixed on the machine with pre-stressed bolts. Before assembly the mounting bolts should be coated slightly with oil. The necessary tightening torgue for corresponding bolt size and material is indicated in Table 1.



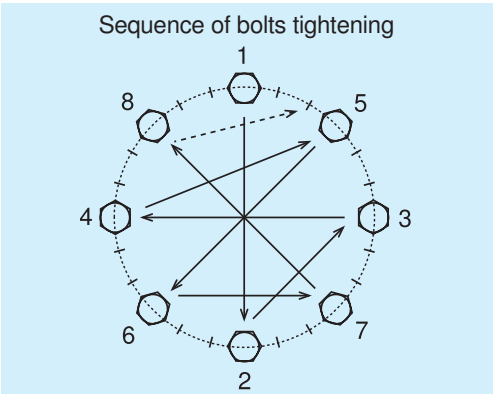


Table 1

Bolt Thread Size	Bore Diameter [mm] DIN/ISO 273	Tightening torgue at μ = 0.14 [Nm] Rigidity Class of Bolt 8.8	Rigidity Class of Bolt 10.9
M 12	14	78	117
M 14	16	126	184
M 16	17.5	193	279
M 18	20	270	387
M 20	22	387	558
M 24	26	666	954
M 27	30	990	1395
M 30	33	1350	1890
		Grade 5	Grade 8
UNC 5/8“-11	18	180	260
UNC 3/4“-10	21	320	460
UNC 7/8“-9	25	520	730
UNC 1“-8	27.5	770	1100
UNC 1 1/8“-7	32	970	1560
UNC 1 1/4“-7	35	1370	2190
		Grade 5	Grade 8
UNF 5/8“-18	18	210	290
UNF 3/4“-16	21	360	510
UNF 7/8“-14	25	580	820
UNF 1“-12	27.5	860	1210
UNF 1 1/8“-12	32	1100	1760
UNF 1 1/4“-12	35	1520	2440

Slewing Ring Inspection in Operation

During service it is necessary to regularly recheck the fixing bolts torque at the in recommended intervals. Individual inspection intervals vary according to machine operation conditions.

When inspecting, the following method can be used (approximately valid for crane operation):

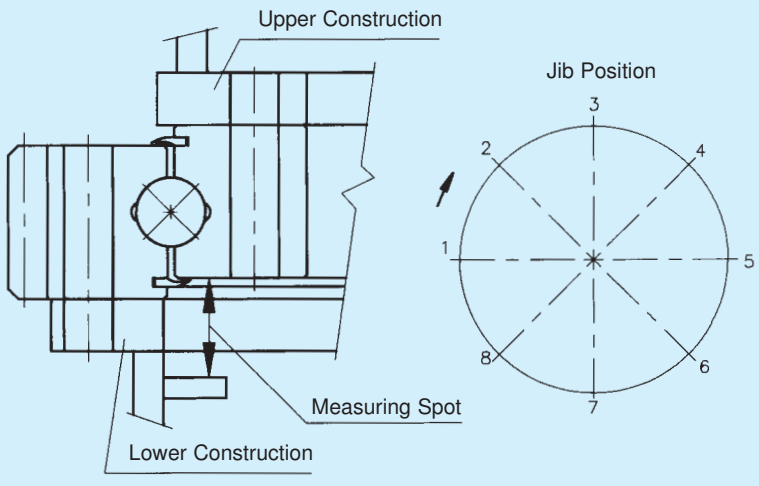
Inspection No.	Number of Operating Hours	Inspecting Action
1.	About 200 Hours	- inspection of all bolts torque - if more than 10% of bolts are loose, another inspection is necessary after about 200 operating hours
2.	About 600 Hours	- inspection of all bolts torque
3. and further	After about 2 000 Hours	- if one or more bolts are loose to less than 80% of the prescribed torque, these and both adjoining bolts must be replaced by new ones - if 20% of all bolts have less than 80% of prescribed torque, all bolts must be replaced by new ones
	Each 12 000 Hours	- replace all bolts by new ones

Note: Specified inspection intervals must be shortened by 1/2 up to 1/3 for machines loaded more heavily by vibrations or dynamically.

In addition to the fixing bolts check, raceway wear checking is also carried out in operation (mainly at significant important rotary connections) using the measurement method "tilting clearance". The tilting clearance is the difference of the mutual ring displacement in axial direction measured under load by minimum and maximum tilting moment. In the operation register of the equipment the initial tilting clearance is recorded (in the jib position 1 to 8) and its enlargement is then followed in certain time intervals. The principle of the tilting clearance measurement and an example of the measuring record are shown in Figure 3.

More detailed technical information concerning slewing ring checking can be provided by the experts of PSL, Technical Consultancy Department.

Figure 3



Slewing Ring Tables

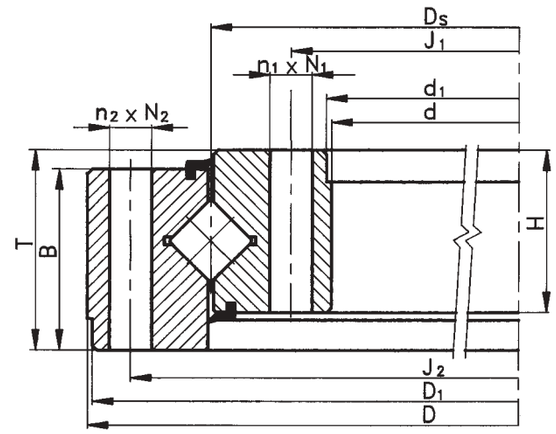
The following Tables (pages 14 - 27) show the standard PSL slewing rings whose cross-section corresponds to the figure above the Table. Any deviations are specified in the notes.

Further Tables (pages 28 - 30) show special slewing rings whose cross-section does not correspond to the figures over the Tables, or they differ from the standard design (e.g. they have irregular spacing of the fastening holes, special gear, higher tolerance class, are non-sealed from one or both sides, or have non-standard shape of the rings, etc.). More detailed information concerning these slewing rings can be provided by the experts of the PSL Technical Consultancy Department, address - see page 2.

The tables of the special slewing rings show some types designated by the designation PSL 912-... They are slewing rings of the old three-ring design (one ring is split).

CROSSED ROLLER SLEWING RINGS

- without gear [O]



Number of the Loading Curve	Boundary Dimensions d	D	T	Static Ax.Basic Load Rating C_{oa}	Designation	Weight G	Abutment Dimensions J_1	J_2	N_1	N_2	n_1	n_2	Other Specifications d_1	D_1	H	B	Note No
	[mm]			[kN]		[kg]	[mm]						[mm]				
100	**130**	310	65	777	**9O-1Z20-0220-0184**	23	162	278	17	17	10	10	-	-	57	57	
101	**136**	250	40	436	**9O-1Z14-0193-0152**	8.2	156	230	11	11	12	12	-	-	35	35	
102	**140**	300	36	420	**9O-1Z12-0222-0440-1**	12	170	270	M16	M16	6	12	-	-	30	30	
103	**140**	300	39	420	**9O-1Z14-0222-0440**	12.5	170	270	18	M16	12	12	-	-	33	33	
104	**160**	266	30	313	**9O-1Z10-0216-0177**	6.3	176	252	8.5	M8	6	8	-	-	24	27	
105	**180**	332	42	581	**9O-1Z14-0254-0168**	13.8	210	300	13	13	21	24	-	-	35	35	1
106	**200**	304	30	359	**9O-1Z10-0250-0176**	7.7	216	288	8.5	M8	6	8	-	-	24	27	
107	**220**	370	64	1070	**9O-1Z20-0295-0151**	26	245	345	11	11	12	12	-	-	55	55	
108	**230**	400	68	1321	**9O-1Z25-0315-0487**	32	255	375	15	15	24	23	-	-	58	58	2
109	**234**	403.5	55	979	**9O-1Z20-0308-0298**	26	259	358	13	13	25	24	235.057	379.868	45	45	3
110	**240**	360	36	701	**9O-1Z14-0300-0378**	12.5	260	340	8.4	8.4	12	12	242	358	31	31	
111	**250**	366	40	702	**9O-1Z14-0305-0218**	14	270	345	11	11	20	20	-	365	35	35	
112	**300**	500	80	2099	**9O-1Z30-0400-0488**	59.5	330	470	17	17	24	23	-	-	70	70	2
113	**304**	465	50	988	**9O-1Z16-0384-0219**	30	334	434	17	17	16	16	-	464	45	45	
114	**340**	550	90	2449	**9O-1Z30-0461-28-1**	75	380	515	M20	M20	21	20	-	-	76	72	4; 5; 6
115	**340**	550	90	2449	**9O-1Z30-0461-28-2**	75	380	515	22	M20	21	20	-	-	76	72	4; 5; 6
116	**340**	580	86	2449	**9O-1Z30-0461-0125**	90	380	540	M20	22	21	20	-	-	76	76	4
117	**340**	550	90	2449	**9O-1Z30-0461-0260**	76.5	380	515	22	M20	21	20	-	-	72	80	4; 5
118	**340**	580	86	2449	**9O-1Z30-0461-0278**	90	380	540	22	22	21	20	-	-	76	76	4
119	**435**	698.5	76	3031	**9O-1Z30-0561-0432**	122	473	644.5	24	20.5	24	18	-	-	76	76	7
120	**465**	725	100	4244	**9O-1Z40-0595-0480**	146	505	685	22	22	30	29	-	-	90	90	8
121	**640**	868	97	4197	**9O-1Z30-0766-38**	163	684	838	M20	M20	30	30	-	-	87	82	5
122	**715**	935	100	4433	**9O-1Z30-0823-15-1**	166	753	893	22	22	18	18	718	-	81	79	9
123	**868**	1095	100	5365	**9O-1Z30-0980-16-8**	208	910	1050	17	17	18	18	870	-	85	79	10
124	**870**	1095	85	5365	**9O-1Z30-0980-0163**	182	910	1050	22	22	18	18	-	-	75	75	
125	**870**	1095	95	5365	**9O-1Z30-0980-0105**	195	910	1050	22	22	36	36	-	-	85	85	
126	**1120**	1300	60	4152	**9O-1Z20-1210-0195**	121	1152	1268	17	17	30	30	-	-	50	50	
127	**1430**	1808	141	11879	**9O-1Z40-1584-0159**	858	1485	1671	33	M27	30	30	1437	-	118	125	5
128	**1610**	2025	130	13786	**9O-1Z40-1815-0106**	1020	1680	1950	35	M24	36	24	-	-	110	115	
129	**1891**	2245	140	20230	**9O-1Z50-2071-0315**	960	1950	2190	32	32	45	45	1896	2240	125	125	
130	**2095**	2420	135	16971	**9O-1Z40-2248-55**	1020	2140	2365	26	33	48	32	2100	-	120	125	

1 Fixing holes on inner ring are divided on the circumference with spacing a' 360°/24 (3 places a' 90° are not occupied)
2 Fixing holes on outer ring are divided on the circumference with spacing a' 360°/24
3 Fixing holes on inner ring are divided on the circumference with spacing a' 360°/28 (3 places a' 90° are not occupied)
4 Fixing holes on inner ring are divided on the circumference with spacing a' 360°/22
5 Non-through tapped fixing holes on outer ring
6 Centering of inner ring is on the outer diameter ∅ 440 into the depth 8
7 Fixing holes on outer ring are recessed on ∅ 32 into the depth of 21
8 Fixing holes on outer ring are divided on the circumference with spacing a' 360°/30
9 Centering of outer ring is on the inner diameter ∅ 845 into the depth 10
10 Centering of outer ring is on the inner diameter ∅ 993 into the depth 6.5

SPECIAL SLEWING RINGS

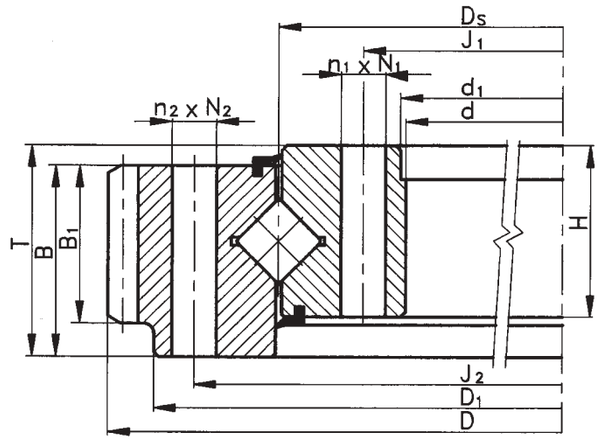
- without gear [O]

BALL SLEWING RINGS				
Designation	Boundary Dimensions			Weight
	d	D	B	
	[mm]			[kg]
9O-1B17-0183-0320	140	240	22	4
9O-1B17-0183-0245	140	240	22	4.15
9O-1B17-0183-0482	140	240	26	4.5
9O-1B17-0183-0322	140	266	22	4.5
9O-1B17-0183-0332	140	266	22	4.5
9O-1B17-0183-0244	140	266	22	5
9O-1B25-0310-0239	199.8	410	75	33
9O-1B25-0310-0239-1	199.8	410	75	33
9O-1B14-0225-0360	200	289.5	23.75	4.8
9O-1B14-0225-0491	200	290	24	5.6
9O-1B21-0310-0269	235	462	55	34
9O-1B21-0310-0269HL	235	462	55	34
9O-1B30-0360-0340	265	455	75	44
9O-1B25-0408-0292	276	540	67	51
9O-1B25-0410-0404	296.6	510	76	44
9O-2B25-0410-0498	296.6	510	106	74
9O-1B22-0414-0490	304	517.9	56	24.5
9O-1B33-0460-0405	329.4	570	90	75
9O-1B20-0405-0229	336	475	45	26.5
9O-1B25-0440-0270	366	577	53.5	42
9O-1B25-0440-0270HL	366	577	53.5	42
9O-1B25-0474-0293	380	605	72	53.8
9O-1B25-0475-0289	400	545	59	40
9O-1B22-0544-0429	434.1	648	55.9	32
9O-1B25-0550-0272	440	691	68.5	87
9O-1B25-0550-0272HL	440	691	68.5	87
9O-1B20-0530-0228	460	600	45	34.9
9O-1B20-0590-0271	505	670	71	57
9O-1B20-0590-0271HL	505	670	71	57
9O-1B20-0590-0501	505	670	71	61
9O-1B20-0590-0501HL	505	670	71	61
9O-1B20-0660-0132	559	762	38	55.5
9O-1B22-0744-0489	634	848.1	56	43.5
9O-1B13-0787-0230	742	832	40	30.5
9O-1B17-0945-0426	880	1023.5	42.5	49.5
9O-1B35-1065-0474	935	1195	93	265
9O-1B36-1282-0422	1127	1447	65	280
9O-1B25-1898-0127	1810	1985	80	262.5

CYLINDRICAL ROLLER SLEWING RINGS				
Designation	Boundary Dimensions			Weight
	d	D	B	
	[mm]			[kg]
9O-1Z10-0147-0376	60	240	37	10.5
9O-1Z10-0225-0247	170	290	28	6
9O-1Z10-0225-0456	200	295	30	5.3
9O-1Z20-0282-0291	212	352	40	17.5
9O-1Z14-0280-0138	240	320	35	8.6
9O-1Z20-0344-0395	250	438	63	38.5
9O-1Z10-0280-0423	250	310	25	5
9O-1Z14-0305-0115	250	365	37	14.4
9O-1Z22-0337-0416	280	389	55	23
9O-1Z25-0384-0246	300	455	85	48
9O-1Z14-0384-86	300	460	60	34.3
9O-1Z25-0384-18	300	460	85	45.3
9O-1Z25-0384-0403S	300	460	85	47.5
9O-1Z14-0384-86-1	300	500	60	39.4
9O-1Z14-0405-0137	335	475	45	27
9O-1Z14-0405-0155	336	475	45	27
9O-2Z25-0400-0143	340	460	123	61.5
9O-1Z30-0461-28	340	550	90	75
9O-1Z14-0405-0147	345	478	42	18.9
9O-1Z14-0405-0148	345	478	42	18
9O-1Z14-0530-0154	460	600	45	36.2
9O-1Z16-0548-0338	470	626	50	39
9O-1Z20-0550-0424	500	600	40	26
9O-1Z30-0766-38-1	640	868	97	169
9O-1Z10-0787-0262	734	844	40	38
9O-1Z10-0787-0199	742	832	40	30.5
9O-1Z30-0980-16-3	868	1095	100	208
9O-1Z40-1621-0425	1404.5	1810	150	890
9O-1Z40-2248-55-1	2095	2420	135	1020

CROSSED ROLLER SLEWING RINGS

- with external gear [E]



Number of the Loading Curve	Boundary Dimensions d	D	T	Static Ax.Basic Load Rating C_{oa}	Designation	Weight G	Abutment Dimensions J_1	J_2	N_1	N_2	n_1	n_2	Other Specifications d_1	D_1	H	B	B_1	m(DP)	z	x	Permisible circumferencial force F_{TDov}	$F_{TmaxDov}$	Note No
	[mm]			[kN]		[kg]	[mm]						[mm]								[kN]		
131	**140**	348	39	508	**9E-1Z14-0222-0439**	17.9	170	270	18	M16	12	12	-	-	33	33	44	3	114	-	10	21	
132	**180**	342	42	581	**9E-1Z14-0254-0110**	14.5	210	300	M12	13	21	24	-	324	35	35	30	3	112	-	6	13	1
133	**180**	342	42	581	**9E-1Z14-0254-0110-1**	15.5	210	300	M12	M12	21	12	-	324	35	35	30	3	112	-	6	13	1
134	**234**	403.5	55	803	**9E-1Z16-0310-0111**	23.5	259	358	M12	13	25	24	235	380	47	45	39	4.5	88	-	13	26	2
135	**234**	403.5	55	803	**9E-1Z16-0310-0111-1**	25	259	358	13	M12	25	24	235	380	47	45	39	4.5	88	-	13	26	2
136	**235**	403.5	55	803	**9E-1Z16-0310-0517**	24	259	358	13	13	27	24	-	379	45	46	40	4.5	88	-	13	26	3
137	**300**	475	85	1632	**9E-1Z25-0384-18-1**	50	323	430	13	M16	19	16	-	450	70	75	60	5	93	-	15	30	4
138	**340**	579.8	90	2449	**9E-1Z30-0461-0126**	86.2	380	515	M20	M20	21	20	-	550	72	80	62	5	114	-	16	32	5;6
139	**340**	579.8	90	2449	**9E-1Z30-0461-0119**	83	380	515	22	M20	21	20	-	550	72	80	62	5	114	-	16	32	5;7
140	**380**	589.5	75	1564	**9E-1Z20-0474-0100**	67	410	540	17	M16	18	18	384	565	58	60	40	4.5	129	-	13	27	7
141	**390**	654	85	2683	**9E-1Z30-0508-0236**	98	432	582	22	22	29	30	392	610	73	73	60	8	80	-	44	88	8
142	**573**	816	90	2878	**9E-1Z25-0675-0145**	120	604	753	22	22	18	18	573	781	70	73	65	6	132	+1.092	42	85	
143	**634**	846	75	2491	**9E-1Z20-0730-0101**	105	667	795	17	17	18	18	640	822	58	60	40	4.5	186	-	13	27	7
144	**640**	909	90	4197	**9E-1Z30-0766-0214**	176.5	684	838	22	M20	29	30	-	875	80	80	65	4.5	200	-	22	44	7;8
145	**715**	976	100	4433	**9E-1Z30-0823-37**	177	753	893	22	22	18	18	-	-	84	83	83	8	120	-	34	69	
146	**715**	979	100	4433	**9E-1Z30-0823-15**	180	753	893	22	22	18	18	718	932	81	79	63	10	94	+1.1	47	94	9
147	**715**	979	100	4433	**9E-1Z30-0823-15-2**	183	753	893	22	22	18	18	718	932	81	79	70	10	94	+1.1	52	105	9
148	**715**	979	100	4433	**9E-1Z30-0823-80**	176	753	893	22	22	35	36	718	932	81	79	63	10	94	+1.1	73	146	9;10
149	**715**	980	100	4433	**9E-1Z30-0823-15-3**	180	753	893	22	22	18	18	718	932	81	79	63	10	96	-	38	77	9
150	**868**	1144	100	5365	**9E-1Z30-0980-16**	230	910	1050	22	22	18	18	870	1095	85	79	66	10	111	+0.7	49	99	11
151	**890**	1080	82	4278	**9E-1Z25-0984-0452**	125	922	1015	M16	M16	30	30	895	1043	67	70	62	8	133	-	47	95	7
152	**890**	1089	90	4277	**9E-1Z25-0980-0294**	141	922	1015	18	M16	30	30	-	-	67	75	75	9	119	-	54	108	7
153	**984**	1289.5	114	7413	**9E-1Z36-1116-0237**	325	1035	1198	22	22	40	40	985	1240	94	90	78	10	125	+1.05	90	180	
154	**1000.76**	1286.66	127	8273	**9E-1Z40-1121-0460**	411	1043.69	1198.63	3/4-10 UNC	3/4-10 UNC	36	36	-	-	117.35	117.35	117.35	(3)	150	-	79	158	12
155	**1014**	1290.32	130.65	8274	**9E-1Z40-1124-0436**	385	1054.1	1193.8	M20	M20	32	32	1016	-	107.95	120.65	120.65	(2.5)	125	-	98	196	12;13
156	**1084**	1476	110	9332	**9E-1Z40-1250-0263**	478	1150	1350	26	26	28	24	1085	1415	100	90	77	10	144	+0.86	84	169	
157	**1206**	1604	130	13372	**9E-1Z50-1390-0231**	635	1280	1494	24	24	47	48	1208	1551	116	107	85	10	157	+0.75	82	164	14
158	**1430**	1808	141	11879	**9E-1Z40-1584-26**	772	1485	1671	33	M27	30	30	1437	-	118	125	125	16	111	-	104	208	7;15
159	**1430**	1800	141	11879	**9E-1Z40-1584-26-1**	768	1485	1671	33	M27	30	30	1437	-	118	125	125	12	148	-	78	156	7;15
160	**1430**	1800	141	11879	**9E-1Z40-1584-0371**	768	1485	1671	33	M27	34	34	1437	-	118	125	125	16	111	-	192	384	7;15
161	**1615**	2027	150	17485	**9E-1Z50-1790-0232**	1025	1675	1905	30	30	36	36	1617	1960	128	130	120	14	142	+0.7	194	389	16
162	**1680**	2028	120	10148	**9E-1Z30-1830-0297**	625	1745	1915	30	30	48	48	-	-	100	90	90	10	200	+0.4	68	136	
163	**1686**	2034	120	13999	**9E-1Z40-1848-0328**	700	1750	1936	27	M24	24	24	1690	1984	102	102	90	9	224	-	64	129	17
164	**2320**	2613.6	109	13532	**9E-1Z30-2435-0349-1**	702	2360	2510	M20	17.5	24	24	-	-	79	100	100	12	216	-	91	182	

Notes

1 Fixing holes on inner ring are divided on the circumference with spacing a' 360°/24 (3 places a' 90° are not occupied)
2 Fixing holes on inner ring are divided on the circumference with spacing a' 360°/28 (3 places a' 90° are not occupied)
3 Fixing holes on inner ring are divided on the circumference with spacing a' 360°/28
4 Fixing holes on inner ring are divided on the circumference with spacing a' 360°/20
5 Fixing holes on inner ring are divided on the circumference with spacing a' 360°/22
6 Non-through tapped fixing holes on both rings
7 Non-through tapped fixing holes on outer ring
8 Fixing holes on inner ring are divided on the circumference with spacing a' 360°/30
9 Centering of outer ring is on the inner diameter ∅ 845 into the depth 10
10 Fixing holes on inner ring are divided on the circumference with spacing a' 360°/36
11 Centering of outer ring is on the inner diameter ∅ 993 into the depth 6.5
12 Gear Involute Full Depth α = 20°
13 Centering of outer ring is on the inner diameter ∅ 1130.3 into the depth 6.35
14 Fixing holes on inner ring are divided on the circumference with spacing a' 360°/48
15 Centering of outer ring is on the inner diameter ∅ 1608 into the depth 10
16 Centering of outer ring is on the inner diameter ∅ 1808 into the depth 10
17 Centering of outer ring is on the inner diameter ∅ 1860 into the depth 9

SPECIAL SLEWING RINGS

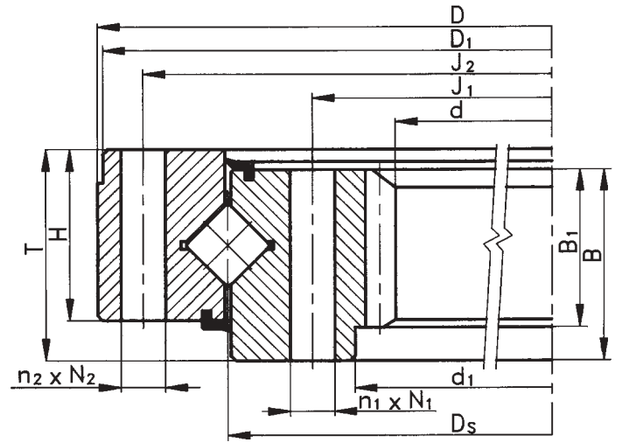
- with external gear [E]

BALL SLEWING RINGS				
Designation	Boundary Dimensions			Weight
	d	D	B	
	[mm]			[kg]
9E-1B20-0287-0499	**210**	373	40	18.5
9E-1B20-0287-0442	**210.1**	373	40	19.5
9E-1B32-0419-0398	**319**	530.22	71.4	68
9E-1B45-0453-0505	**327.15**	600.7	87.38	114.5
9E-1B32-0521-0469	**412.75**	651.51	88.9	107
9E-1B32-0519-0486	**412.75**	654.1	88.9	108
9E-1B30-0520-0500	**413**	654	89	108
9E-1B45-0559-0465	**431.8**	721.36	87.38	138
9E-1B45-0559-0348	**435.1**	721.36	87.38	145
9E-1B45-0614-0453	**479.6**	766.216	88.4	150
9E-1B20-0744-0448	**634**	838.8	56	54
9E-1B45-0857-0336	**714.25**	981.7	125.5	255
9E-1B45-0857-0347	**714.25**	981.73	125.5	265
9E-1B40-0867-0466	**752.35**	1011.76	82.5	165
9E-1B20-0969-0213	**893**	1079	90	135
9E-1B20-0969-0213-1	**893**	1079	90	141
9E-1B25-0984-0445	**895**	1078	100	154
9E-2B20-0971-0112	**895**	1079.12	80	130
9E-1B40-1676-0494	**1546.23**	1849.12	76.2	406

CYLINDRICAL ROLLER SLEWING RINGS				
Designation	Boundary Dimensions			Weight
	d	D	B	
	[mm]			[kg]
9E-1Z10-0152-0307	**101.6**	217	31.75	5.3
9E-1Z10-0152-0524	**101.6**	219.075	31.75	5.3
9E-1Z14-0305-3-1	**245**	381	40	17
PSL912-25-1	**350**	868.47	177	424
9E-1Z20-0498-0227	**408**	586.4	75	60
9E-1Z30-0668-0331	**518**	848	120	232
9E-1Z30-0668-0331-1	**518**	848	120	232
9E-1Z40-0855-45	**640**	1082.45	192	574
9E-1Z30-0823-0277	**718**	979	100	186.5
PSL912-37	**715**	979	100	177
PSL912-23-1	**780**	1340.5	215	845
9E-1Z30-0980-0224	**868**	1144	100	220
9E-1Z30-0980-0276	**868**	1144	100	245
9E-1Z30-0980-16-1	**868**	1144	100	229
9E-1Z30-0980-16-4	**868**	1144	100	225
9E-1Z30-0980-16-4P4	**868**	1144	100	225
9E-1Z30-0980-16-1P5	**868**	1144	100	229
9E-1Z30-0980-16-1S	**868**	1144	100	229
9E-1Z30-0980-16-7	**868**	1144	100	229
9E-1Z30-0980-16-1P4	**868.8**	1144	99.2	229
9E-1Z30-0980-0458	**869**	1144	100	219
9E-1Z30-1035-21	**880**	1220	120	361
9E-1Z30-1035-21-1	**880**	1220	120	360
9E-1Z30-1420-22	**1270**	1620	135	692
PSL912-36	**1270**	1620	135	727
9E-1Z35-2435-0349	**2320**	2613.6	109	695

CROSSED ROLLER SLEWING RINGS

- with internal gear [I]



Number of the Loading Curve	Boundary Dimensions d	D	T	Static Ax.Basic Load Rating C_{oa}	Designation	Weight G	Abutment Dimensions J_1	J_2	N_1	N_2	n_1	n_2	Other Specifications d_1	D_1	H	B	B_1	m(DP)	z	x	Permisible circumferencial force F_{TDov}	$F_{TmaxDov}$	Note No
	[mm]			[kN]		[kg]	[mm]						[mm]								[kN]		
165	**325.5**	486	56	1081	**9I-1Z16-0415-0189**	31	375	460	M12	14	24	24	-	484	44	48	48	5	67	-	20	41	1
166	**325.5**	486	56	1081	**9I-1Z16-0415-0196**	31	375	460	13	M12	24	24	-	484	44	48	48	5	67	-	20	41	2
167	**332.8**	486	56	1081	**9I-1Z16-0415-0510**	31	375	460	13	M12	24	24	-	484	44	48	48	4	85	-	16	32	2
168	**634**	905	85	4315	**9I-1Z30-0790-0475**	161	715	865	21	21	36	36	670	-	75	75	68	8	81	-	48	97	
169	**824**	1170	120	5714	**9I-1Z30-1035-0174**	363	940	1120	M30	26	16	24	866	-	100	100	80	8	105	-	66	133	1
170	**940**	1190	100	5949	**9I-1Z30-1090-0103**	208	1040	1160	M20	18	36	36	990	-	65	90	80	10	94	-1	88	176	1; 3
171	**958**	1225	90	6181	**9I-1Z30-1120-0356**	244	1050	1190	M20	21	36	30	-	1223	80	80	80	11	88	-0.5	102	204	
172	**961**	1175	90	4667	**9I-1Z25-1075-0300**	170	1040	1134	M16	18	36	36	1010	1165	75	75	65	10	98	-	68	136	1
173	**963**	1365	170	8697	**9I-1Z40-1175-30**	692	1080	1315	M24	27	30	30	1035	1355	125	150	140	14	71	+0.14286	202	405	1; 4
174	**1130.5**	1427	95	7231	**9I-1Z30-1305-0406**	346	1220	1390	21	21	36	36	-	1425	80	85	85	10	115	-	87	175	5
175	**1140.3**	1427	114	5755	**9I-1Z25-1315-0374**	360	1246	1383	M20	22	36	36	-	-	83.5	105	105	12	96	-0.5	146	292	
176	**1160**	1600	200	10816	**9I-1Z40-1432-29**	1020	1320	1435	33	33	30	24	1240	1550	165	160	150	16	75	+0.325	246	493	
177	**1177**	1530	130	10393	**9I-1Z40-1385-0301**	555	1290	1480	M24	26	36	36	-	-	107	110	110	12	100	-	138	276	6
178	**1231**	1600	95	7932	**9I-1Z30-1437-52**	466	1320	1550	18	18	24	24	1262	1595	75	85	50	6	207	-	19	39	
179	**1375**	1760	150	12090	**9I-1Z40-1608-0192**	723	1500	1710	30	M27	48	48	1439	-	108	124	110	14	100	-	161	322	7
180	**1414.9**	1795	140	12302	**9I-1Z40-1632-0194**	870	1550	1740	M24	27	36	36	1500	1790	120	130	115	14	103	-	167	335	8

1 Non-through tapped fixing holes on inner ring
2 Non-through tapped fixing holes on outer ring
3 Centering of inner ring is on the outer diameter ∅ 1075 into the depth 10
4 Centering of inner ring is on the outer diameter ∅ 1160 into the depth 12
5 Fixing holes on inner ring are recessed on ∅ 32 into the depth of 24
6 Centering of inner ring is on the outer diameter ∅ 1360 into the depth 10
7 Centering of inner ring is on the outer diameter ∅ 1580 into the depth 12
8 Centering of inner ring is on the outer diameter ∅ 1600 into the depth 10

SPECIAL SLEWING RINGS

- with internal gear [I]

BALL SLEWING RINGS				
Designation	Boundary Dimensions			Weight
	d	D	B	
	[mm]			[kg]
9I-1B25-0310-0178	**199.8**	410	75	32.3
9I-1B25-0310-0178-1	**199.8**	410	75	32.3
9I-1B25-0410-0240	**296.6**	510	76	43
9I-1B25-0410-0240-1	**296.6**	510	76	43
9I-2B25-0410-0497	**296.6**	510	106	63
9I-1B33-0460-0306	**329.4**	570	90	72
9I-1B33-0460-0306-1	**329.4**	570	90	72
9I-1B20-0465-0133	**380**	535	50	34
9I-1B25-0547-0156	**439**	635	60	59
9I-1B25-0570-0221	**462**	651	65	62
9I-1B36-0715-0254	**560**	825	90	139
9I-1B25-0720-0190	**585**	810	85	108
9I-1B20-0741-0279	**650.24**	848	56	54.8
9I-1B30-0990-0169	**864**	1084	73	133
9I-1B25-1014-0250	**882**	1116	75	155
9I-1B30-1050-0375	**920**	1145	92	187
9I-1B32-1087-0413	**957.1**	1163.57	100	182
9I-1B30-1094-0314	**961**	1205	95	224
9I-1B40-1090-0339	**967.23**	1222.25	127	306
9I-1B22-1086-0459	**971.6**	1171.96	85.3	145
9I-1B32-1167-0382	**1009.9**	1298.45	101.6	308
9I-1B40-1165-0495	**1010.031**	1298.7	106.4	328
9I-1B40-1250-0358	**1038.76**	1450.85	104.6	413
9I-1B45-1240-0506	**1048.5**	1381.25	127	448
9I-1B45-1240-0464-1	**1048.50**	1381.25	127	451.5
9I-1B45-1240-0464	**1048.5**	1381.25	127	465
9I-1B30-1205-0251	**1075**	1300	110	240
9I-1B40-1252-0364	**1078**	1377	130	416
9I-1B32-1243-0369	**1092**	1360	125	325
9I-1B40-1350-0483	**1164**	1495	110	428
9I-1B35-1344-0368	**1192**	1464.56	135.1	380
9I-1B50-1470-0203	**1239.9**	1622.55	133.35	653
9I-1B40-1420-0365	**1262**	1549.4	145	465

CYLINDRICAL ROLLER SLEWING RINGS				
Designation	Boundary Dimensions			Weight
	d	D	B	
	[mm]			[kg]
9I-1Z25-1075-0330	**960**	1167	90	171
9I-1Z30-1198-0120	**992**	1313	94	223
9I-1Z40-1432-29-3	**1160**	1600	200	1020
PSL 912-29	**1160**	1600	200	1020
PSL 912-52	**1231**	1600	95	466