

Shim rings and supporting rings

DIN
988

Paßscheiben und Stützscheiben

Supersedes May 1971 edition.

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

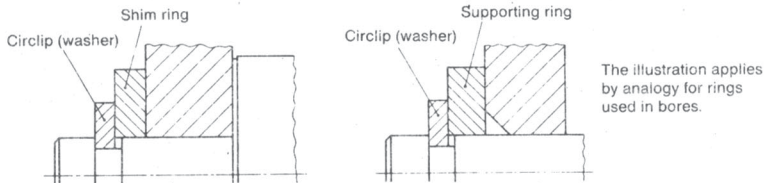
Dimensions in mm

1 Scope and field of application

Shim rings are designed to prevent machine components from moving axially. The preferred application of these rings is to compensate for the play of such components where secured by circlips as specified in DIN 471 and DIN 472, DIN 983 and DIN 984 or lock washers as specified in DIN 6799. Shim rings may only be used where the contact faces are smooth. They shall not suffer any deformation when used with components that have rounded edges (shaft collars, stepped holes).

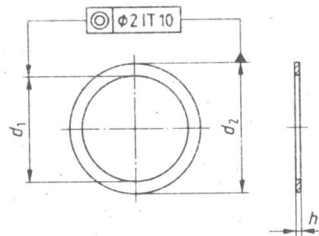
Supporting rings are intended for use with circlips or lock washers to ensure that do not deform when subjected to excessive axial forces as may be expected where the edges of machine components are rounded or chamfered.

Supporting rings may be used in combination with shim rings.



It should be noted that where shim rings and/or supporting rings are used as part of rolling bearings, there may be the risk of the rings scraping against projecting parts of the cage, or the inner or outer bearing ring.

2 Dimensions and designation



2.1 Shim rings

Designation of a shim ring with inside diameter, $d_1 = 40$ mm, outside diameter, $d_2 = 50$ mm, and thickness, $h = 0,5$ mm:

Shim ring DIN 988 – 40 × 50 × 0,5

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Table 1. Dimensions

Nominal size	Thickness, h		Approximate mass (785 kg/dm ³), per 1000 units, in kg																		
	Inside diameter, d_1 (D12)		Outside diameter, d_2 (d12)																		
	min	max	min	max	0.1	0.15	0.2	0.3	0.5	1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2	
3	3.02	3.12	6	5.85	5.97	0.017	0.025	0.033	0.05	0.083	0.166	0.183	0.2								
4	4.03	4.15	8	7.81	7.96	0.03	0.044	0.059	0.089	0.148	0.296	0.326	0.355								
5	5.03	5.15	10	9.81	9.96	0.046	0.069	0.092	0.139	0.231	0.462	0.509	0.555								
6	6.03	6.15	12	11.77	11.95	0.067	0.1	0.133	0.2	0.333	0.666	0.732	0.799	0.866	0.932						
7	7.04	7.19	13	12.77	12.95	0.074	0.111	0.148	0.222	0.37	0.74	0.814	0.888	0.962	1.04						
8	8.04	8.19	14	13.77	13.95	0.081	0.122	0.163	0.244	0.407	0.814	0.895	0.977	1.06	1.14	1.22	1.3				
9	9.04	9.19	15	14.77	14.95	0.089	0.133	0.178	0.266	0.444	0.888	0.977	1.07	1.15	1.24	1.33	1.42				
10	10.04	10.19	16	15.77	15.95	0.096	0.144	0.192	0.289	0.481	0.962	1.06	1.15	1.25	1.35	1.44	1.54	1.64	1.73		
11	11.05	11.23	17	16.77	16.95	0.104	0.155	0.207	0.311	0.518	1.04	1.14	1.24	1.35	1.45	1.55	1.66	1.76	1.86		
12	12.05	12.23	18	17.77	17.95	0.111	0.166	0.222	0.333	0.555	1.11	1.22	1.33	1.44	1.55	1.66	1.78	1.89	2		
13	13.05	13.23	19	18.725	18.935	0.118	0.178	0.237	0.355	0.592	1.18	1.3	1.42	1.54	1.66	1.78	1.89	2.01	2.13	2.25	2.37
14	14.05	14.23	20	19.725	19.935	0.126	0.189	0.252	0.377	0.629	1.26	1.38	1.51	1.64	1.76	1.89	2.01	2.14	2.26	2.39	2.52
15	15.05	15.23	21	20.725	20.935	0.133	0.2	0.266	0.4	0.666	1.33	1.46	1.6	1.73	1.86	2	2.13	2.26	2.4	2.53	2.66
16	16.05	16.23	22	21.725	21.935	0.141	0.211	0.281	0.422	0.703	1.41	1.55	1.69	1.83	1.97	2.11	2.25	2.39	2.53	2.67	2.81
17	17.05	17.23	24	23.725	23.935	0.177	0.265	0.354	0.531	0.885	1.77	1.95	2.12	2.3	2.48	2.65	2.83	3.01	3.19	3.36	3.54
18	18.05	18.23	25	24.725	24.935	0.186	0.278	0.371	0.557	0.928	1.86	2.04	2.23	2.41	2.6	2.78	2.97	3.15	3.34	3.53	3.71
19	19.065	19.275	26	25.725	25.935	0.194	0.291	0.388	0.583	0.971	1.94	2.14	2.33	2.52	2.72	2.91	3.11	3.3	3.5	3.69	3.88
20	20.065	20.275	28	27.725	27.935	0.237	0.355	0.474	0.71	1.18	2.37	2.6	2.84	3.08	3.31	3.55	3.79	4.02	4.26	4.5	4.74
22	22.065	22.275	30	29.725	29.935	0.256	0.385	0.513	0.769	1.28	2.56	2.82	3.08	3.33	3.59	3.85	4.1	4.36	4.62	4.87	5.13
22	22.065	22.275	32	31.67	31.92	0.333	0.499	0.666	0.999	1.66	3.33	3.66	4	4.33	4.66	4.99	5.33	5.66	5.99	6.33	6.66
25	25.065	25.275	35	34.67	34.92	0.37	0.555	0.74	1.11	1.85	3.7	4.07	4.44	4.81	5.18	5.55	5.92	6.29	6.66	7.03	7.4
25	25.065	25.275	36	35.67	35.92	0.414	0.621	0.827	1.24	2.07	4.14	4.55	4.96	5.38	5.79	6.21	6.62	7.03	7.45	7.86	8.27
26	26.065	26.275	37	36.67	36.92	0.427	0.641	0.855	1.28	2.14	4.27	4.7	5.13	5.55	5.98	6.41	6.84	7.26	7.69	8.12	8.55
28	28.065	28.275	40	39.67	39.92	0.503	0.755	1.01	1.51	2.52	5.03	5.53	6.04	6.54	7.04	7.55	8.05	8.55	9.06	9.56	10.1
30	30.065	30.275	42	41.67	41.92	0.533	0.799	1.07	1.6	2.66	5.33	5.86	6.39	6.93	7.46	7.99	8.52	9.06	9.59	10.1	10.7
32	32.065	32.33	45	44.67	44.92	0.617	0.926	1.23	1.85	3.09	6.17	6.79	7.41	8.02	8.64	9.26	9.87	10.5	11.1	11.7	12.3
35	35.08	35.33	45	44.67	44.92	0.493	0.74	0.986	1.48	2.47	4.93	5.43	5.92	6.41	6.91	7.4	7.89	8.38	8.88	9.37	9.86
36	36.08	36.33	45	44.67	44.92	0.449	0.674	0.899	1.35	2.25	4.49	4.94	5.39	5.84	6.29	6.74	7.19	7.64	8.09	8.54	8.99
37	37.08	37.33	47	46.67	46.92	0.518	0.777	1.04	1.55	2.59	5.18	5.7	6.21	6.73	7.25	7.77	8.29	8.8	9.32	9.84	10.4
40	40.08	40.33	50	49.67	49.92	0.555	0.832	1.11	1.66	2.77	5.55	6.1	6.66	7.21	7.77	8.32	8.88	9.43	9.99	10.5	11.1

Shim rings are normally manufactured in the sizes for which a value of mass has been specified.

2.2 Supporting rings

Designation of a supporting ring (S) with inside diameter, $d_1 = 40$ mm, and outside diameter, $d_2 = 50$ mm:

Supporting ring DIN 988 – S 40 × 50

Table 2. Dimensions

Nominal size	Inside diameter, d_1 (D12)		Outside diameter, d_2 (d12)			Thickness, h		Approximate mass (7,85 kg/dm ³), per 1000 units, in kg
	min.	max.	Nominal size	min.	max.	max = nominal size	min.	
3	3,02	3,12	6	5,85	5,97	1	0,95	0,166
4	4,03	4,15	8	7,81	7,96	1	0,95	0,296
5	5,03	5,15	10	9,81	9,96	1	0,95	0,462
6	6,03	6,15	12	11,77	11,95	1,2	1,15	0,799
7	7,04	7,19	13	12,77	12,95	1,2	1,15	0,888
8	8,04	8,19	14	13,77	13,95	1,2	1,15	0,977
9	9,04	9,19	15	14,77	14,95	1,2	1,15	1,07
10	10,04	10,19	16	15,77	15,95	1,2	1,15	1,15
11	11,05	11,23	17	16,77	16,95	1,2	1,15	1,24
12	12,05	12,23	18	17,77	17,95	1,2	1,15	1,33
13	13,05	13,23	19	18,725	18,935	1,5	1,45	1,78
14	14,05	14,23	20	19,725	19,935	1,5	1,45	1,89
15	15,05	15,23	21	20,725	20,935	1,5	1,45	2
16	16,05	16,23	22	21,725	21,935	1,5	1,45	2,11
17	17,05	17,23	24	23,725	23,935	1,5	1,45	2,65
18	18,05	18,23	25	24,725	24,935	1,5	1,45	2,78
19	19,065	19,275	26	25,725	25,935	1,5	1,45	2,91
20	20,065	20,275	28	27,725	27,935	2	1,95	4,74
22	22,065	22,275	30	29,725	29,935	2	1,95	5,13
22	22,065	22,275	32	31,67	31,92	2	1,95	6,66
25	25,065	25,275	35	34,67	34,92	2	1,95	7,4
25	25,065	25,275	36	35,67	35,92	2	1,95	8,27
26	26,065	26,275	37	36,67	36,92	2	1,95	8,54
28	28,065	28,275	40	39,67	39,92	2	1,95	10,1
30	30,065	30,275	42	41,67	41,92	2,5	2,45	13,3
32	32,08	32,33	45	44,67	44,92	2,5	2,45	15,4
35	35,08	35,33	45	44,67	44,92	2,5	2,45	12,3
36	36,08	36,33	45	44,67	44,92	2,5	2,45	11,2
37	37,08	37,33	47	46,67	46,92	2,5	2,45	12,9
40	40,08	40,33	50	49,67	49,92	2,5	2,45	13,9
42	42,08	42,33	52	51,6	51,9	2,5	2,45	14,5
45	45,08	45,33	55	54,6	54,9	3	2,94	18,5
45	45,08	45,33	56	55,6	55,9	3	2,94	20,5
48	48,08	48,33	60	59,6	59,9	3	2,94	24
50	50,08	50,33	62	61,6	61,9	3	2,94	24,9
50	50,08	50,33	63	62,6	62,9	3	2,94	27,2
52	52,1	52,4	65	64,6	64,9	3	2,94	28,1
55	55,1	55,4	68	67,6	67,9	3	2,94	29,6
56	56,1	56,4	70	69,6	69,9	3	2,94	32,6
56	56,1	56,4	72	71,6	71,9	3	2,94	37,9
60	60,1	60,4	75	74,6	74,9	3	2,94	37,5
63	63,1	63,4	80	79,6	79,9	3	2,94	45
65	65,1	65,4	85	84,53	84,88	3,5	3,44	64,7
70	70,1	70,4	90	89,53	89,88	3,5	3,44	69,1
75	75,1	75,4	95	94,53	94,88	3,5	3,44	73,4
80	80,1	80,4	100	99,53	99,88	3,5	3,44	77,7
85	85,12	85,47	105	104,53	104,88	3,5	3,44	82
90	90,12	90,47	110	109,53	109,88	3,5	3,44	86,3
95	95,12	95,47	115	114,53	114,88	3,5	3,44	90,6
100	100,12	100,47	120	119,53	119,88	3,5	3,44	94,9
100	100,12	100,47	125	124,455	124,855	3,5	3,42	121
105	105,12	105,47	130	129,455	129,855	3,5	3,42	127
110	110,12	110,47	140	139,455	139,855	3,5	3,42	162
120	120,12	120,47	150	149,455	149,855	3,5	3,42	175
130	130,145	130,545	160	159,455	159,855	3,5	3,42	188
140	140,145	140,545	170	169,455	169,855	3,5	3,42	201
150	150,145	150,545	180	179,455	179,855	3,5	3,42	214
160	160,145	160,545	190	189,37	189,83	3,5	3,42	227
170	170,145	170,545	200	199,37	199,83	3,5	3,42	240

3 Technical delivery conditions

3.1 Material

Shim rings shall be made from steel of at least grade St 2 K 50 as specified in DIN 1624, whereas spring steel with a hardness of 440 to 500 HV 10 as specified in DIN 17 222 shall be used for supporting rings.

3.2 Finish

Shim rings shall have a type BK surface appearance as specified in DIN 1624, and be oiled.

Supporting rings with a thickness of 1,5 mm or less shall have a type BK surface appearance as specified in DIN 17 222, and be either oiled, or phosphated and oiled (at the manufacturer's discretion), as shall be supporting rings of a larger thickness, which, however, shall have ground side faces.

3.3 Camber

The camber shall be determined by axially loading the ring, placed between two parallel platens, with test load F . c , to be calculated from $c = h'' - h_{\text{actual}}$, shall not exceed the values specified in table 3 or 4.

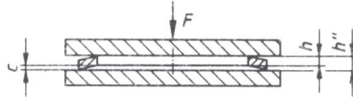


Table 3. Shim rings

Thickness, h	Test force, F	Maximum deflection, c
$0,1 \leq h < 0,3$	5 N	0,025
$0,3 \leq h < 0,5$	20 N	0,025
$0,5 \leq h < 1,5$	50 N	0,05
$1,5 \leq h \leq 2,0$	50 N	0,075

Table 4. Supporting rings

Thickness, h	Test force, F	Maximum deflection, c
$1,0 \leq h \leq 3,5$	50 N	0,05

Standards referred to

- DIN 71 Circlips (retaining rings) for shafts; normal type and heavy type
DIN 472 Circlips (retaining rings) for bores; normal type and heavy type
DIN 983 Spring retaining rings with lugs for shafts
DIN 984 Spring retaining rings with lugs for use in bores (internal circlips)
DIN 1624 Steel flat products; cold reduced mild unalloyed steel strip in widths not exceeding 650 mm; technical delivery conditions
DIN 6799 Lock washers (retaining washers) for shafts
DIN 17 222 Cold rolled steel strip for springs; technical delivery conditions

Previous editions

DIN 988: 08.50, 05.71.

Amendments

The following amendments have been made to the May 1971 edition.

- a) The scope of the standard has been extended to include an inside diameter, d_1 , of 170 mm and an outside diameter, d_2 , of 200 mm.
- b) Limits of size have been included.
- c) A thickness, h , of 0,15 mm has been included for shim rings.
- d) Specifications for the camber of shim rings and supporting rings have been included.
- e) The standard has been editorially revised.

International Patent Classification

F 16 B 21/10

F 16 B 43/00

F 16 G 35/06