

DIN 2093 Disc Spring Catalogue

Series A, B and C (Belleville) — dimensions, working load at 75 % deflection, 50CrV4 / 51CrV4 spring steel

DIN 2093 divides Belleville disc springs into three series by the free-height-to-thickness ratio h_0 / t . Series A is stiff and load-heavy (h_0 / t "H 0.4), used for bolt preload, brake linings and heavy machinery clamping. Series B is a compromise (h_0 / t "H 0.75) for general use. Series C is soft and travel-heavy (h_0 / t "H 1.3), used where axial movement or thermal expansion has to be taken up. The tables below list the DIN 2093 core sizes with the outside diameter D_e , bore D_i , disc thickness t , cone height h_0 and the load F at 75 % deflection ($h = 0.75 \cdot h_0$, the design working point). Values are for 50CrV4 or 51CrV4 spring steel (300 – 320 HV, quench-and-tempered), the standard grade for DIN 2093.

Series A — h_0 / t "H 0.4 (16 sizes)

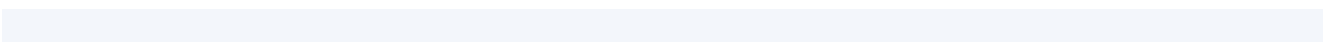
De (mm)	Di (mm)	t (mm)	h0 (mm)	F @ 75 % (N)
8	4.2	0.4	0.2	210
10	5.2	0.5	0.25	335
12.5	6.2	0.7	0.3	640
16	8.2	0.9	0.35	1030
20	10.2	1.1	0.45	1550
25	12.2	1.5	0.55	2900
31.5	16.3	1.75	0.7	4000
40	20.4	2.25	0.9	6600
50	25.4	3.0	1.1	11800
63	31	3.5	1.4	15600
80	41	5.0	1.7	31600
100	51	6.0	2.2	46000
125	64	8.0	2.7	84000
140	72	8.0	3.2	82500
200	102	12.0	4.7	191000
250	127	14.0	6.0	265000

Series B — h_0 / t "H 0.75 (16 sizes)

De (mm)	Di (mm)	t (mm)	h0 (mm)	F @ 75 % (N)
8	4.2	0.3	0.25	105
10	5.2	0.4	0.3	175
12.5	6.2	0.5	0.4	265
16	8.2	0.6	0.5	395
20	10.2	0.8	0.6	705
25	12.2	0.9	0.8	900
31.5	16.3	1.25	0.95	1800
40	20.4	1.5	1.25	2600
50	25.4	2.0	1.5	4600
63	31	2.5	1.9	7150
80	41	3.0	2.4	10100
100	51	3.5	3.0	13200
125	64	5.0	3.75	27700
140	72	5.0	4.2	25850
200	102	8.0	6.0	65000
250	127	10.0	7.5	105000

Series C — h_0 / t "H 1.3 (16 sizes)

De (mm)	Di (mm)	t (mm)	h0 (mm)	F @ 75 % (N)
8	4.2	0.2	0.3	46
10	5.2	0.25	0.4	73
12.5	6.2	0.35	0.45	135
16	8.2	0.45	0.6	225



Stacking rules

- Parallel (in the same direction, nested) — force adds, travel is unchanged. Two springs in parallel double F and hold h_0 ; three triple F, and so on. Loss to friction between the discs is ~5 % per interface, so parallel stacks over four discs deliver diminishing return.
- Series (alternating, back-to-back) — travel adds, force is unchanged. Two springs in series double the working stroke and hold F. Series stacks are the way to open up a Series A spring's travel without changing its load.
- Combined series-parallel — for example 3P × 4S: three parallel groups of four series discs delivers 3·F over 4·(0.75· h_0) travel. Use the multiplier that matches your load-and-stroke need.
- Guide — every stack needs a bolt through the bore or a sleeve inside the outside diameter to guide the discs concentrically. Guide clearance "H 0.5 mm on the outside diameter for De "d 50 mm and 1 % of De above that.
- Preload and pretension — DIN 2093 loads are for the ends supported and the load applied to the inside crown. Do not stack outside the range $h = 0.15 \cdot h_0$ (minimum preload) to $h = 0.75 \cdot h_0$ (maximum working load); at $h > 0.75 \cdot h_0$ the stress at the inside diameter passes the fatigue limit and the disc will crack.

Material grades

DIN 2093 default is 50CrV4 (1.8159) or 51CrV4 (1.8159, same base steel with a slightly higher C content), quench-and-tempered to 42 – 48 HRC (approx 400 – 480 HV) for the standard load class. For dynamic or fatigue-loaded stacks the disc is shot-peened after hardening. 30WCrV6-3 (1.7737) is used where working temperature exceeds 250 °C. Stainless X7CrNiAl17-7 (1.4568, DIN 17224) is used for corrosive or food-contact service — stainless discs lose 30 – 40 % of the load compared with 50CrV4 at the same dimensions.

Reference compiled by cBallast from DIN 2093 and cross-checked against the Schnorr and Christian Bauer / Mubea disc-spring handbooks. Load values are theoretical DIN 2093 at 75 % deflection, 20 °C, static loading; deduct the friction correction for stacked discs and apply the load-collective correction for dynamic service. Confirm against the controlling standard and the disc-spring maker's current tables before manufacture or procurement. All trademarks are the property of their respective owners.

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