SCHNORR® Product range

EN

Disc springs
Bolt locking systems

STORM HALVORSEN
KOMPONENTER TIL INDUSTRIEN

SCHNORR®
DISC SPRING ENGINEERING

STORM HALVORSEN
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SCHNORR® GmbH

Original SCHNORR® disc springs

Original SCHNORR® bolt locking systems

SCHNORR Engineering & technical information

Original SCHNORR® disc springs

The characteristic benefits of original SCHNORR® disc springs include:

① Load deflection curves of straight, progressive or degressive character according to the selection of spring arrangement and dimension.

② Simple adjustment of the spring stack length by the addition or removal of individual springs, thus altering the spring stack characteristic.

③ Efficient use of space with high spring forces obtainable with small deflections.

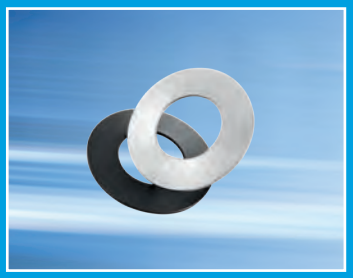
④ Largely self damping, particularly with parallel stacking.

⑤ No setting or fatigue under normal loads load.

⑥ Long service life

⑦ Flexibility in application of the disc springs can lead to a reduction in stock levels.

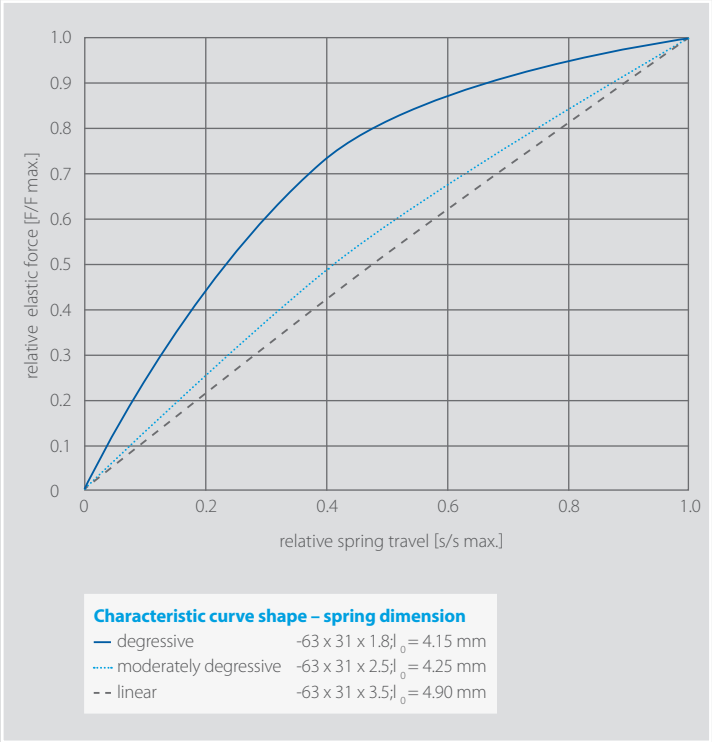
By means of these characteristics, the original SCHNORR® disc spring has developed such a wealth of application areas that nowadays there is scarcely an engineering area where it is not used.



Effect of spring forces

The importance of disc springs on machines and control systems is very often underestimated. At the same time, any change to the behaviour of these components may give rise to a malfunction or even failure of entire facilities.

Classification of the various spring type is often carried out according to the kind of load. The disc spring has a special place in the range of springs commonly available. By changing its geometric parameters it is possible to provide individual springs with characteristic curves from linear to strongly degressive accrording to the application needs.



Characteristic curve shape – spring dimension

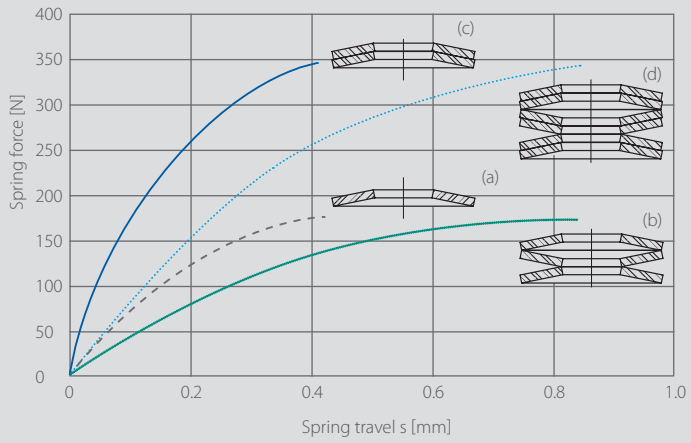
— degressive	-63 x 31 x 1.8; l_0 = 4.15 mm
····· moderately degressive	-63 x 31 x 2.5; l_0 = 4.25 mm
- - linear	-63 x 31 x 3.5; l_0 = 4.90 mm

A key advantage of the disc spring is that it can raise a high elastic force with a small spring travel. That is why it is used very often to store potential energy. Apart from this virtual static use, it is also often used in dynamic applications.

When using disc springs under sinusoidal oscillating loads, fatigue strength and time yield diagrams are available in order to enable a safe design. Wherever possible the spring arrangement applied should achieve a fatigue live in excess of 2 million cycles. Fundamental to the successful application of a disc spring under these conditions is observing the minimum preload requirements and that the springs are correctly guided.

SCHNORR® fatigue life estimates are based on a sinusoidal load input. For applications where step input (i.e. impact) is seen SCHNORR® can advise on fatigue life according to application.

The conical shape of the disc spring allows single springs to be combined in different ways. As a result, the characteristic of a spring combination can be varied in almost any way desired. In principle the following possibilities exist. In spring columns with single springs stacked in series, the spring deflections add up with constant load (b). In spring columns with springs stacked in parallel, the forces add up at the same deflection (c). In spring columns with combinations of serial and parallel stacking, various characteristic curves can be realized (d).



Spring dimensions: 15 x 5.2 x 0.4; l_0 = 0.95
- - (a) single disc spring
— (b) stacked in series; example 3 x 1 = triple deflection
— (c) stacked in parallel; example 1 x 2 = double force
····· (d) parallel pairs arranged in series; example 3 x 2 = double force and triple deflection

If disc springs of different thickness are stacked in a suitable way, then even progressive characteristic curves can be realized. For this, either several disc springs of different material thickness or identical disc springs with intermediate rings of different thickness or different layering types are used.

Due to this flexibility in the characteristic curve design, the disc spring can be used in a very wide spectrum.

Do you require assistance in specifying the correct disc spring either standard or special to your exact requirements?

Our engineering team will be pleased to help you in designing the most suitable disc spring solution according to your specifications.

The earlier we are involved in the development process, the better we can support you with our expertise.

What should one look for when selecting disc springs?

The price of incorrect selection with warranty claims and loss of reputation is very often more than the initial cost of a quality disc spring in the first place. In order to help you, we think the following are the most important criteria:

① Does the manufactured version comply with the quality requirements? On pages 8 and 9 you will find various manufacturing processes. One should pay attention to using a quality which complies with the requirements. We would be glad to advise you on the correct selection.

② Is the disc spring preset? Some suppliers in the low-price segment try to save this step. As a result, the disc spring will take a set after the first load.

③ Was a suitable material selected? In case of high temperatures or hostile environment, special materials need to be specified (see page 41).

④ Was a suitable surface treatment selected for corrosion protection (see page 44)?

Should individual consulting and design be carried out? We would be glad to support you with our experience and know-how.

V-Card Schnorr

Original SCHNORR® disc springs

Today DIN EN 16983 (previously DIN 2093) divides three manufacturing methods depending on the relevant thickness:

Group 1: t < 1,25, punching, cold forming, rounding-off edges

Group 2: 1,25 ≤ t ≤ 6 mm, punching, cold forming, turning and rounding off edges or fine-blanking, cold forming and rounding off edge

Group 3: > 6 < t ≤ 14 mm, cold or hot forming, turning all sides, rounding off edges or punching, cold for ming, turning and rounding off edges or fine-blanking, cold forming, rounding off edges.

Notes on the disc spring table

The following tables, list the springs according to DIN EN 16983 (previously DIN 2093) as well as those to SCHNORR® Internal standards. Sizes according to DIN EN 16983 (previously DIN 2093) are shown in heavy type. The prefix A, B or C shows the corresponding series. All sizes listed are in production and normally available from stock. The Article number quoted is the normal manufacture from spring steel with phosphate finish.

The load and the corresponding stresses are given for the three points s = 0.25 h_o, s= 0.5 h_o, s = 0.75 h_o. From s > 0.75 h_o, the actual characteristic curve increases progressively, contrary to the calculation (the table contains calculated values).

Disc springs according to group 3 are provided with turned bearing surfaces and reduced disc thickness. The disc's force increased by the bearing surfaces which is compensated by means of the reduced disc thickness t'.

Disc thickness t' corresponds to the effective thickness of the spring and must be accounted for with parallel stacking for determining the column length. The elastic force applies to disc springs made of spring steel.

Dimensional series

Dimensional series	h_o/t
A	~ 0,40
B	~ 0,75
C	~ 1,30

The following tolerances apply to springs made of standard materials (C75S and 51CrV4) (Tolerances for springs made of corrosion-resistant materials according to factory standard):

Load tolerances

Nominal spring thickness		Admissible tolerances	
t or. t' [mm]		F* [%]	
greater than	up to	max.	min.
0,20	1,25	+25	-7,5
1,25	3,00	+15	-7,5
3,00	6,00	+10	-5,0
6,00	16,00	+5	-5,0

Allowances for the spring load with springs according to DIN EN 16983 (previously DIN 2093)
* F with test length $l_p = l_o - 0{,}75 * h_o$

Diameter tolerances

Nominal dimension		Admissible tolerances				
D_e or D_i [mm]		D_e [mm]		D_i [mm]		concentricity [mm]
greater	up to	max.	min.	max.	min.	max.
3	6	0	-0,12	+0,12	0	0,15
6	10	0	-0,15	+0,15	0	0,18
10	18	0	-0,18	+0,18	0	0,22
18	30	0	-0,21	+0,21	0	0,26
30	50	0	-0,25	+0,25	0	0,32
50	80	0	-0,30	+0,30	0	0,60
80	120	0	-0,35	+0,35	0	0,70
120	180	0	-0,40	+0,40	0	0,80
180	250	0	-0,46	+0,46	0	0,92

Allowances for external and internal diameters and concentricity with springs according to DIN EN 16983 (previously DIN 2093)

Thickness tolerances

Nominal spring thickness		Admissible tolerances	
t or t' [mm]		t or t' [mm]	
greater than	up to	greater than	up to
0,20	0,60	+0,02	-0,06
0,60	1,25	+0,03	-0,09
1,25	3,80	+0,04	-0,12
3,80	6,00	+0,05	-0,15
6,00	16,00	+0,10	-0,10

Allowances for spring thickness with springs according to DIN EN 16983 (previously DIN 2093)

Overall height tolerances

Nominal spring thickness		Admissible tolerances	
t or t' [mm]		l_o [mm]	
greater than	up to	max.	min.
0,20	1,25	+0,10	-0,05
1,25	2,00	+0,15	-0,08
2,00	3,00	+0,20	-0,10
3,00	6,00	+0,30	-0,15
6,00	16,00	+0,30	-0,30

Allowances for the overall height with springs according to DIN EN 16983 (previously DIN 2093)

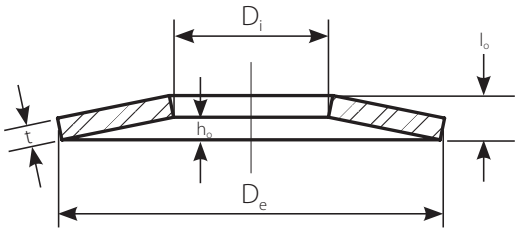
Original SCHNORR® disc springs

The following dimension tables describe:

Further versions:

Furthermore, we also manufacture from special materials, such as:
> Steel grades for higher temperatures (X22 CrMoV 12-1, X39 CrMo 17-1)
> Copper alloys (CuSn 8, CuBe 2)
> Nickel and cobalt alloys (Nimonic 90, Inconel X750, Inconel 718)
> and other material grades

For this, please see our material grade overview table on pages 42 and 43



Reference for a disc spring

D_e = 40 mm, D_i = 20.4 mm, t = 1.5 mm:
Disc spring 40 x 20.4 x 1.5
according to DIN EN 16983
or Article no. 012 800

Original SCHNORR® disc spring standard material **Ø 6 - 15 mm**

Article-number/ Order reference	Ordering dimensions							Weight	Spring travel s and force F					
							Gr. acc. to DIN	per 1000 pieces	at s = 0,25 h_o		at s = 0,50 h_o		at s ≈ 0,75 h_o	
	D_e [mm]	D_i [mm]	t [mm]	t' [mm]	l_o [mm]	h_o [mm]	EN 16983	[kg]	s [mm]	F [N]	s [mm]	F [N]	s [mm]	F [N]
000 100	6,00	3,20	0,30		0,45	0,15	1	0,044	0,038	45	0,075	84	0,113	119
000 200	8,00	3,20	0,20		0,40	0,20	1	0,064	0,050	12	0,100	21	0,150	26
000 300	8,00	3,20	0,30		0,55	0,25	1	0,093	0,063	46	0,125	79	0,188	104
000 400	8,00	3,20	0,40		0,60	0,20	1	0,126	0,050	69	0,100	130	0,150	186
000 550 C	**8,00**	**4,20**	**0,20**		0,45	0,25	1	0,055	0,063	21	0,125	33	0,188	39
000 600 B	**8,00**	**4,20**	**0,30**		0,55	0,25	1	0,080	0,063	52	0,125	89	0,188	118
000 700 A	**8,00**	**4,20**	**0,40**		0,60	0,20	1	0,107	0,050	78	0,100	147	0,150	210
000 800	10,00	3,20	0,30		0,65	0,35	1	0,157	0,088	51	0,175	82	0,263	98
000 900	10,00	3,20	0,40		0,70	0,30	1	0,211	0,075	75	0,150	133	0,225	179
001 000	10,00	3,20	0,50		0,75	0,25	1	0,266	0,063	104	0,125	196	0,188	279
001 100	10,00	4,20	0,40		0,70	0,30	1	0,193	0,075	79	0,150	140	0,225	189
001 200	10,00	4,20	0,50		0,75	0,25	1	0,243	0,063	110	0,125	206	0,188	294
001 300 C	**10,00**	**5,20**	**0,25**		0,55	0,30	1	0,109	0,075	31	0,150	48	0,225	58
001 400 B	**10,00**	**5,20**	**0,40**		0,70	0,30	1	0,170	0,075	88	0,150	155	0,225	209
001 500 A	**10,00**	**5,20**	**0,50**		0,75	0,25	1	0,214	0,063	122	0,125	228	0,188	325
001 600	12,00	4,20	0,40		0,80	0,40	1	0,297	0,100	85	0,200	141	0,300	178
001 700	12,00	4,20	0,50		0,85	0,35	1	0,374	0,088	116	0,175	208	0,263	284
001 800	12,00	4,20	0,60		1,00	0,40	1	0,450	0,100	224	0,200	405	0,300	557
001 900	12,00	5,20	0,50		0,90	0,40	1	0,345	0,100	151	0,200	263	0,300	350
002 000	12,00	5,20	0,60		0,95	0,35	1	0,415	0,088	196	0,175	361	0,263	506
002 100	12,00	6,20	0,50		0,85	0,35	1	0,310	0,088	134	0,175	239	0,263	326
002 200	12,00	6,20	0,60		0,95	0,35	1	0,373	0,088	214	0,175	394	0,263	552
002 300	12,50	5,20	0,50		0,85	0,35	1	0,382	0,088	111	0,175	200	0,263	272
002 050 C	**12,50**	**6,20**	**0,35**		0,80	0,45	1	0,251	0,113	84	0,225	130	0,338	151
002 500 B	**12,50**	**6,20**	**0,50**		0,85	0,35	1	0,346	0,088	120	0,175	215	0,263	294
002 700 A	**12,50**	**6,20**	**0,70**		1,00	0,30	1	0,488	0,075	240	0,150	457	0,225	660
002 750 C	**14,00**	**7,20**	**0,35**		0,80	0,45	1	0,308	0,113	68	0,225	106	0,338	123
002 800 B	**14,00**	**7,20**	**0,50**		0,90	0,40	1	0,425	0,100	120	0,200	210	0,300	279
002 900 A	**14,00**	**7,20**	**0,80**		1,10	0,30	1	0,676	0,075	284	0,150	547	0,225	797
003 000	15,00	5,20	0,40		0,95	0,55	1	0,468	0,138	101	0,275	154	0,413	176
003 100	15,00	5,20	0,50		1,00	0,50	1	0,588	0,125	133	0,250	221	0,375	278
003 200	15,00	5,20	0,60		1,05	0,45	1	0,708	0,113	171	0,225	302	0,338	407
003 300	15,00	5,20	0,70		1,10	0,40	1	0,828	0,100	214	0,200	395	0,300	555
003 500	15,00	6,20	0,50		1,00	0,50	1	0,553	0,125	138	0,250	230	0,375	289
003 600	15,00	6,20	0,60		1,05	0,45	1	0,665	0,113	178	0,225	314	0,338	424
003 700	15,00	6,20	0,70		1,10	0,40	1	0,778	0,100	222	0,200	411	0,300	578
003 800	15,00	8,20	0,70		1,10	0,40	1	0,654	0,100	256	0,200	474	0,300	666
003 900	15,00	8,20	0,80		1,20	0,40	1	0,740	0,100	367	0,200	689	0,300	982

Original SCHNORR® disc springs standard material — Ø 16 - 23 mm

Article-number/ Order reference	Order reference							Weight	Spring travel s and force F					
							Gr. acc.	per 1000	at s = 0,25 h_o		at s = 0,50 h_o		at s ≈ 0,75 h_o	
	D_e	D_i	t	t'	l_o	h_o	to DIN	pieces	s	F	s	F	s	F
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	EN 16983	[kg]	[mm]	[N]	[mm]	[N]	[mm]	[N]
004 100 C	**16,00**	**8,20**	**0,40**		0,90	0,50	1	0,444	0,125	84	0,250	131	0,375	154
004 300 B	**16,00**	**8,20**	**0,60**		1,05	0,45	1	0,672	0,113	172	0,225	304	0,338	410
004 400	16,00	8,20	0,70		1,15	0,45	1	0,786	0,113	254	0,225	461	0,338	637
004 500	16,00	8,20	0,80		1,20	0,40	1	0,888	0,100	308	0,200	579	0,300	825
004 600 A	**16,00**	**8,20**	**0,90**		1,25	0,35	1	1,002	0,088	363	0,175	697	0,263	1013
004 700	18,00	6,20	0,40		1,00	0,60	1	0,677	0,150	85	0,300	126	0,450	139
004 800	18,00	6,20	0,50		1,10	0,60	1	0,850	0,150	130	0,300	206	0,450	246
004 900	18,00	6,20	0,60		1,20	0,60	1	1,024	0,150	191	0,300	317	0,450	400
005 000	18,00	6,20	0,70		1,25	0,55	1	1,197	0,138	236	0,275	414	0,413	553
005 100	18,00	6,20	0,80		1,30	0,50	1	1,353	0,125	286	0,250	523	0,375	726
005 200	18,00	8,20	0,50		1,10	0,60	1	0,762	0,150	140	0,300	222	0,450	265
005 300	18,00	8,20	0,70		1,25	0,55	1	1,073	0,138	255	0,275	446	0,413	596
005 400	18,00	8,20	0,80		1,30	0,50	1	1,213	0,125	309	0,250	564	0,375	783
005 500	18,00	8,20	1,00		1,40	0,40	1	1,524	0,100	425	0,200	815	0,300	1181
005 550 C	**18,00**	**9,20**	**0,45**		1,05	0,60	1	0,651	0,150	121	0,300	186	0,450	214
005 600 B	**18,00**	**9,20**	**0,70**		1,20	0,50	1	0,999	0,125	233	0,250	417	0,375	566
005 700 A	**18,00**	**9,20**	**1,00**		1,40	0,40	1	1,418	0,100	451	0,200	865	0,300	1254
005 800	20,00	8,20	0,60		1,30	0,70	1	1,191	0,175	214	0,350	342	0,525	412
005 900	20,00	8,20	0,70		1,35	0,65	1	1,393	0,163	262	0,325	442	0,488	569
006 000	20,00	8,20	0,80		1,40	0,60	1	1,574	0,150	315	0,300	557	0,450	751
006 100	20,00	8,20	0,90		1,45	0,55	1	1,776	0,138	374	0,275	685	0,413	954
006 200	20,00	8,20	1,00		1,55	0,55	1	1,978	0,138	494	0,275	918	0,413	1295
006 300 C	**20,00**	**10,20**	**0,50**		1,15	0,65	1	0,876	0,163	141	0,325	219	0,488	254
006 400 B	**20,00**	**10,20**	**0,80**		1,35	0,55	1	1,394	0,138	304	0,275	547	0,413	748
006 500	20,00	10,20	0,90		1,45	0,55	1	1,573	0,138	412	0,275	754	0,413	1050
006 600	20,00	10,20	1,00		1,55	0,55	1	1,752	0,138	544	0,275	1010	0,413	1425
006 700 A	**20,00**	**10,20**	**1,10**		1,55	0,45	1	1,913	0,113	548	0,225	1050	0,338	1521
006 800	20,00	10,20	1,25		1,75	0,50	2^g	2,181	0,125	890	0,250	1708	0,375	2477
018 982	20,00	10,20	1,25		1,75	0,50	2^f	2,181	0,125	890	0,250	1708	0,375	2477
006 900	20,00	10,20	1,50		1,80	0,30	2^g	2,610	0,075	857	0,150	1695	0,225	2521
018 983	20,00	10,20	1,50		1,80	0,30	2^f	2,610	0,075	857	0,150	1695	0,225	2521
007 000 C	**22,50**	**11,20**	**0,60**		1,40	0,80	1	1,361	0,200	241	0,400	370	0,600	426
007 100 B	**22,50**	**11,20**	**0,80**		1,45	0,65	1	1,799	0,163	306	0,325	533	0,488	708
007 200 A	**22,50**	**11,20**	**1,25**		1,75	0,50	2^g	2,814	0,125	693	0,250	1330	0,375	1929
019 984 A	**22,50**	**11,20**	**1,25**		1,75	0,50	2^f	2,814	0,125	693	0,250	1330	0,375	1929
007 400	23,00	8,20	0,70		1,50	0,80	1	1,939	0,200	280	0,400	448	0,600	544
007 500	23,00	8,20	0,80		1,55	0,75	1	2,192	0,188	332	0,375	560	0,563	719
007 600	23,00	8,20	0,90		1,60	0,70	1	2,472	0,175	391	0,350	687	0,525	919
007 700	23,00	8,20	1,00		1,70	0,70	1	2,753	0,175	507	0,350	909	0,525	1240
007 800	23,00	10,20	0,90		1,65	0,75	1	2,270	0,188	463	0,375	802	0,563	1058
007 900	23,00	10,20	1,00		1,70	0,70	1	2,527	0,175	538	0,350	964	0,525	1315
008 000	23,00	10,20	1,25		1,90	0,65	2^g	3,172	0,163	870	0,325	1627	0,488	2310
019 985	23,00	10,20	1,25		1,90	0,65	2^f	3,172	0,163	870	0,325	1627	0,488	2310
008 100	23,00	12,20	1,00		1,60	0,60	1	2,255	0,150	475	0,300	872	0,450	1217
008 200	23,00	12,20	1,25		1,85	0,60	2^g	2,807	0,150	864	0,300	1630	0,450	2331
018 986	23,00	12,20	1,25		1,85	0,60	2^f	2,807	0,150	863	0,300	1630	0,450	2331
008 350	23,00	12,20	1,50		2,00	0,50	2^g	3,359	0,125	1159	0,250	2250	0,375	3297
013 433	23,00	12,20	1,50		2,00	0,50	2^f	3,359	0,125	1159	0,250	2250	0,375	3297

2^g = according to group 2 (DIN EN 16983) - manufacturing process turned (D_e/D_i) 2^f = according to group 2 (DIN EN 16983) - manufacturing process fine blanked

Original SCHNORR® disc springs standard material — Ø 25 - 34 mm

Article-number/ Order reference	Order reference							Weight	Spring travel s and force F					
							Gr. acc.	per 1000	at s = 0,25 h_o		at s = 0,50 h_o		at s ≈ 0,75 h_o	
	D_e	D_i	t	t'	l_o	h_o	to DIN	pieces	s	F	s	F	s	F
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	EN 16983	[kg]	[mm]	[N]	[mm]	[N]	[mm]	[N]
008 600	25,00	10,20	1,00		1,75	0,75	1	3,105	0,188	492	0,375	870	0,563	1172
008 700 C	**25,00**	**12,20**	**0,70**		1,60	0,90	1	1,994	0,225	331	0,450	515	0,675	600
008 800 B	**25,00**	**12,20**	**0,90**		1,60	0,70	1	2,543	0,175	367	0,350	644	0,525	862
008 900	25,00	12,20	1,00		1,80	0,80	1	2,832	0,200	585	0,400	1021	0,600	1359
009 000	25,00	12,20	1,25		1,95	0,70	2^g	3,526	0,175	848	0,350	1573	0,525	2214
018 987	25,00	12,20	1,25		1,95	0,70	2^f	3,526	0,175	848	0,350	1573	0,525	2214
009 100 A	**25,00**	**12,20**	**1,50**		2,05	0,55	2^g	4,219	0,138	1040	0,275	2007	0,413	2926
016 838 A	**25,00**	**12,20**	**1,50**		2,05	0,55	2^f	4,219	0,138	1040	0,275	2007	0,413	2926
009 200	28,00	10,20	0,80		1,75	0,95	1	3,233	0,238	348	0,475	553	0,713	662
009 300	28,00	10,20	1,00		1,90	0,90	1	4,062	0,225	512	0,450	872	0,675	1130
009 400	28,00	10,20	1,25		2,05	0,80	2^g	5,057	0,200	737	0,400	1339	0,600	1853
018 988	28,00	10,20	1,25		2,05	0,80	2^f	5,057	0,200	737	0,400	1339	0,600	1853
009 500	28,00	10,20	1,50		2,20	0,70	2^g	6,051	0,175	1003	0,350	1899	0,525	2723
017 519	28,00	10,20	1,50		2,20	0,70	2^f	6,051	0,175	1003	0,350	1899	0,525	2723
009 600	28,00	12,20	1,00		1,95	0,95	1	3,789	0,238	590	0,475	992	0,713	1268
009 700	28,00	12,20	1,25		2,10	0,85	2^g	4,717	0,213	844	0,425	1519	0,638	2083
014 236	28,00	12,20	1,25		2,10	0,85	2^f	4,717	0,213	844	0,425	1519	0,638	2083
009 800	28,00	12,20	1,50		2,25	0,75	2^g	5,645	0,188	1149	0,375	2159	0,563	3077
018 738	28,00	12,20	1,50		2,25	0,75	2^f	5,645	0,188	1149	0,375	2159	0,563	3077
009 900 C	**28,00**	**14,20**	**0,80**		1,80	1,00	1	2,760	0,250	435	0,500	681	0,750	801
010 000 B	**28,00**	**14,20**	**1,00**		1,80	0,80	1	3,468	0,200	476	0,400	832	0,600	1107
010 100	28,00	14,20	1,25		2,10	0,85	2^g	4,317	0,213	907	0,425	1634	0,638	2240
014 426	28,00	14,20	1,25		2,10	0,85	2^f	4,317	0,213	907	0,425	1634	0,638	2240
010 200 A	**28,00**	**14,20**	**1,50**		2,15	0,65	2^g	5,166	0,163	1033	0,325	1970	0,488	2841
018 599 A	**28,00**	**14,20**	**1,50**		2,15	0,65	2^f	5,166	0,163	1033	0,325	1970	0,488	2841
010 300	31,50	12,20	1,00		2,10	1,10	1	5,035	0,275	587	0,550	951	0,825	1167
010 400	31,50	12,20	1,25		2,20	0,95	2^g	6,268	0,238	761	0,475	1343	0,713	1805
018 989	31,50	12,20	1,25		2,20	0,95	2^f	6,268	0,238	761	0,475	1343	0,713	1805
010 500	31,50	12,20	1,50		2,35	0,85	2^g	7,501	0,213	1033	0,425	1912	0,638	2688
018 990	31,50	12,20	1,50		2,35	0,85	2^f	7,501	0,213	1033	0,425	1912	0,638	2688
010 650 C	**31,50**	**16,30**	**0,80**		1,85	1,05	1	3,442	0,263	384	0,525	594	0,788	687
010 700 B	**31,50**	**16,30**	**1,25**		2,15	0,90	2^g	5,384	0,225	791	0,450	1409	0,675	1913
018 734 B	**31,50**	**16,30**	**1,25**		2,15	0,90	2^f	5,384	0,225	791	0,450	1409	0,675	1913
010 800	31,50	16,30	1,50		2,40	0,90	2^g	6,443	0,225	1260	0,450	2314	0,675	3230
014 396	31,50	16,30	1,50		2,40	0,90	2^f	6,443	0,225	1260	0,450	2314	0,675	3230
010 900 A	**31,50**	**16,30**	**1,75**		2,45	0,70	2^g	7,546	0,175	1391	0,350	2669	0,525	3871
018 991 A	**31,50**	**16,30**	**1,75**		2,45	0,70	2^f	7,546	0,175	1391	0,350	2669	0,525	3871
011 000	31,50	16,30	2,00		2,75	0,75	2^g	8,605	0,188	2199	0,375	4239	0,563	6173
014 399	31,50	16,30	2,00		2,75	0,75	2^f	8,605	0,188	2199	0,375	4239	0,563	6173
011 100	34,00	12,30	1,00		2,25	1,25	1	6,006	0,313	637	0,625	998	0,938	1174
011 200	34,00	12,30	1,25		2,35	1,10	2^g	7,477	0,275	815	0,550	1395	0,825	1818
014 099	34,00	12,20	1,25		2,35	1,10	2^f	7,477	0,275	814	0,550	1393	0,825	1815
011 300	34,00	12,30	1,50		2,50	1,00	2^g	8,948	0,250	1097	0,500	1982	0,750	2725
014 235	34,00	12,20	1,50		2,50	1,00	2^f	8,948	0,250	1095	0,500	1979	0,750	2721
011 400	34,00	14,30	1,25		2,40	1,15	2^g	7,074	0,288	913	0,575	1546	0,863	1993
018 992	34,00	14,20	1,25		2,40	1,15	2^f	7,074	0,287	911	0,575	1543	0,862	1989
011 500	34,00	14,30	1,50		2,55	1,05	2^g	8,465	0,263	1224	0,525	2192	0,788	2990
018 993	34,00	14,20	1,50		2,55	1,05	2^f	8,465	0,262	1221	0,525	2187	0,787	2984
011 600	34,00	16,30	1,50		2,55	1,05	2^g	7,911	0,263	1291	0,525	2313	0,788	3155
018 994	34,00	16,30	1,50		2,55	1,05	2^f	7,911	0,263	1291	0,525	2313	0,788	3155
011 700	34,00	16,30	2,00		2,85	0,85	2^g	10,570	0,213	2097	0,425	4003	0,638	5783
014 397	34,00	16,30	2,00		2,85	0,85	2^f	10,570	0,213	2097	0,425	4003	0,638	5783

2^g = according to group 2 (DIN EN 16983) - manufacturing process turned (D_e/D_i) 2^f = according to group 2 (DIN EN 16983) - manufacturing process fine blanked

Original SCHNORR® disc springs standard material — Ø 35,5 - 50 mm

Article-number/ Order reference	Order reference							Weight	Spring travel s and force F					
							Gr. acc.	per 1000	at s = 0,25 h_o		at s = 0,50 h_o		at s ≈ 0,75 h_o	
	D_e	D_i	t	t'	l_o	h_o	to DIN	pieces	s	F	s	F	s	F
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	EN 16983	[kg]	[mm]	[N]	[mm]	[N]	[mm]	[N]
011 850 C	**35,50**	**18,30**	**0,90**		2,05	1,15	1	4,952	0,288	458	0,575	712	0,863	832
011 900 B	**35,50**	**18,30**	**1,25**		2,25	1,00	2^g	6,865	0,250	731	0,500	1277	0,750	1699
014 405 B	**35,50**	**18,30**	**1,25**		2,25	1,00	2^f	6,865	0,250	731	0,500	1277	0,750	1699
012 000 A	**35,50**	**18,30**	**2,00**		2,80	0,80	2^g	10,970	0,200	1864	0,400	3576	0,600	5187
014 537 A	**35,50**	**18,30**	**2,00**		2,80	0,80	2^f	10,970	0,200	1864	0,400	3576	0,600	5187
012 100	40,00	14,30	1,25		2,65	1,40	2^g	10,400	0,350	904	0,700	1459	1,050	1780
018 995	40,00	14,30	1,25		2,65	1,40	2^f	10,400	0,350	904	0,700	1459	1,050	1780
012 200	40,00	14,30	1,50		2,75	1,25	2^g	12,450	0,313	1114	0,625	1929	0,938	2545
012 626	40,00	14,20	1,50		2,75	1,25	2^f	12,450	0,313	1113	0,625	1927	0,938	2542
012 300	40,00	14,30	2,00		3,05	1,05	2^g	16,630	0,263	1800	0,525	3363	0,788	4769
018 996	40,00	14,20	2,00		3,05	1,05	2^f	16,630	0,262	1797	0,525	3359	0,787	4763
012 400	40,00	16,30	1,50		2,80	1,30	2^g	11,890	0,325	1224	0,650	2102	0,975	2749
016 296	40,00	16,30	1,50		2,80	1,30	2^f	11,890	0,325	1224	0,650	2102	0,975	2749
012 500	40,00	16,30	2,00		3,10	1,10	2^g	15,890	0,275	1972	0,550	3663	0,825	5169
018 997	40,00	16,30	2,00		3,10	1,10	2^f	15,890	0,275	1972	0,550	3663	0,825	5169
012 600	40,00	18,30	2,00		3,15	1,15	2^g	15,040	0,288	2182	0,575	4030	0,863	5656
018 998	40,00	18,30	2,00		3,15	1,15	2^f	15,040	0,288	2182	0,575	4030	0,863	5656
012 700 C	**40,00**	**20,40**	**1,00**		2,30	1,30	1	7,067	0,325	565	0,650	876	0,975	1017
012 800 B	**40,00**	**20,40**	**1,50**		2,65	1,15	2^g	10,530	0,288	1109	0,575	1953	0,863	2621
018 543 B	**40,00**	**20,40**	**1,50**		2,65	1,15	2^f	10,530	0,288	1109	0,575	1953	0,863	2621
012 900	40,00	20,40	2,00		3,10	1,10	2^g	14,060	0,275	2175	0,550	4041	0,825	5701
013 334	40,00	20,40	2,00		3,10	1,10	2^f	14,060	0,275	2175	0,550	4041	0,825	5701
013 000 A	**40,00**	**20,40**	**2,25**		3,15	0,90	2^g	15,720	0,225	2336	0,450	4481	0,675	6500
018 999 A	**40,00**	**20,40**	**2,25**		3,15	0,90	2^f	15,720	0,225	2336	0,450	4481	0,675	6500
013 100	40,00	20,40	2,50		3,45	0,95	2^g	17,520	0,238	3351	0,475	6453	0,713	9390
014 404	40,00	20,40	2,50		3,45	0,95	2^f	17,520	0,238	3351	0,475	6453	0,713	9390
013 250 C	**45,00**	**22,40**	**1,25**		2,85	1,60	2^g	11,340	0,400	1041	0,800	1620	1,200	1891
019 176 C	**45,00**	**22,40**	**1,25**		2,85	1,60	2^f	11,340	0,400	1041	0,800	1620	1,200	1891
013 300 B	**45,00**	**22,40**	**1,75**		3,05	1,30	2^g	15,890	0,325	1524	0,650	2701	0,975	3646
014 398 B	**45,00**	**22,40**	**1,75**		3,05	1,30	2^f	15,890	0,325	1524	0,650	2701	0,975	3646
013 400 A	**45,00**	**22,40**	**2,50**		3,50	1,00	2^g	22,770	0,250	2773	0,500	5320	0,750	7716
014 427 A	**45,00**	**22,40**	**2,50**		3,50	1,00	2^f	22,770	0,250	2773	0,500	5320	0,750	7716
013 500	50,00	18,40	1,25		2,85	1,60	2^g	16,130	0,400	757	0,800	1178	1,200	1375
019 177	50,00	18,40	1,25		2,85	1,60	2^f	16,130	0,400	757	0,800	1178	1,200	1375
013 600	50,00	18,40	1,50		3,30	1,80	2^g	19,310	0,450	1379	0,900	2184	1,350	2606
019 178	50,00	18,30	1,50		3,30	1,80	2^f	19,310	0,450	1378	0,900	2182	1,350	2603
013 700	50,00	18,40	2,00		3,50	1,50	2^g	25,790	0,375	1918	0,750	3392	1,125	4572
019 179	50,00	18,30	2,00		3,50	1,50	2^f	25,790	0,375	1916	0,750	3389	1,125	4567
013 800	50,00	18,40	2,50		4,10	1,60	2^g	32,140	0,400	3703	0,800	6733	1,200	9315
019 180	50,00	18,30	2,50		4,10	1,60	2^f	32,140	0,400	3699	0,800	6726	1,200	9305
013 900	50,00	18,40	3,00		4,40	1,40	2^g	38,350	0,350	5043	0,700	9546	1,050	13688
019 181	50,00	18,30	3,00		4,40	1,40	2^f	38,350	0,350	5038	0,700	9535	1,050	13673
014 000	50,00	20,40	2,00		3,50	1,50	2^g	24,850	0,375	1966	0,750	3478	1,125	4687
019 182	50,00	20,40	2,00		3,50	1,50	2^f	24,850	0,375	1966	0,750	3478	1,125	4687
014 100	50,00	20,40	2,50		3,85	1,35	2^g	30,970	0,338	3008	0,675	5601	1,013	7919
019 183	50,00	20,40	2,50		3,85	1,35	2^f	30,970	0,338	3008	0,675	5601	1,013	7919
014 200	50,00	22,40	2,00		3,60	1,60	2^g	23,820	0,400	2247	0,800	3924	1,200	5222
019 184	50,00	22,40	2,00		3,60	1,60	2^f	23,820	0,400	2247	0,800	3924	1,200	5222
014 300	50,00	22,40	2,50		3,90	1,40	2^g	29,680	0,350	3261	0,700	6044	1,050	8510
019 473	50,00	22,40	2,50		3,90	1,40	2^f	29,680	0,350	3261	0,700	6044	1,050	8510
014 400 C	**50,00**	**25,40**	**1,25**		2,85	1,60	2^g	13,820	0,400	854	0,800	1328	1,200	1550
019 185 C	**50,00**	**25,40**	**1,25**		2,85	1,60	2^f	13,820	0,400	854	0,800	1328	1,200	1550

2^g = according to group 2 (DIN EN 16983) - manufacturing process turned (D_e/D_i) 2^f = according to group 2 (DIN EN 16983) - manufacturing process fine blanked

Original SCHNORR® disc springs standard material — Ø 50 - 70 mm

Article-number/ Order reference	Order reference							Weight	Spring travel s and force F					
							Gr. acc.	per 1000	at s = 0,25 h_o		at s = 0,50 h_o		at s ≈ 0,75 h_o	
	D_e	D_i	t	t'	l_o	h_o	to DIN	pieces	s	F	s	F	s	F
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	EN 16983	[kg]	[mm]	[N]	[mm]	[N]	[mm]	[N]
014 500	50,00	25,40	1,50		3,10	1,60	2^g	16,540	0,400	1242	0,800	2028	1,200	2512
017 308	50,00	25,40	1,50		3,10	1,60	2^f	16,540	0,400	1242	0,800	2028	1,200	2512
014 600 B	**50,00**	**25,40**	**2,00**		3,40	1,40	2^g	22,090	0,350	1949	0,700	3491	1,050	4762
018 498 B	**50,00**	**25,40**	**2,00**		3,40	1,40	2^f	22,090	0,350	1949	0,700	3491	1,050	4762
014 700	50,00	25,40	2,50		3,90	1,40	2^g	27,520	0,350	3473	0,700	6437	1,050	9063
014 428	50,00	25,40	2,50		3,90	1,40	2^f	27,520	0,350	3473	0,700	6437	1,050	9063
014 800 A	**50,00**	**25,40**	**3,00**		4,10	1,10	2^g	32,850	0,275	4255	0,550	8214	0,825	11976
014 425 A	**50,00**	**25,40**	**3,00**		4,10	1,10	2^f	32,850	0,275	4255	0,550	8214	0,825	11976
014 950 C	**56,00**	**28,50**	**1,50**		3,45	1,95	2^g	20,850	0,488	1458	0,975	2259	1,463	2622
017 704 C	**56,00**	**28,50**	**1,50**		3,45	1,95	2^f	20,850	0,488	1458	0,975	2259	1,463	2622
015 000 B	**56,00**	**28,50**	**2,00**		3,60	1,60	2^g	27,810	0,400	1910	0,800	3335	1,200	4438
019 186 B	**56,00**	**28,50**	**2,00**		3,60	1,60	2^f	27,810	0,400	1910	0,800	3335	1,200	4438
015 100 A	**56,00**	**28,50**	**3,00**		4,30	1,30	2^g	41,570	0,325	4142	0,650	7895	0,975	11388
014 424 A	**56,00**	**28,50**	**3,00**		4,30	1,30	2^f	41,570	0,325	4142	0,650	7895	0,975	11388
015 200	60,00	20,50	2,00		4,10	2,10	2^g	38,160	0,525	2318	1,050	3802	1,575	4730
019 187	60,00	20,40	2,00		4,10	2,10	2^f	38,160	0,525	2316	1,050	3799	1,575	4727
015 300	60,00	20,50	2,50		4,30	1,80	2^g	47,690	0,450	3018	0,900	5379	1,350	7302
019 188	60,00	20,40	2,50		4,30	1,80	2^f	47,690	0,450	3016	0,900	5375	1,350	7297
015 400	60,00	20,50	3,00		4,70	1,70	2^g	57,040	0,425	4449	0,850	8234	1,275	11577
019 189	60,00	20,50	3,00		4,70	1,70	2^f	57,040	0,425	4449	0,850	8234	1,275	11577
015 500	60,00	25,50	2,50		4,40	1,90	2^g	44,200	0,475	3447	0,950	6081	1,425	8175
019 190	60,00	25,40	2,50		4,40	1,90	2^f	44,200	0,475	3442	0,950	6073	1,425	8164
015 600	60,00	25,50	3,00		4,65	1,65	2^g	52,860	0,413	4495	0,825	8352	1,238	11784
019 191	60,00	25,40	3,00		4,65	1,65	2^f	52,860	0,412	4489	0,825	8341	1,237	11768
015 700	60,00	30,50	2,50		4,30	1,80	2^g	39,940	0,450	3447	0,900	6145	1,350	8342
012 758	60,00	30,50	2,50		4,30	1,80	2^f	39,940	0,450	3447	0,900	6145	1,350	8342
015 800	60,00	30,50	3,00		4,70	1,70	2^g	47,770	0,425	5083	0,850	9407	1,275	13226
017 070	60,00	30,50	3,00		4,70	1,70	2^f	47,770	0,425	5083	0,850	9407	1,275	13226
015 900	60,00	30,50	3,50		5,00	1,50	2^g	55,100	0,375	6591	0,750	12574	1,125	18153
016 881	60,00	30,50	3,50		5,00	1,50	2^f	55,100	0,375	6591	0,750	12574	1,125	18153
016 050 C	**63,00**	**31,00**	**1,80**		4,15	2,35	2^g	32,530	0,588	2364	1,175	3658	1,763	4238
019 192 C	**63,00**	**31,00**	**1,80**		4,15	2,35	2^f	32,530	0,588	2364	1,175	3658	1,763	4238
016 100 B	**63,00**	**31,00**	**2,50**		4,25	1,75	2^g	44,850	0,438	2942	0,875	5270	1,313	7189
019 193 B	**63,00**	**31,00**	**2,50**		4,25	1,75	2^f	44,850	0,438	2942	0,875	5270	1,313	7189
016 200	63,00	31,00	3,00		4,80	1,80	2^g	53,860	0,450	4891	0,900	8981	1,350	12536
014 429	63,00	31,00	3,00		4,80	1,80	2^f	53,860	0,450	4891	0,900	8981	1,350	12536
016 300 A	**63,00**	**31,00**	**3,50**		4,90	1,40	2^g	62,130	0,350	5399	0,700	10359	1,050	15025
018 637 A	**63,00**	**31,00**	**3,50**		4,90	1,40	2^f	62,130	0,350	5399	0,700	10359	1,050	15025
016 400	70,00	25,50	2,00		4,50	2,50	2^g	50,780	0,625	2408	1,250	3771	1,875	4437
019 194	70,00	25,50	2,00		4,50	2,50	2^f	50,780	0,625	2408	1,250	3771	1,875	4437
016 500	70,00	30,50	2,50		4,90	2,40	2^g	59,530	0,600	3755	1,200	6297	1,800	8031
019 195	70,00	30,50	2,50		4,90	2,40	2^f	59,530	0,600	3755	1,200	6297	1,800	8031
016 600	70,00	30,50	3,00		5,10	2,10	2^g	71,190	0,525	4676	1,050	8376	1,575	11426
019 196	70,00	30,50	3,00		5,10	2,10	2^f	71,190	0,525	4676	1,050	8376	1,575	11426
016 700	70,00	35,50	3,00		5,10	2,10	2^g	65,210	0,525	5028	1,050	9007	1,575	12287
019 197	70,00	35,50	3,00		5,10	2,10	2^f	65,210	0,525	5028	1,050	9007	1,575	12287
016 800	70,00	35,50	4,00		5,80	1,80	2^g	86,130	0,450	8757	0,900	16634	1,350	23923
019 198	70,00	35,50	4,00		5,80	1,80	2^f	86,130	0,450	8757	0,900	16634	1,350	23923
016 900	70,00	40,50	4,00		5,60	1,60	2^g	77,040	0,400	8391	0,800	16099	1,200	23351
019 199	70,00	40,50	4,00		5,60	1,60	2^f	77,040	0,400	8391	0,800	16099	1,200	23351
017 000	70,00	40,50	5,00		6,20	1,20	2^g	95,150	0,300	11544	0,600	22728	0,900	33672
017 085	70,00	40,50	5,00		6,20	1,20	2^f	95,150	0,300	11544	0,600	22728	0,900	33672

2^g = according to group 2 (DIN EN 16983) - manufacturing process turned (D_e/D_i) 2^f = according to group 2 (DIN EN 16983) - manufacturing process fine blanked

Original SCHNORR® disc springs standard material — Ø 71 - 112 mm

Article-number/ Order reference	Order reference							Weight	Spring travel s and force F					
							Gr. acc.	per 1000	at s = 0,25 h_o		at s = 0,50 h_o		at s ≈ 0,75 h_o	
	D_e	D_i	t	t'	l_o	h_o	to DIN	pieces	s	F	s	F	s	F
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	EN 16983	[kg]	[mm]	[N]	[mm]	[N]	[mm]	[N]
017 100 C	**71,00**	**36,00**	**2,00**		4,60	2,60	2^g	44,660	0,650	2861	1,300	4432	1,950	5144
019 200 C	**71,00**	**36,00**	**2,00**		4,60	2,60	2^f	44,660	0,650	2861	1,300	4432	1,950	5144
017 200 B	**71,00**	**36,00**	**2,50**		4,50	2,00	2^g	56,110	0,500	2894	1,000	5054	1,500	6725
019 201 B	**71,00**	**36,00**	**2,50**		4,50	2,00	2^f	56,110	0,500	2894	1,000	5054	1,500	6725
017 300 A	**71,00**	**36,00**	**4,00**		5,60	1,60	2^g	88,630	0,400	7379	0,800	14157	1,200	20535
017 196 A	**71,00**	**36,00**	**4,00**		5,60	1,60	2^f	88,630	0,400	7379	0,800	14157	1,200	20535
017 400	80,00	31,00	2,50		5,30	2,80	2^g	82,010	0,700	3678	1,400	5933	2,100	7239
019 202	80,00	31,00	2,50		5,30	2,80	2^f	82,010	0,700	3678	1,400	5933	2,100	7239
017 500	80,00	31,00	3,00		5,50	2,50	2^g	98,010	0,625	4531	1,250	7847	1,875	10352
019 203	80,00	31,00	3,00		5,50	2,50	2^f	98,010	0,625	4531	1,250	7847	1,875	10352
017 600	80,00	31,00	4,00		6,10	2,10	2^g	130,000	0,525	7319	1,050	13677	1,575	19394
014 522	80,00	31,00	4,00		6,10	2,10	2^f	130,000	0,525	7319	1,050	13677	1,575	19394
017 700	80,00	36,00	3,00		5,70	2,70	2^g	91,920	0,675	5401	1,350	9196	2,025	11919
019 204	80,00	36,00	3,00		5,70	2,70	2^f	91,920	0,675	5401	1,350	9196	2,025	11919
017 800	80,00	36,00	4,00		6,20	2,20	2^g	121,900	0,550	8163	1,100	15168	1,650	21400
018 573	80,00	36,00	4,00		6,20	2,20	2^f	121,900	0,550	8163	1,100	15168	1,650	21400
017 850 C	**80,00**	**41,00**	**2,25**		5,20	2,95	2^g	63,540	0,738	3698	1,475	5715	2,213	6613
018 739 C	**80,00**	**41,00**	**2,25**		5,20	2,95	2^f	63,540	0,738	3698	1,475	5715	2,213	6613
017 900 B	**80,00**	**41,00**	**3,00**		5,30	2,30	2^g	84,920	0,575	4450	1,150	7838	1,725	10518
016 935 B	**80,00**	**41,00**	**3,00**		5,30	2,30	2^f	84,920	0,575	4450	1,150	7838	1,725	10518
018 000	80,00	41,00	4,00		6,20	2,20	2^g	112,600	0,550	8726	1,100	16213	1,650	22874
018 674	80,00	41,00	4,00		6,20	2,20	2^f	112,600	0,550	8726	1,100	16213	1,650	22874
018 100 A	**80,00**	**41,00**	**5,00**		6,70	1,70	2^g	139,500	0,425	11821	0,850	22928	1,275	33559
018 934 A	**80,00**	**41,00**	**5,00**		6,70	1,70	2^f	139,500	0,425	11821	0,850	22928	1,275	33559
018 200 C	**90,00**	**46,00**	**2,50**		5,70	3,20	2^g	89,740	0,800	4232	1,600	6585	2,400	7684
018 935 C	**90,00**	**46,00**	**2,50**		5,70	3,20	2^f	89,740	0,800	4232	1,600	6585	2,400	7684
018 300 B	**90,00**	**46,00**	**3,50**		6,00	2,50	2^g	125,300	0,625	5836	1,250	10416	1,875	14161
017 122 B	**90,00**	**46,00**	**3,50**		6,00	2,50	2^f	125,300	0,625	5836	1,250	10416	1,875	14161
018 400 A	**90,00**	**46,00**	**5,00**		7,00	2,00	2^g	177,600	0,500	11267	1,000	21617	1,500	31354
018 936 A	**90,00**	**46,00**	**5,00**		7,00	2,00	2^f	177,600	0,500	11267	1,000	21617	1,500	31354
018 500	100,00	41,00	4,00		7,20	3,20	2^g	200,000	0,800	8714	1,600	15219	2,400	20251
018 484	100,00	41,00	4,00		7,20	3,20	2^f	200,000	0,800	8714	1,600	15219	2,400	20251
018 600	100,00	41,00	5,00		7,75	2,75	2^g	248,900	0,688	12345	1,375	22937	2,063	32361
018 937	100,00	41,00	5,00		7,75	2,75	2^f	248,900	0,688	12345	1,375	22937	2,063	32361
018 750 C	**100,00**	**51,00**	**2,70**		6,20	3,50	2^g	120,100	0,875	4779	1,750	7410	2,625	8609
018 938 C	**100,00**	**51,00**	**2,70**		6,20	3,50	2^f	120,100	0,875	4779	1,750	7410	2,625	8609
018 800 B	**100,00**	**51,00**	**3,50**		6,30	2,80	2^g	155,400	0,700	5624	1,400	9823	2,100	13070
018 939 B	**100,00**	**51,00**	**3,50**		6,30	2,80	2^f	155,400	0,700	5624	1,400	9823	2,100	13070
018 900	100,00	51,00	4,00		7,00	3,00	2^g	177,600	0,750	8673	1,500	15341	2,250	20674
018 940	100,00	51,00	4,00		7,00	3,00	2^f	177,600	0,750	8673	1,500	15341	2,250	20674
019 000	100,00	51,00	5,00		7,80	2,80	2^g	221,100	0,700	13924	1,400	25810	2,100	36339
017 123	100,00	51,00	5,00		7,80	2,80	2^f	221,100	0,700	13924	1,400	25810	2,100	36339
019 150 A	**100,00**	**51,00**	**6,00**		8,20	2,20	2^g	262,800	0,550	17061	1,100	32937	1,650	48022
016 832 A	**100,00**	**51,00**	**6,00**		8,20	2,20	2^f	262,800	0,550	17061	1,100	32937	1,650	48022
019 250 C	**112,00**	**57,00**	**3,00**		6,90	3,90	2^g	168,000	0,975	5834	1,950	9038	2,925	10489
018 941 C	**112,00**	**57,00**	**3,00**		6,90	3,90	2^f	168,000	0,975	5834	1,950	9038	2,925	10489
019 300 B	**112,00**	**57,00**	**4,00**		7,20	3,20	2^g	222,700	0,800	7639	1,600	13341	2,400	17752
018 942 B	**112,00**	**57,00**	**4,00**		7,20	3,20	2^f	222,700	0,800	7639	1,600	13341	2,400	17752
019 450 A	**112,00**	**57,00**	**6,00**		8,50	2,50	2^g	332,100	0,625	15800	1,250	30215	1,875	43707
018 943 A	**112,00**	**57,00**	**6,00**		8,50	2,50	2^f	332,100	0,625	15800	1,250	30215	1,875	43707

2^g = according to group 2 (DIN EN 16983) - manufacturing process turned (D_e/D_i) 2^f = according to group 2 (DIN EN 16983) - manufacturing process fine blanked

Original SCHNORR® disc springs standard material — Ø 125 - 180 mm

Article-number/ Order reference	Order reference							Weight	Spring travel s and force F					
	D_e [mm]	D_i [mm]	t [mm]	t' [mm]	l_o [mm]	h_o [mm]	Gr. acc. to DIN EN 16983	per 1000 pieces [kg]	at s = 0,25 h_o s [mm]	F [N]	at s = 0,50 h_o s [mm]	F [N]	at s ≈ 0,75 h_o s [mm]	F [N]
019 500	125,00	41,00	4,00		8,20	4,20	2^g	338,100	1,050	8501	2,100	13943	3,150	17346
018 944	125,00	41,00	4,00		8,20	4,20	2^f	338,100	1,050	8501	2,100	13943	3,150	17346
019 600	125,00	51,00	4,00		8,50	4,50	2^g	315,600	1,125	10096	2,250	16265	3,375	19817
018 945	125,00	51,00	4,00		8,50	4,50	2^f	315,600	1,125	10096	2,250	16265	3,375	19817
019 700	125,00	51,00	5,00		8,90	3,90	2^g	391,500	0,975	13063	1,950	22931	2,925	30669
018 542	125,00	51,00	5,00		8,90	3,90	2^f	391,500	0,975	13063	1,950	22931	2,925	30669
019 850	125,00	51,00	6,00		9,40	3,40	2^g	465,800	0,850	17027	1,700	31514	2,550	44307
018 946	125,00	51,00	6,00		9,40	3,40	2^f	465,800	0,850	17027	1,700	31514	2,550	44307
019 900	125,00	61,00	5,00		9,00	4,00	2^g	357,600	1,000	14615	2,000	25526	3,000	33965
018 947	125,00	61,00	5,00		9,00	4,00	2^f	357,600	1,000	14615	2,000	25526	3,000	33965
020 050	125,00	61,00	6,00		9,60	3,60	2^g	425,400	0,900	19789	1,800	36336	2,700	50722
018 948	125,00	61,00	6,00		9,60	3,60	2^f	425,400	0,900	19789	1,800	36336	2,700	50722
020 200 C	**125,00**	**64,00**	**3,50**		8,00	4,50	2^g	242,300	1,125	8514	2,250	13231	3,375	15416
000 465 C	**125,00**	**64,00**	**3,50**		8,00	4,50	2^f	242,300	1,125	8514	2,250	13231	3,375	15416
020 300 B	**125,00**	**64,00**	**5,00**		8,50	3,50	2^g	346,200	0,875	12238	1,750	21924	2,625	29908
018 949 B	**125,00**	**64,00**	**5,00**		8,50	3,50	2^f	346,200	0,875	12238	1,750	21924	2,625	29908
020 550	125,00	71,00	6,00		9,30	3,30	2^g	377,900	0,825	19538	1,650	36302	2,475	51304
018 950	125,00	71,00	6,00		9,30	3,30	2^f	377,900	0,825	19538	1,650	36302	2,475	51304
020 100	125,00	61,00	8,00	7,50	10,90	2,90	3	547,300	0,725	34434	1,450	65305	2,175	93577
020 400 A	**125,00**	**64,00**	**8,00**	7,50	10,60	2,60	3	529,900	0,650	31118	1,300	59520	1,950	85926
020 600	125,00	71,00	8,00	7,40	10,40	2,40	3	479,600	0,600	30867	1,200	59149	1,800	85494
020 700	125,00	71,00	10,00	9,20	11,80	1,80	3	596,300	0,450	42963	0,900	84219	1,350	124124
020 850 C	**140,00**	**72,00**	**3,80**		8,70	4,90	2^g	329,700	1,225	9514	2,450	14773	3,675	17195
018 951 C	**140,00**	**72,00**	**3,80**		8,70	4,90	2^f	329,700	1,225	9514	2,450	14773	3,675	17195
020 900 B	**140,00**	**72,00**	**5,00**		9,00	4,00	2^g	433,200	1,000	12014	2,000	20982	3,000	27920
017 168 B	**140,00**	**72,00**	**5,00**		9,00	4,00	2^f	433,200	1,000	12014	2,000	20982	3,000	27920
021 000 A	**140,00**	**72,00**	**8,00**	7,50	11,20	3,20	3	663,000	0,800	31903	1,600	59967	2,400	85251
021 100	150,00	61,00	5,00		10,30	5,30	2^g	565,000	1,325	15292	2,650	25021	3,975	31041
018 952	150,00	61,00	5,00		10,30	5,30	2^f	565,000	1,325	15292	2,650	25021	3,975	31041
021 250	150,00	61,00	6,00		10,80	4,80	2^g	676,800	1,200	19560	2,400	34161	3,600	45456
018 953	150,00	61,00	6,00		10,80	4,80	2^f	676,800	1,200	19560	2,400	34161	3,600	45456
021 350	150,00	71,00	6,00		10,80	4,80	2^g	628,900	1,200	20721	2,400	36189	3,600	48155
018 954	150,00	71,00	6,00		10,80	4,80	2^f	628,900	1,200	20721	2,400	36189	3,600	48155
021 400	150,00	71,00	8,00	7,50	12,00	4,00	3	803,600	1,000	35296	2,000	64684	3,000	89851
021 500	150,00	81,00	8,00	7,50	11,70	3,70	3	732,900	0,925	34518	1,850	63876	2,775	89532
021 600	150,00	81,00	10,00	9,30	13,00	3,00	3	908,800	0,750	50088	1,500	96120	2,250	139128
021 650 C	**160,00**	**82,00**	**4,30**		9,90	5,60	2^g	492,200	1,400	12162	2,800	18832	4,200	21843
017 130 C	**160,00**	**82,00**	**4,30**		9,90	5,60	2^f	492,200	1,400	12162	2,800	18832	4,200	21843
021 750 B	**160,00**	**82,00**	**6,00**		10,50	4,50	2^g	679,800	1,125	17203	2,250	30431	3,375	41008
018 955 B	**160,00**	**82,00**	**6,00**		10,50	4,50	2^f	679,800	1,125	17203	2,250	30431	3,375	41008
021 800 A	**160,00**	**82,00**	**10,00**	9,40	13,50	3,50	3	1089,000	0,875	50547	1,750	96216	2,625	138331
021 850 C	**180,00**	**92,00**	**4,80**		11,00	6,20	2^g	705,300	1,550	14646	3,100	22731	4,650	26442
018 956 C	**180,00**	**92,00**	**4,80**		11,00	6,20	2^f	705,300	1,550	14646	3,100	22731	4,650	26442
021 950 B	**180,00**	**92,00**	**6,00**		11,10	5,10	2^g	862,500	1,275	16558	2,550	28552	3,825	37502
018 957 B	**180,00**	**92,00**	**6,00**		11,10	5,10	2^f	862,500	1,275	16558	2,550	28552	3,825	37502
022 000 A	**180,00**	**92,00**	**10,00**	9,40	14,00	4,00	3	1381,000	1,000	46850	2,000	88141	3,000	125417

2^g = according to group 2 (DIN EN 16983) - manufacturing process turned (D_e/D_i) 2^f = according to group 2 (DIN EN 16983) - manufacturing process fine blanked

Original SCHNORR® disc springs standard material — Ø 200 - 250 mm

Article-number/ Order reference	Order reference							Weight	Spring travel s and force F					
							Gr. acc.	per 1000	at s = 0,25 h_o		at s = 0,50 h_o		at s ≈ 0,75 h_o	
	D_e	D_i	t	t'	l_o	h_o	to DIN	pieces	s	F	s	F	s	F
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	EN 16983	[kg]	[mm]	[N]	[mm]	[N]	[mm]	[N]
022 100	200,00	82,00	8,00	7,60	14,20	6,20	3	1554,000	1,550	35029	3,100	60013	4,650	78034
022 200	200,00	82,00	10,00	9,60	15,50	5,50	3	1962,000	1,375	51105	2,750	93357	4,125	129445
022 300	200,00	82,00	12,00	11,50	16,60	4,60	3	2351,000	1,150	66924	2,300	127191	3,450	182737
022 400	200,00	92,00	10,00	9,50	15,60	5,60	3	1840,000	1,400	55136	2,800	100014	4,200	137688
022 500	200,00	92,00	12,00	11,40	16,80	4,80	3	2208,000	1,200	73913	2,400	139548	3,600	199269
022 600	200,00	92,00	14,00	13,10	18,10	4,10	3	2537,000	1,025	95633	2,050	184092	3,075	267227
022 650 C	**200,00**	**102,00**	**5,50**		12,50	7,00	2^g	999,300	1,750	19817	3,500	30882	5,250	36111
018 958 C	**200,00**	**102,00**	**5,50**		12,50	7,00	2^f	999,300	1,750	19817	3,500	30882	5,250	36111
022 700 B	**200,00**	**102,00**	**8,00**	7,50	13,60	5,60	3	1363,000	1,400	33367	2,800	57955	4,200	76378
022 800	200,00	102,00	10,00	9,40	15,60	5,60	3	1708,000	1,400	58757	2,800	106099	4,200	145357
022 900 A	**200,00**	**102,00**	**12,00**	11,25	16,20	4,20	3	2044,000	1,050	66983	2,100	127401	3,150	183020
023 000	200,00	102,00	14,00	13,10	18,20	4,20	3	2380,000	1,050	103781	2,100	199476	3,150	289181
023 100	200,00	112,00	12,00	11,10	16,20	4,20	3	1870,000	1,050	72257	2,100	136873	3,150	195830
023 200	200,00	112,00	14,00	12,90	17,50	3,50	3	2173,000	0,875	91033	1,750	176156	2,625	256758
023 300	200,00	112,00	16,00	14,80	18,80	2,80	3	2493,000	0,700	105268	1,400	206697	2,100	305100
023 350 C	**225,00**	**112,00**	**6,50**	6,20	13,60	7,10	3	1450,000	1,775	23582	3,550	37417	5,325	44580
023 400 B	**225,00**	**112,00**	**8,00**	7,50	14,50	6,50	3	1754,000	1,625	32870	3,250	55412	4,875	70749
023 500 A	**225,00**	**112,00**	**12,00**	11,25	17,00	5,00	3	2631,000	1,250	64497	2,500	120738	3,750	171016
023 600	250,00	102,00	10,00	9,60	18,00	8,00	3	3075,000	2,000	56867	4,000	97282	6,000	126387
023 700	250,00	102,00	12,00	11,50	19,00	7,00	3	3683,000	1,750	73563	3,500	133130	5,250	182962
023 750 C	**250,00**	**127,00**	**7,00**	6,70	14,80	7,80	3	1909,000	1,950	26895	3,900	42527	5,850	50466
023 800 B	**250,00**	**127,00**	**10,00**	9,40	17,00	7,00	3	2678,000	1,750	51871	3,500	90206	5,250	119053
023 900	250,00	127,00	12,00	11,25	19,30	7,30	3	3205,000	1,825	87633	3,650	156021	5,475	210806
024 000 A	**250,00**	**127,00**	**14,00**	13,10	19,60	5,60	3	3732,000	1,400	93239	2,800	175145	4,200	248828
024 100	250,00	127,00	16,00	15,00	21,80	5,80	3	4273,000	1,450	140941	2,900	267295	4,350	383017

2^g = according to group 2 (DIN EN 16983) - manufacturing process turned (D_e/D_i) 2^f = according to group 2 (DIN EN 16983) - manufacturing process fine blanked

Corrosion-resistant SCHNORR® disc springs, material 1.4310 (X10 CrNi 18-8) — Ø 6 - 12 mm

Article Number/ Order reference	Ordering dimensions					Weight	Spring travel s and force F					
						per 1000	at s = 0,25 h_o		at s = 0,50 h_o		at s ≈ 0,75 h_o	
	D_e	D_i	t	l_o	h_o	pieces	s	F	s	F	s	F
	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	[mm]	[N]	[mm]	[N]	[mm]	[N]
024650	6,00	3,20	0,30	0,45	0,15	0,047	0,038	41	0,075	77	0,113	110
025250	8,00	3,20	0,20	0,40	0,20	0,066	0,050	11	0,100	19	0,150	24
025400	8,00	3,20	0,30	0,55	0,25	0,098	0,063	42	0,125	73	0,188	96
025700	8,00	3,20	0,40	0,55	0,15	0,131	0,038	45	0,075	87	0,113	126
026300	8,00	3,20	0,50	0,70	0,20	0,166	0,050	118	0,100	227	0,150	330
026700	8,00	4,20	0,20	0,45	0,25	0,057	0,063	20	0,125	31	0,188	36
027100	8,00	4,20	0,30	0,50	0,20	0,085	0,050	34	0,100	61	0,150	84
027400	8,00	4,20	0,40	0,60	0,20	0,113	0,050	72	0,100	136	0,150	193
028910	10,00	3,20	0,30	0,65	0,35	0,165	0,088	47	0,175	75	0,263	91
029101	10,00	3,20	0,40	0,70	0,30	0,220	0,075	69	0,150	123	0,225	165
029301	10,00	3,20	0,50	0,70	0,20	0,274	0,050	73	0,100	140	0,150	203
029602	10,00	4,20	0,40	0,70	0,30	0,202	0,075	73	0,150	129	0,225	174
029701	10,00	4,20	0,50	0,70	0,20	0,252	0,050	77	0,100	148	0,150	214
030290	10,00	5,20	0,25	0,55	0,30	0,112	0,075	28	0,150	44	0,225	53
030800	10,00	5,20	0,40	0,65	0,25	0,179	0,063	62	0,125	113	0,188	157
031000	10,00	5,20	0,50	0,70	0,20	0,223	0,050	85	0,100	163	0,150	237
032040	12,00	4,20	0,40	0,80	0,40	0,309	0,100	79	0,200	130	0,300	165
032500	12,00	4,20	0,50	0,80	0,30	0,386	0,075	86	0,150	158	0,225	220

Corrosion-resistant SCHNORR® disc springs, material 1.4310 (X10 CrNi 18-8) — Ø 12 - 20 mm

Article Number/ Order reference	Ordering dimensions					Weight	Spring travel s and force F					
						per 1000 pieces	at s = 0,25 h_o		at s = 0,50 h_o		at s ≈ 0,75 h_o	
	D_e [mm]	D_i [mm]	t [mm]	l_o [mm]	h_o [mm]	[kg]	s [mm]	F [N]	s [mm]	F [N]	s [mm]	F [N]
032704	12,00	4,20	0,60	0,85	0,25	0,463	0,063	111	0,125	213	0,188	308
033400	12,00	5,20	0,50	0,80	0,30	0,357	0,075	91	0,150	166	0,225	232
033500	12,00	5,20	0,60	0,85	0,25	0,429	0,063	118	0,125	225	0,188	325
034200	12,00	6,20	0,50	0,85	0,35	0,323	0,088	123	0,175	221	0,263	301
034550	12,00	6,20	0,60	0,85	0,25	0,387	0,063	128	0,125	245	0,188	355
035040	12,50	5,20	0,50	0,85	0,35	0,395	0,088	103	0,175	184	0,263	251
035103	12,50	6,20	0,35	0,80	0,45	0,253	0,113	77	0,225	120	0,338	140
035400	12,50	6,20	0,50	0,85	0,35	0,361	0,088	111	0,175	198	0,263	271
035601	12,50	6,20	0,70	0,95	0,25	0,504	0,063	178	0,125	344	0,188	503
038353	14,00	7,20	0,35	0,80	0,45	0,310	0,113	63	0,225	98	0,338	114
038600	14,00	7,20	0,50	0,90	0,40	0,442	0,100	111	0,200	194	0,300	258
039040	14,00	7,20	0,80	1,05	0,25	0,706	0,063	213	0,125	414	0,188	608
039500	15,00	5,20	0,40	0,95	0,55	0,486	0,138	93	0,275	142	0,413	162
039800	15,00	5,20	0,50	1,00	0,50	0,607	0,125	123	0,250	203	0,375	257
039971	15,00	5,20	0,60	1,05	0,45	0,728	0,113	158	0,225	279	0,338	376
040130	15,00	5,20	0,70	1,10	0,40	0,849	0,100	197	0,200	365	0,300	512
040950	15,00	6,20	0,50	1,00	0,50	0,572	0,125	127	0,250	212	0,375	267
041301	15,00	6,20	0,60	1,00	0,40	0,687	0,100	137	0,200	248	0,300	341
041700	15,00	6,20	0,70	1,05	0,35	0,801	0,088	172	0,175	323	0,263	461
042400	15,00	8,20	0,70	1,00	0,30	0,677	0,075	164	0,150	312	0,225	451
042601	15,00	8,20	0,80	1,10	0,30	0,773	0,075	238	0,150	459	0,225	668
043750	16,00	8,20	0,40	0,90	0,50	0,464	0,125	77	0,250	121	0,375	142
044000	16,00	8,20	0,60	1,05	0,45	0,695	0,113	159	0,225	281	0,338	378
044101	16,00	8,20	0,70	1,05	0,35	0,811	0,088	167	0,175	313	0,263	446
044201	16,00	8,20	0,80	1,10	0,30	0,926	0,075	200	0,150	386	0,225	561
044400	16,00	8,20	0,90	1,20	0,30	1,042	0,075	280	0,150	543	0,225	796
045800	18,00	6,20	0,40	1,00	0,60	0,702	0,150	78	0,300	116	0,450	128
046003	18,00	6,20	0,50	1,10	0,60	0,878	0,150	120	0,300	190	0,450	226
046252	18,00	6,20	0,60	1,20	0,60	1,053	0,150	176	0,300	293	0,450	369
046400	18,00	6,20	0,70	1,25	0,55	1,228	0,138	218	0,275	382	0,413	510
046505	18,00	6,20	0,80	1,30	0,50	1,403	0,125	264	0,250	482	0,375	669
046924	18,00	8,20	0,50	1,10	0,60	0,789	0,150	129	0,300	205	0,450	244
047070	18,00	8,20	0,70	1,20	0,50	1,104	0,125	203	0,250	362	0,375	492
047300	18,00	8,20	0,80	1,25	0,45	1,262	0,113	246	0,225	457	0,338	643
047691	18,00	8,20	1,00	1,35	0,35	1,576	0,088	335	0,175	649	0,263	948
047910	18,00	9,20	0,45	1,05	0,60	0,662	0,150	111	0,300	171	0,450	197
048050	18,00	9,20	0,70	1,20	0,50	1,029	0,125	215	0,250	384	0,375	522
048098	18,00	9,20	1,00	1,35	0,35	1,469	0,088	356	0,175	689	0,263	1006
048051	20,00	8,20	0,50	1,15	0,65	1,029	0,163	118	0,325	183	0,488	213
051100	20,00	8,20	0,60	1,30	0,70	1,226	0,175	198	0,350	316	0,525	380
052270	20,00	8,20	0,70	1,35	0,65	1,430	0,163	241	0,325	408	0,488	524
051450	20,00	8,20	0,80	1,40	0,60	1,634	0,150	291	0,300	514	0,450	693
051701	20,00	8,20	0,90	1,45	0,55	1,838	0,138	345	0,275	632	0,413	880
051761	20,00	8,20	1,00	1,45	0,45	2,042	0,113	352	0,225	669	0,338	962
052803	20,00	10,20	0,50	1,15	0,65	0,910	0,163	130	0,325	202	0,488	234
052804	20,00	10,20	0,60	1,20	0,60	1,098	0,150	163	0,300	271	0,450	342
053500	20,00	10,20	0,80	1,35	0,55	1,454	0,138	281	0,275	504	0,413	690
053701	20,00	10,20	0,90	1,40	0,50	1,635	0,125	333	0,250	619	0,375	872
053901	20,00	10,20	1,00	1,40	0,40	1,817	0,100	336	0,200	645	0,300	936
054380	20,00	10,20	1,10	1,50	0,40	1,998	0,100	440	0,200	850	0,300	1240
055280	20,00	10,20	1,25	1,55	0,30	2,269	0,075	463	0,150	911	0,225	1349
055650	20,00	10,20	1,50	1,75	0,25	2,721	0,063	654	0,125	1297	0,188	1934

Corrosion-resistant SCHNORR® disc springs, material 1.4310 (X10 CrNi 18-8) — Ø 22,5 - 45 mm

Article Number/ Order reference	Ordering dimensions					Weight	Spring travel s and force F					
						per 1000	at s = 0,25 h_o		at s = 0,50 h_o		at s ≈ 0,75 h_o	
	D_e	D_i	t	l_o	h_o	pieces	s	F	s	F	s	F
	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	[mm]	[N]	[mm]	[N]	[mm]	[N]
057710	22,50	11,20	0,60	1,40	0,80	1,406	0,200	222	0,400	341	0,600	392
057903	22,50	11,20	0,80	1,45	0,65	1,873	0,163	283	0,325	492	0,488	653
058050	22,50	11,20	1,25	1,65	0,40	2,924	0,100	494	0,200	961	0,300	1411
058950	23,00	8,20	0,70	1,50	0,80	1,987	0,200	258	0,400	414	0,600	501
059210	23,00	8,20	0,80	1,55	0,75	2,271	0,188	306	0,375	517	0,563	663
059400	23,00	8,20	0,90	1,60	0,70	2,554	0,175	361	0,350	633	0,525	848
059504	23,00	8,20	1,00	1,60	0,60	2,838	0,150	375	0,300	689	0,450	962
060460	23,00	10,20	0,90	1,55	0,65	2,352	0,163	341	0,325	608	0,488	825
060600	23,00	10,20	1,00	1,60	0,60	2,613	0,150	398	0,300	731	0,450	1020
060901	23,00	10,20	1,25	1,70	0,45	3,264	0,113	512	0,225	989	0,338	1444
001922	23,00	12,20	1,00	1,60	0,60	2,337	0,150	438	0,300	804	0,450	1122
061600	23,00	12,20	1,25	1,65	0,40	2,919	0,100	492	0,200	958	0,300	1406
061951	23,00	12,20	1,50	1,85	0,35	3,501	0,088	722	0,175	1423	0,263	2110
063872	25,00	10,20	1,00	1,70	0,70	3,205	0,175	408	0,350	732	0,525	998
064400	25,00	12,20	0,70	1,60	0,90	2,052	0,225	305	0,450	475	0,675	553
064900	25,00	12,20	0,90	1,60	0,70	2,637	0,175	338	0,350	594	0,525	795
065104	25,00	12,20	1,00	1,65	0,65	2,929	0,163	394	0,325	715	0,488	987
065129	25,00	12,20	1,25	1,75	0,50	3,660	0,125	512	0,250	983	0,375	1425
065400	25,00	12,20	1,50	1,95	0,45	4,389	0,113	763	0,225	1490	0,338	2193
071600	28,00	10,20	0,80	1,75	0,95	3,351	0,238	321	0,475	510	0,713	610
071752	28,00	10,20	1,00	1,90	0,90	4,188	0,225	472	0,450	804	0,675	1042
007791	28,00	10,20	1,25	1,95	0,70	5,047	0,175	565	0,350	1047	0,525	1474
072105	28,00	10,20	1,50	2,10	0,60	6,277	0,150	767	0,300	1471	0,450	2134
072750	28,00	12,20	1,00	1,95	0,95	3,911	0,238	544	0,475	915	0,713	1170
072860	28,00	12,20	1,25	1,95	0,70	4,887	0,175	593	0,350	1099	0,525	1548
073300	28,00	12,20	1,50	2,05	0,55	5,862	0,138	727	0,275	1403	0,413	2045
075260	28,00	14,20	0,80	1,80	1,00	2,870	0,250	401	0,500	628	0,750	739
075700	28,00	14,20	1,00	1,80	0,80	3,586	0,200	439	0,400	767	0,600	1021
075925	28,00	14,20	1,25	1,90	0,65	4,480	0,163	578	0,325	1082	0,488	1535
076160	28,00	14,20	1,50	2,05	0,55	5,373	0,138	781	0,275	1508	0,413	2199
082253	31,50	12,20	1,00	2,10	1,10	5,191	0,275	541	0,550	877	0,825	1076
081505	31,50	12,20	1,25	2,15	0,90	6,486	0,225	646	0,450	1152	0,675	1564
082303	31,50	12,20	1,50	2,25	0,75	7,781	0,188	808	0,375	1519	0,563	2164
082801	31,50	16,30	0,80	1,85	1,05	3,577	0,263	354	0,525	548	0,788	634
004842	31,50	16,30	1,25	2,00	0,75	5,374	0,188	560	0,375	1029	0,563	1437
083800	31,50	16,30	1,50	2,15	0,65	6,698	0,163	763	0,325	1454	0,488	2097
084493	31,50	16,30	1,75	2,30	0,55	7,811	0,138	971	0,275	1892	0,413	2779
084800	31,50	16,30	2,00	2,50	0,50	8,923	0,125	1289	0,250	2534	0,375	3750
087900	34,00	12,30	1,00	2,25	1,25	6,187	0,313	588	0,625	920	0,938	1083
088046	34,00	12,30	1,25	2,35	1,10	7,732	0,275	752	0,550	1287	0,825	1677
088300	34,00	12,30	1,50	2,40	0,90	9,275	0,225	872	0,450	1600	0,675	2234
089321	34,00	14,30	1,25	2,30	1,05	7,321	0,263	723	0,525	1250	0,788	1646
089400	34,00	14,30	1,50	2,35	0,85	8,783	0,213	837	0,425	1549	0,638	2178
090500	34,00	16,30	1,50	2,30	0,80	8,216	0,200	815	0,400	1519	0,600	2151
091100	34,00	16,30	2,00	2,60	0,60	10,946	0,150	1293	0,300	2523	0,450	3713
004543	35,50	18,30	0,90	2,05	1,15	5,132	0,288	422	0,575	657	0,863	767
004616	35,50	18,30	1,25	2,25	1,00	6,852	0,250	674	0,500	1177	0,750	1567
093683	35,50	18,30	2,00	2,65	0,65	11,385	0,163	1352	0,325	2628	0,488	3855
099423	40,00	14,30	1,25	2,65	1,40	10,752	0,350	834	0,700	1346	1,050	1642
099461	40,00	14,30	1,50	2,75	1,25	12,899	0,313	1028	0,625	1779	0,938	2348
099833	40,00	14,30	2,00	2,90	0,90	17,189	0,225	1365	0,450	2592	0,675	3729
100503	40,00	16,30	1,50	2,70	1,20	12,332	0,300	992	0,600	1732	0,900	2304
100801	40,00	16,30	2,00	2,90	0,90	16,433	0,225	1406	0,450	2671	0,675	3842
101755	40,00	18,30	2,00	2,85	0,85	15,584	0,213	1367	0,425	2610	0,638	3770
102531	40,00	20,40	1,00	2,30	1,30	7,300	0,325	521	0,650	808	0,975	938
103000	40,00	20,40	1,50	2,60	1,10	10,942	0,275	955	0,550	1697	0,825	2296
103500	40,00	20,40	2,00	2,80	0,80	14,580	0,200	1345	0,400	2580	0,600	3743
103953	40,00	20,40	2,25	2,95	0,70	16,397	0,175	1613	0,350	3143	0,525	4618
104465	40,00	20,40	2,50	3,15	0,65	18,212	0,163	2017	0,325	3961	0,488	5856
004443	45,00	22,40	1,25	2,90	1,65	11,690	0,413	1023	0,825	1578	1,238	1822
110501	45,00	22,40	1,75	2,95	1,20	16,434	0,300	1247	0,600	2241	0,900	3068
110901	45,00	22,40	2,50	3,35	0,85	23,457	0,213	2116	0,425	4105	0,638	6008

Corrosion-resistant SCHNORR® disc springs, material 1.4310 (X10 CrNi 18-8) Ø 50 - 90 mm

Article Number/ Order reference	Ordering dimensions					Weight	Spring travel s and force F					
						per 1000 pieces	at s = 0,25 h_o		at s = 0,50 h_o		at s ≈ 0,75 h_o	
	D_e [mm]	D_i [mm]	t [mm]	l_o [mm]	h_o [mm]	[kg]	s [mm]	F [N]	s [mm]	F [N]	s [mm]	F [N]
115970	50,00	18,40	1,25	2,85	1,60	16,679	0,400	698	0,800	1086	1,200	1268
116300	50,00	18,40	1,50	3,30	1,80	20,011	0,450	1272	0,900	2015	1,350	2404
116653	50,00	18,40	2,00	3,45	1,45	26,669	0,363	1680	0,725	2990	1,088	4054
116901	50,00	18,40	2,50	3,65	1,15	33,323	0,288	2203	0,575	4176	0,863	5996
117400	50,00	20,40	2,00	3,40	1,40	25,710	0,350	1634	0,700	2927	1,050	3993
117703	50,00	20,40	2,50	3,60	1,10	32,123	0,275	2138	0,550	4070	0,825	5864
118401	50,00	22,40	2,00	3,30	1,30	24,652	0,325	1515	0,650	2747	0,975	3792
014401	50,00	25,40	1,25	2,85	1,60	13,792	0,400	787	0,800	1225	1,200	1430
003023	50,00	22,40	2,50	3,50	1,00	30,800	0,250	1969	0,500	3777	0,750	5478
120103	50,00	25,40	1,50	3,10	1,60	17,168	0,400	1145	0,800	1871	1,200	2317
120400	50,00	25,40	2,00	3,30	1,30	22,878	0,325	1613	0,650	2926	0,975	4039
120801	50,00	25,40	2,50	3,50	1,00	28,582	0,250	2096	0,500	4022	0,750	5834
128599	56,00	28,50	1,50	3,45	1,95	21,495	0,488	1345	0,975	2084	1,463	2419
128600	56,00	28,50	2,00	3,60	1,60	28,646	0,400	1761	0,800	3076	1,200	4093
131 001	60,00	20,50	2,00	4,10	2,10	39,235	0,525	2138	1,050	3507	1,575	4363
003 158	60,00	20,50	2,50	4,05	1,55	49,027	0,388	2239	0,775	4092	1,163	5687
131 801	60,00	25,50	2,50	4,10	1,60	45,471	0,400	2463	0,800	4479	1,200	6196
113 193	60,00	30,50	2,50	4,00	1,50	41,157	0,375	2444	0,750	4488	1,125	6265
138 221	63,00	31,00	1,80	4,10	2,30	33,419	0,575	2086	1,150	3248	1,725	3792
138 503	63,00	31,00	2,50	4,15	1,65	46,389	0,413	2489	0,825	4504	1,238	6202
144 401	70,00	25,50	2,00	4,50	2,50	52,479	0,625	2221	1,250	3478	1,875	4093
146 250	70,00	30,50	2,50	4,70	2,20	61,266	0,550	2984	1,100	5106	1,650	6653
153 014	71,00	36,00	2,00	4,60	2,60	46,249	0,650	2639	1,300	4088	1,950	4744
153 110	71,00	36,00	2,50	4,50	2,00	57,789	0,500	2669	1,000	4662	1,500	6203
159 600	80,00	31,00	2,50	5,30	2,80	84,001	0,700	3393	1,400	5472	2,100	6677
161 220	80,00	41,00	2,25	5,20	2,95	65,586	0,738	3410	1,475	5271	2,213	6099
169 200	90,00	46,00	2,50	5,70	3,20	92,370	0,800	3903	1,600	6073	2,400	7087

Corrosion-resistant SCHNORR® disc springs, material 1.4568 (X7 CrNiAl 17-7) Ø 31,5 - 90 mm

Article Number/ Order reference	Ordering dimensions					Weight	Spring travel s and force F					
						per 1000 pieces	at s = 0,25 h_o		at s = 0,50 h_o		at s ≈ 0,75 h_o	
	D_e [mm]	D_i [mm]	t [mm]	l_o [mm]	h_o [mm]	[kg]	s [mm]	F [N]	s [mm]	F [N]	s [mm]	F [N]
084 150	31,50	16,30	1,75	2,30	0,55	7,800	0,138	997	0,275	1942	0,413	2852
094 210	35,50	18,30	2,00	2,65	0,65	11,400	0,162	1387	0,325	2697	0,487	3956
103 515	40,00	20,40	2,00	2,80	0,80	14,600	0,200	1380	0,400	2648	0,600	3841
104 295	40,00	20,40	2,25	2,95	0,70	16,400	0,175	1655	0,350	3226	0,525	4740
110 601	45,00	22,40	1,75	2,80	1,05	16,500	0,262	1058	0,525	1942	0,787	2711
110 870	45,00	22,40	2,50	3,30	0,80	23,500	0,200	2028	0,400	3946	0,600	5792
120 520	50,00	25,40	2,00	3,15	1,15	22,900	0,287	1395	0,575	2577	0,862	3617
001 889	50,00	25,40	2,50	3,50	1,00	28,600	0,250	2152	0,500	4128	0,750	5988
120 955	50,00	25,40	3,00	3,85	0,85	34,400	0,213	3011	0,425	5892	0,638	8688
128 656	56,00	28,50	2,00	3,40	1,40	28,700	0,350	1472	0,700	2637	1,050	3598
129 025	56,00	28,50	3,00	4,05	1,05	43,000	0,262	3046	0,525	5898	0,787	8621
000 637	63,00	31,00	2,50	3,95	1,45	46,400	0,363	2131	0,725	3932	1,088	5513
153 061	71,00	36,00	2,50	4,25	1,75	57,800	0,438	2231	0,875	3996	1,313	5452
000 136	80,00	41,00	3,00	4,90	1,90	87,400	0,475	3172	0,950	5777	1,425	8005
001 041	90,00	46,00	2,50	5,05	2,55	92,400	0,637	2589	1,275	4277	1,912	5365

Original SCHNORR® bearing preload spring

The optimal supplement for ball bearings

Two problems continually occupy design engineers using bearings, the reduction in noise and the elimination of play in ball bearings. A solution of both these problems has been achieved by Schnorr working in close cooperation with well-known ball bearings manufacturers. The fitting of a special version of our disc springs effectively reduces both problems and frequently results in simpler designs.

Fitting of bearing preload springs

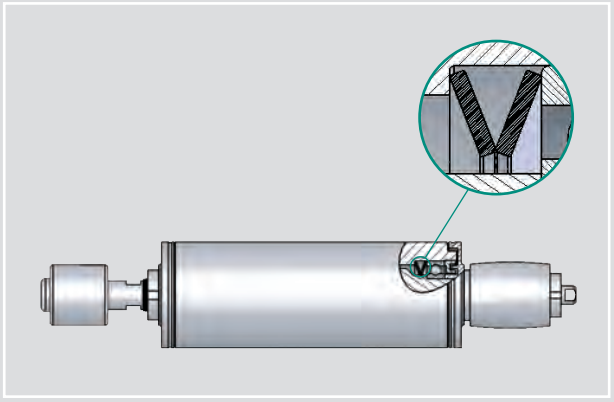
The drawing illustrates how the outer ring of the ball bearing usually is correctly preloaded using a disc spring "K" series. Depending on the requirements of the design, one or more disc springs can be used. In some cases it is preferable to preload the inner ring of the bearing. That is why the bore holes of disc springs for ball bearings were chosen in such a way that they match the internal diameter of an other ball bearing size. That way, a disc spring suitable for pushing the external ring of the ball bearing 6302, for example, can also be used to pretension the inner rings of the ball bearings 6205 and 6305.

Key advantages speak for bearing preload springs

An important advantage of "K" disc springs is being round. That ensures an equal bearing surface when multiple discs are installed. As with standard disc springs, here it also applies that in alternating arrangement with the constant force the spring deflections add up, while in case of parallel layering (same laying in) with constant spring deflection the loads add up (see figure page 7). As all springs have a strongly digressive spring characteristic (great h_o/t), the spring force continues to be almost constant over a large deflection range.

Apart from the compensation for play, this brings the following advantages:

- The tolerance built up in the assembly can be accomodated without significant change in preload.
- Length variations due to heat impact are absorbed.
- Any subsequent axial movement of the assembly does not alter the preload significantly.



Bearing preload spring

We withstand pressure - or hold it.

For example safety systems in power plants (coal- or gas-fired)

References

Mowing machine

Safety washer

Heavy-duty crane

Safety washer

Motorbike

Safety washer

Phtotovoltaics

Safety washer

Original SCHNORR® safety washers.

The original SCHNORR® safety washers were developed as a reliable and economic bolt locking device with the basic principle of a disc spring. This ingenious form combines the advantage of security through friction and mechanical locking.

Original SCHNORR® safety washers are now used world wide where secure fastening connections to counter the effect of vibration are required.

Applications are manifold, from automotive engineering to machine, aggregate and plant engineering.
SCHNORR® safety washers are used, for example, in mowing machines, textile machines, machine tools and a lot of other applications..

STORM HALVORSEN
KOMPONENTER TIL INDUSTRIEN

Disc spring engineering

Thoroughly dealing with elaborate customized solutions.

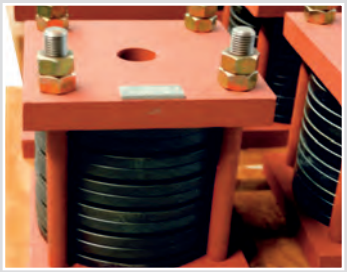
We specialise in developing tailor-made solutions in partnership with our customers; be it in new applications, increasing quality and capacity requirements or specific materials. Our inhouse testing facilities permit sampling or 100% volume inspection according to customer and quality standard requirements.

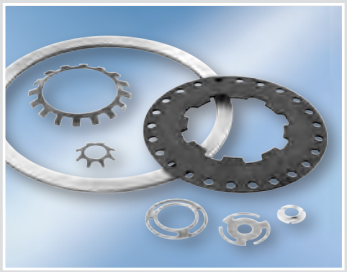
To facilitate this process we can utilise highly skilled specialists, latest construction tools, FEM-Calculations, specialized manufacturing processes in the appropriate machinery as well as our 100 years of experience.

SCHNORR® provide top quality specialised disc springs from single item to large scale production as well as first class standard products. Our in-house test facilities permit sampling or 100% volume inspection according to customer and quality standard requirements

The fields of application know no bounds.
Only some examples are listed below:

- special springs for bayonet catches
- star springs for very low loads
- springs for damper parts
- special springs for motorsports
- converted spring columns und spring stacks
- springs for pressure limitation
- special springs for clutches
- special springs for torque limiters





Wave Springs

The SCHNORR GmbH is both able to deliver wave springs according to drawings, and to develop wave springs according to customer requirements. Wave springs are wound or stamped parts made of spring steel, which usually are made of flats (can also be made of round material)

Wave springs with static to medium dynamic usage show huge space-saving potential with reductions of installation height up to 50%. Based on the specific geometry and function of the wave spring, it ensues a very low hysteresis in comparison to the use of a disc spring.
For the manufacturing of wave springs a variety of materials is suitable.

The SCHNORR GmbH manufactures wave springs with the dimension range of:
- Thickness: 0,25 – 5,00 mm
- Outer diameter: 5,00 – 250,00 mm
- Inner diameter: 2,00 – 240,00 mm

Only some examples for wave springs are listed below:

- ball bearings
- automatic transmissions
- tensioning devices

stamped parts | deep drawing parts | fine-blanked parts

With our machinery and our expertise in the processing of spring steels, we are able to manufacture any kind of stamped parts made of spring steel as well as other materials according to your requirements.

Furthermore, we develop and manufacture deep drawing and fine blanking parts made of a wide range of materials tailored to your requirements.

Here again SCHNORR® creates high-quality solutions for you!

The fields of application know no bounds. Only some examples are listed below:

- vibration damper
- spring steel cover sheets
- heat shields
- retaining plates
- other stamped parts made of spring steel
- deep drawing parts made of spring steel
- special fine blanked parts
- bar springs

Safety washers

In addition to the standard sizes and standard materials mentioned on page 29 to 32, our engineers and technicians are able to develop safety washers with special dimensions and also special materials in cooperation with you.

Load washers

In addition to the standard sizes and standard materials of the DIN 6796 load washers and the original SCHNORR® HS-Washers mentioned on page 34 to 35, we are able to develop load washers and HS-Washers with special dimensions and special materials according to customer requirements and in close cooperation with our customers

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