

Introduction and specifications

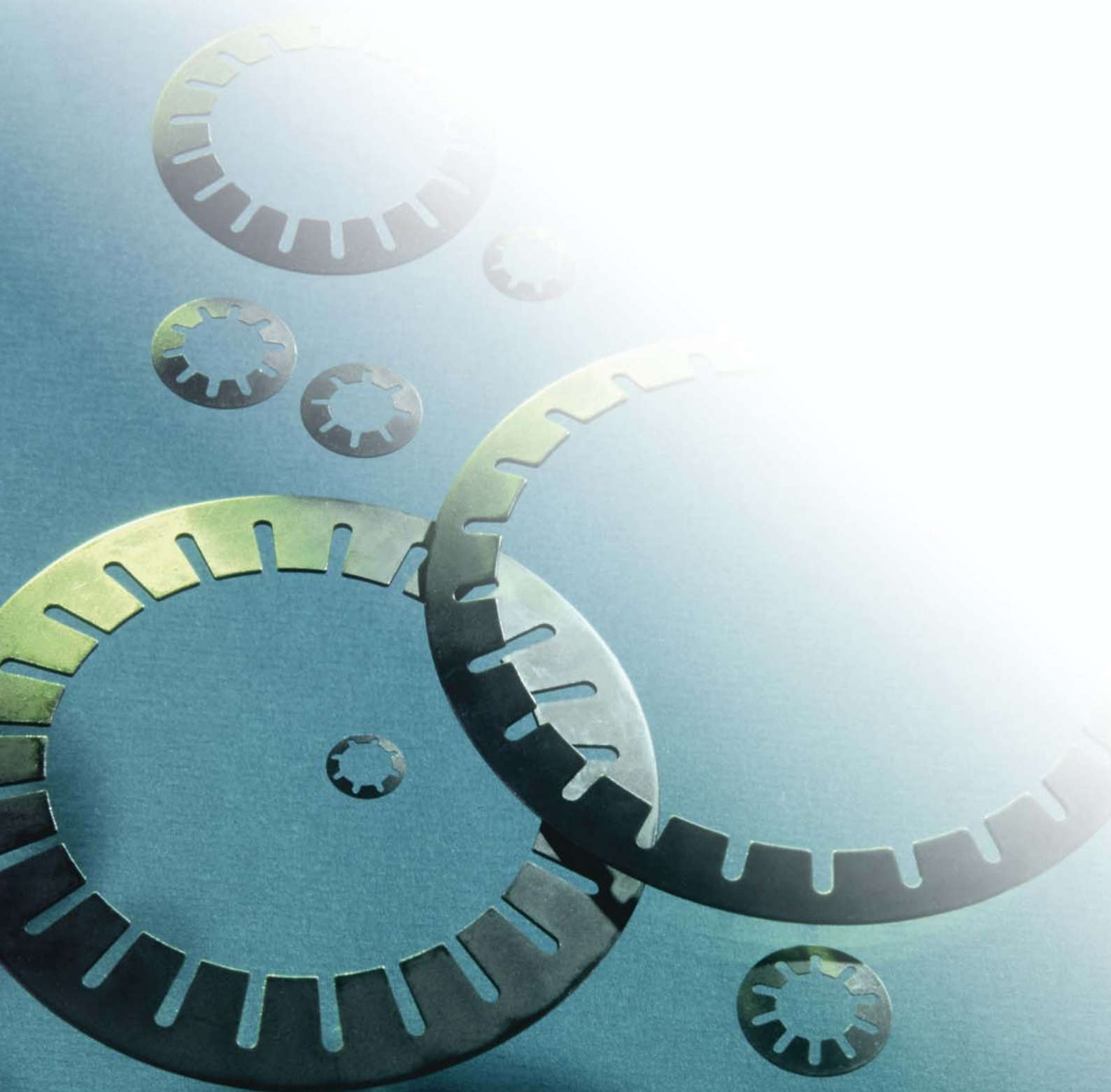


Fig. 1:
Slotted configuration.

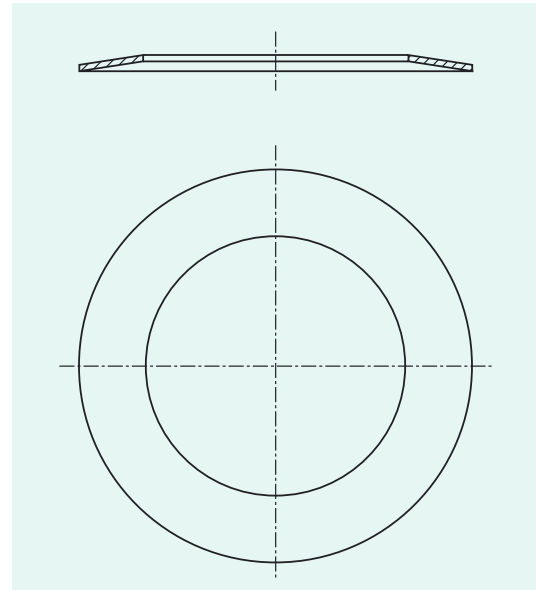
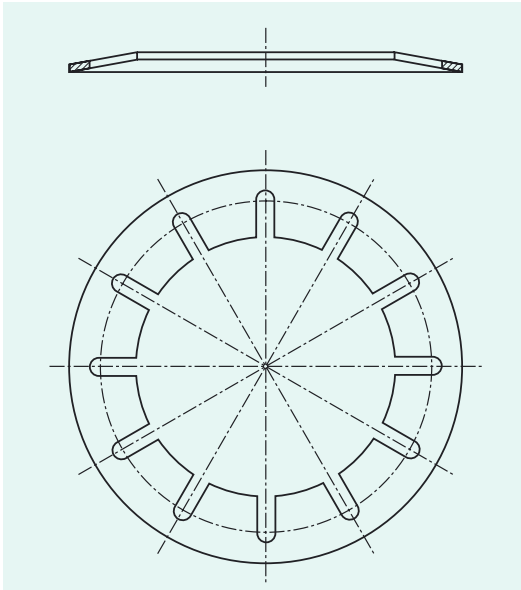


Fig. 2:
Non-slotted configuration.

These special disc springs were developed in close cooperation with leading ball bearing manufacturers. They are used to provide axial pre-stress in deep-groove ball bearings (backlash compensation) and by so doing also bridge the dimensional deviations of the ball bearing seat (Fig. 3). Its sound-absorbing effect helps reduce the degree of stress on the bearing. Up to an outside spring diameter of 94.5 mm, there are two variants available. Variant 1 is slotted around the inside diameter. This version offers particularly high deflection at low spring forces (printed in bold type in table 1). Variant 2 is not slotted and supplies high forces with only a short deflection. For outside diameters greater than 94.5 mm, stacked non-slotted CB ball bearing disc springs are used. In the interests of achieving high compensating deflection

paths, a form of force-deflection characteristic was selected which is highly degressive or else demonstrates a marked force maximum (see chapter 2.5). For this reason, we do not recommend creating disc spring stacks in alternating formation using these parts (see chapter 2.6). Parallel stacking to multiply spring force is possible without restrictions, however. It is important to bear in mind the friction which occurs with multiple stacking, which is expressed as a hysteresis of the characteristic curve (see chapter 2.9). CB ball bearing disc springs are made of spring steel in accordance with DIN EN 10 132-4. However, where special requirements occur, all materials outlined in chapter 2.12 can be used. In this case, we recommend consulting our advisory team.

Fig. 3:
Mounting situation of a
CB ball bearing disc
spring.



The mechanical stresses occurring in ball bearing disc springs are relatively low. This ensures that when the parts are pressed to the flattened position, no major relaxation effect occurs. This opens up the possibility of dispensing with the prestressing process in order to cut the cost of manufacture.

Table 1:
Ball bearing disc springs arranged by dimension

Ball bearing disc spring for ball bearing type			Dimension				F (0,50 h ₀)		F (0,75 h ₀)		Weight (1000 pc.) [kg]	CB-part number
			D _e * [mm]	D _i * [mm]	t [mm]	l ₀ [mm]	s [mm]	F [N]	s [mm]	F [N]		
	623		9,8	6,2	0,15	0,60	0,23	9	0,35	13	0,050	105 245
			9,8	6,2	0,20	0,40	0,10	19	0,15	24	0,072	105 248
	624		12,8	7,2	0,20	0,65	0,23	16	0,35	18	0,130	105 249
			12,8	7,2	0,25	0,50	0,12	24	0,19	29	0,173	105 251
	625	634	15,8	8,2	0,25	0,75	0,25	17	0,40	20	0,280	105 253
			15,8	8,2	0,25	0,55	0,15	20	0,22	23	0,281	105 256
	626	635	18,8	9,2	0,25	1,00	0,38	17	0,55	20	0,34	105 259
			18,8	9,2	0,30	0,65	0,17	26	0,26	31	0,50	105 260
	607		18,8	10,2	0,25	1,05	0,40	19	0,60	24	0,35	105 261
			18,8	10,2	0,35	0,70	0,17	40	0,26	51	0,54	105 263
	608	627	21,8	12,3	0,25	1,25	0,50	19	0,75	24	0,42	105 265
			21,8	12,3	0,35	0,75	0,20	38	0,30	46	0,70	105 267
	609		23,7	14,3	0,30	1,30	0,50	21	0,75	25	0,66	105 273
			23,7	14,3	0,40	0,90	0,25	69	0,37	80	0,88	105 276
6000		629	25,7	14,3	0,30	1,40	0,55	24	0,80	28	0,70	105 277
			25,7	14,3	0,40	0,90	0,25	54	0,37	64	1,13	105 278
6001			27,7	17,3	0,35	1,45	0,55	25	0,80	31	0,79	105 281
			27,7	17,3	0,40	1,00	0,30	73	0,45	80	1,17	105 283
	6200		29,7	17,3	0,35	1,55	0,60	26	0,90	32	1,20	105 285
			29,7	17,3	0,40	1,10	0,35	80	0,52	82	1,43	105 287
6002	6201		31,7	20,4	0,35	1,55	0,60	27	0,90	33	1,02	105 289
			31,7	20,4	0,40	1,10	0,35	79	0,52	81	1,47	105 292
		6300	34,6	20,4	0,40	1,65	0,65	27	1,00	32	1,65	105 293
			34,6	20,4	0,40	1,10	0,35	60	0,52	61	1,93	105 294
6003	6202		34,6	22,4	0,35	1,55	0,60	27	0,90	32	1,20	105 295
			34,6	22,4	0,50	1,20	0,35	106	0,52	119	2,14	105 296
		6301	36,6	20,4	0,40	1,90	0,75	31	1,10	35	2,28	105 299
			36,6	20,4	0,50	1,30	0,40	103	0,60	111	2,85	105 300
	6203		39,6	25,5	0,40	1,90	0,75	33	1,10	37	1,92	105 302
			39,6	25,5	0,50	1,30	0,40	103	0,60	111	2,82	105 303
6004		6302	41,6	25,5	0,45	2,05	0,80	34	1,20	39	2,50	105 304
			41,6	25,5	0,50	1,40	0,45	113	0,67	114	3,34	105 305
6005	6204	6303	46,5	30,5	0,45	2,05	0,80	39	1,20	44	2,84	105 307
			46,5	30,5	0,60	1,50	0,45	140	0,67	155	4,54	105 309

Bold type = slotted version *Values with spring pressed flat

Table 1 (continued):
Ball bearing disc springs arranged by dimension.

Ball bearing disc spring for ball bearing type		Dimension				F (0,50 h ₀)		F (0,75 h ₀)		Weight (1000 pc.) [kg]	CB-part number	
		D _e * [mm]	D _i * [mm]	t [mm]	l ₀ [mm]	s [mm]	F [N]	s [mm]	F [N]			
	6205	6304	51,5	35,5	0,45	2,10	0,85	42	1,25	47	3,07	105 314
			51,5	35,5	0,60	1,50	0,45	124	0,67	135	5,15	105 316
6006			54,5	40,5	0,45	2,15	0,85	48	1,30	53	3,20	105 321
			54,5	40,5	0,60	1,50	0,45	127	0,67	140	4,92	105 324
6007	6206	6305	61,5	40,5	0,55	2,55	1,00	49	1,50	54	5,84	105 325
			61,5	40,5	0,70	1,80	0,55	164	0,82	186	9,25	105 326
6008			67,5	50,5	0,55	2,60	1,05	76	1,60	78	5,50	105 330
			67,5	50,5	0,70	1,70	0,50	143	0,75	160	8,65	105 331
		6306	71,5	45,5	0,60	2,90	1,15	71	1,70	74	9,60	105 332
			71,5	45,5	0,70	2,10	0,70	190	1,05	185	13,12	105 333
	6207		71,5	50,5	0,60	2,90	1,15	127	1,70	127	8,20	105 336
			71,5	50,5	0,70	2,10	0,70	223	1,05	217	11,05	105 339
6009			74,5	55,5	0,60	2,90	1,15	88	1,70	91	7,58	105 345
			74,5	55,5	0,80	1,90	0,55	186	0,82	212	12,17	105 347
		6307	79,5	50,5	0,70	3,10	1,20	78	1,80	83	13,50	105 349
			79,5	50,5	0,80	2,30	0,75	228	1,12	228	18,58	105 350
6010	6208		79,5	55,5	0,70	2,90	1,10	127	1,65	127	14,50	105 351
			79,5	55,5	0,80	2,30	0,75	264	1,12	264	15,97	105 352
	6209		84,5	60,5	0,75	3,15	1,20	66	1,80	78	13,0	105 353
			84,5	60,5	0,90	2,50	0,80	352	1,20	357	19,2	105 356
		6308	89,5	60,5	0,80	3,30	1,25	90	1,90	104	18,1	105 357
			89,5	60,5	0,90	2,50	0,80	284	1,20	288	24,2	105 358
6011	6210		89,5	65,5	0,80	3,40	1,30	180	1,95	189	16,0	105 360
			89,5	65,5	0,90	2,50	0,80	330	1,20	333	20,7	105 361
6012			94,5	75,5	0,80	3,45	1,35	191	2,00	206	13,3	105 362
			94,5	75,5	1,00	2,20	0,60	272	0,90	325	19,9	105 364
		6309	99,0	65,5	1,00	2,60	0,80	274	1,20	293	34,0	105 365
6013	6211		99,0	70,5	1,00	2,60	0,80	312	1,20	333	29,8	105 366
		6310	109,0	70,5	1,25	2,70	0,73	294	1,09	356	53,2	105 367
6014	6212		109,0	75,5	1,25	2,70	0,73	327	1,09	394	47,6	105 368
6015			114,0	90,5	1,25	2,45	0,60	311	0,90	396	37,0	105 369
		6311	119,0	75,5	1,25	2,80	0,78	270	1,16	319	65,2	105 370
	6213		119,0	85,5	1,25	2,80	0,78	331	1,16	391	52,8	105 371
6016	6214		124,0	90,5	1,25	3,00	0,88	392	1,31	441	55,3	105 373

Bold type = slotted version

*Values with spring pressed flat

Table 1 (continued):
Ball bearing disc springs arranged by dimension.

Ball bearing disc spring for ball bearing type			Dimension				F (0,50 h ₀)		F (0,75 h ₀)		Weight (1000 pc.) [kg]	CB-part number
			D _e * [mm]	D _i * [mm]	t [mm]	l ₀ [mm]	s [mm]	F [N]	s [mm]	F [N]		
		6312	129	85,5	1,25	3,20	0,98	375	1,46	402	71,9	105 374
6017	6215		129	95,5	1,25	3,20	0,98	462	1,46	500	58,0	105 375
		6313	139	90,5	1,25	3,25	1,00	329	1,50	353	85,7	105 377
6018	6216		139	101	1,25	3,25	1,00	398	1,50	427	70,2	105 378
		6314	149	95,5	1,50	3,20	0,85	312	1,28	380	120,9	105 381
6020	6217		149	106	1,50	3,20	0,85	368	1,28	448	101,3	105 382
		6315	159	101	1,50	3,50	1,00	356	1,50	409	139,4	105 383
6021	6218		159	111	1,50	3,50	1,00	415	1,50	477	119,8	105 384
		6316	169	111	1,50	3,80	1,15	432	1,73	472	150,1	105 385
6022	6219		169	121	1,50	3,80	1,15	497	1,73	542	128,7	105 386
		6317	179	121	2,00	4,20	1,10	702	1,65	861	214,4	105 389
6024	6220		179	126	2,00	4,20	1,10	761	1,65	934	199,2	105 391
		6318	189	121	2,00	4,30	1,15	628	1,73	760	259,8	105 392
	6221		189	131	2,00	4,30	1,15	702	1,73	849	228,7	105 393
		6319	198	131	2,00	4,50	1,25	691	1,88	813	271,7	105 394
6026	6222		198	141	2,00	4,50	1,25	779	1,88	917	238,1	105 395
	6224	6320	213	151	2,25	4,50	1,12	746	1,69	941	313	105 396
6030		6321	223	161	2,25	4,60	1,17	747	1,76	933	330	105 398
	6226		228	161	2,25	4,95	1,35	864	2,02	1 030	362	105 399
6032		6322	238	161	2,25	5,25	1,50	886	2,25	1 020	426	105 400
	6228		248	171	2,50	5,00	1,25	795	1,88	1 000	497	105 401
6034		6324	258	171	2,50	5,50	1,50	928	2,25	1 108	575	105 402
	6230		268	181	2,50	5,70	1,60	990	2,40	1 160	602	105 403
6036		6326	278	181	2,50	6,00	1,75	1 020	2,63	1 160	686	105 404
6038	6232		288	191	2,75	5,75	1,50	931	2,25	1 150	788	105 405
		6328	298	191	2,75	6,35	1,80	1 130	2,70	1 310	887	105 406
6040	6234		308	202	3,00	6,10	1,55	1 050	2,33	1 300	1 000	105 407
	6236	6330	318	212	3,00	6,20	1,60	1 060	2,40	1 300	1 040	105 408
6044	6238	6332	338	232	3,00	6,60	1,80	1 180	2,70	1 410	1 120	105 409
6048	6240	6334	358	242	3,00	7,20	2,10	1 350	3,15	1 530	1 290	105 410

*Values with spring pressed flat

Fastener Bellevilles are spring elements whose role is to counteract the loosening of screw connections due, for example, to relaxation processes taking place in the components. These spring elements are included as a tensioning element in the connection.

They are configured in line with screws to strength class 8.8 to 10.9. Particularly when used in conjunction with short screws, their function is to increase the elasticity of the overall assembly. Should the screw connection begin to demonstrate symptoms of relaxation, these elements maintain a certain minimum clamping force. However, fastener Bellevilles are not able to prevent a screw from working loose as a result of alternating transverse loads.

In general, fastener Bellevilles are components capable of withstanding extreme loads, which should only be exposed to static application.

Depending on the application case, CB fastener Bellevilles can be supplied in different surface finishes (see table 15, chapter 2.13.2, page 2-36).

Materials

Materials as specified by DIN EN 10 132-4 or equivalent spring steel qualities as selected by the manufacturer can be used.

Testing of fastener Bellevilles DIN 6796 / DIN 267 part 26

Testing for dimensional stability and configuration comply with DIN 267 part 26.

Both a minimum and a maximum value are specified (see adjacent table) for the overall height h when not subjected to load. The maximum value may not be exceeded in the as-delivered status and the minimum value following setting testing (DIN 267 part 26) must be achieved or exceeded.

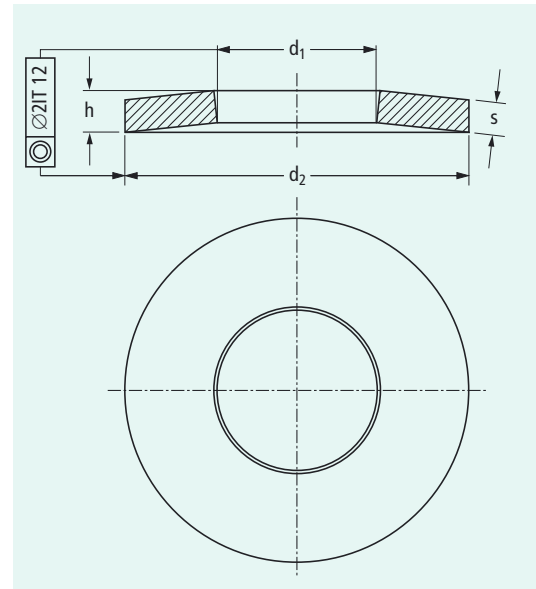


Fig. 4:
Dimensioning.

Table 2:
Characteristic values and surface versions for fastener Bellevilles.

Rated size	Dimensions					Packaging unit	Weight (1000 pc.)	Thread ⁴⁾	Surface			
	d ₁	d ₂	s ³⁾	h _{max} ¹⁾	h _{min} ²⁾				bright	phos-phated Znphr12w	mech. galv. Zn20cC	mech. galv. Zn 20 + Polyamid ^{*)}
	[mm]	[mm]	[mm]	[mm]	[mm]	[pcs.]	[kg]	[mm]	CB-Part no.	CB-Part no.	CB-Part no.	CB-Part no.
2 ⁵⁾	2,2	5	0,4	0,6	0,5	10 000	0,041	2	105 411	105 412	–	–
2,5 ⁵⁾	2,7	6	0,5	0,72	0,61	10 000	0,072	2,5	105 413	105 414	–	–
3 ⁵⁾	3,2	7	0,6	0,85	0,72	10 000	0,119	3	105 415	105 417	105 416	–
3,5 ⁵⁾	3,7	8	0,8	1,06	0,92	10 000	0,25	3,5	105 419	105 421	105 420	–
4	4,3	9	1,0	1,3	1,12	5 000	0,38	4	105 422	105 424	105 423	–
5	5,3	11	1,2	1,55	1,35	2 500	0,61	5	105 425	105 427	105 426	–
6	6,4	14	1,5	2,0	1,7	2 500	1,29	6	105 428	105 432	105 429	–
7	7,4	17	1,75	2,3	2,0	1 000	2,36	7	105 433	105 437	105 434	–
8	8,4	18	2,0	2,6	2,24	1 000	2,76	8	105 438	105 442	105 439	105 444
10	10,5	23	2,5	3,2	2,8	500	5,85	10	105 449	105 454	105 450	105 456
12	13	29	3,0	3,95	3,43	250	11,7	12	105 460	105 464	105 461	105 466
14	15	35	3,5	4,65	4,04	100	20,1	14	105 472	105 474	105 473	–
16	17	39	4,0	5,25	4,58	100	28,1	16	105 479	105 483	105 480	105 484
18	19	42	4,5	5,8	5,08	100	35,4	18	105 487	105 489	105 488	105 490
20	21	45	5,0	6,4	5,6	100	44,5	20	105 491	105 493	105 492	105 494
22	23	49	5,5	7,05	6,15	100	58,9	22	105 496	105 498	105 497	–
24	25	56	6,0	7,75	6,77	50	86,8	24	105 499	105 501	105 500	–
27	28	60	6,5	8,35	7,3	50	105,2	27	105 503	105 505	105 504	–
30	31	70	7,0	9,2	8,0	50	158,9	30	105 506	105 508	105 507	–

¹⁾ Greatest dimension in as-delivered status

²⁾ Minimum dimension after setting test to DIN 267 part 26

³⁾ Limiting dimension to DIN EN 10 140

⁴⁾ For nominal thread diameter

⁵⁾ For these nominal sizes, as yet no test values for spring force testing have been defined in accordance with DIN 267 part 26.

^{*)} As a result of coating, the dimensions deviate from DIN 6796 as follows:
d₁ up to –0.4 mm;
d₂ up to +0.4 mm;
s and h up to +0.4 mm.



**CHRISTIAN BAUER
GMBH + CO. KG**
Postfach 11 20
D-73636 Welzheim

Telefon: +49/71 82/12-0
Telefax: +49/71 82/12-315
E-Mail: info@christianbauer.com
Internet: www.christianbauer.com

England

Bauer Springs Ltd.
Eagle Road
North Moons Moat Ind. Estate
GB-Redditch Worcs. B98 9HF
Telefon: +44/1527-594900
Telefax: +44/1527-594909
E-Mail: sales@bauersprings.co.uk
Internet: www.bauersprings.co.uk

USA

Bauer Springs Inc.
509 Parkway View Drive
Parkway West Ind. Park
USA-Pittsburgh, PA. 15205
Telefon: +1/412-787-7930
Telefax: +1/412-787-3882
E-Mail: info@bauersprings.com
Internet: www.bauersprings.com

