

Townsend Bearings



Disc Springs



**Townsend
Bearings**



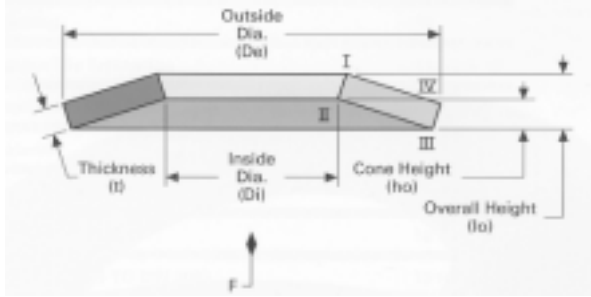
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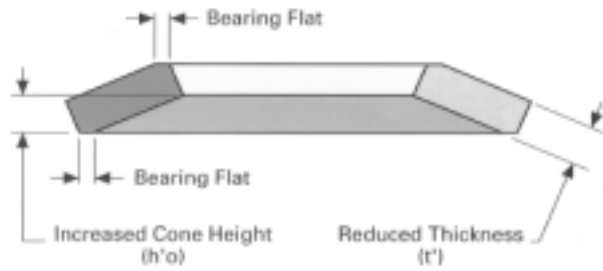
Stainless Steel Disc Springs available on request



Disc Spring without Bearing Flats



Disc Spring with Bearing Flats



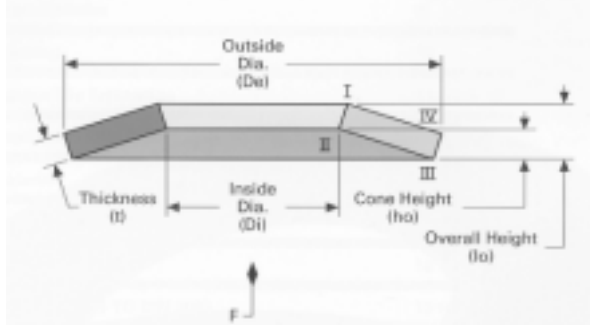
Product Code	Inner Dia. (Di) mm	Outer Dia. (Do) mm	Thick. (t) mm	Reduced Thick. (t') mm	Cone Ht. (ho) mm	Overall Ht. (lo) mm	Cone Ht. To Thickness Ratio	Weight per 1000 pieces	15% Deflection		30% Deflection		45% Deflection		60% Deflection		75% Deflection		90% Deflection									
									Defl. mm		Force N		Defl. mm		Force N		Defl. mm		Force N		Defl. mm		Force N		Defl. mm		Force N	
									Stress δII N/mm2	δIII N/mm2	Stress δII N/mm2	δIII N/mm2	Stress δII N/mm2	δIII N/mm2	Stress δII N/mm2	δIII N/mm2	Stress δII N/mm2	δIII N/mm2	Stress δII N/mm2	δIII N/mm2	Stress δII N/mm2	δIII N/mm2	Stress δII N/mm2	δIII N/mm2	Stress δII N/mm2	δIII N/mm2	Stress δII N/mm2	δIII N/mm2
DS3.2X6X0.3	3.20	6.00	0.30		0.15	0.45	0.50	0.05	0.02	27	0.05	53	0.07	76	0.09	98	0.11	119	0.14	140								
									198	273	420	531	664	774	930	1002	1220	1215	1532	1414								
DS3.2X8X0.2	3.20	8.00	0.20		0.20	0.40	1.00	0.07	0.03	8	0.06	14	0.09	19	0.12	23	0.15	26	0.18	28								
									37	144	97	276	179	396	283	504	409	600	558	684								
DS3.2X8X0.3	3.20	8.00	0.30		0.25	0.55	0.83	0.10	0.04	29	0.08	53	0.11	73	0.15	90	0.19	104	0.23	117								
									113	247	261	475	443	684	660	875	912	1046	1198	1199								
DS3.2X8X0.4	3.20	8.00	0.40		0.20	0.60	0.50	0.13	0.03	43	0.06	82	0.09	119	0.12	153	0.15	186	0.18	217								
									212	214	446	416	702	605	981	783	1281	949	1604	1102								
DS3.2X8X0.5	3.20	8.00	0.50		0.20	0.70	0.40	0.17	0.03	79	0.06	153	0.09	223	0.12	291	0.15	357	0.18	422								
									299	249	620	485	964	710	1329	922	1717	1123	2128	1311								
DS4.2X8X0.2	4.20	8.00	0.20		0.25	0.45	1.25	0.06	0.04	14	0.08	24	0.11	32	0.15	36	0.19	39	0.23	41								
									-7	253	21	483	85	690	185	873	319	1034	489	1172								
DS4.2X8X0.3	4.20	8.00	0.30		0.25	0.55	0.83	0.09	0.04	33	0.08	60	0.11	83	0.15	102	0.19	118	0.23	133								
									99	308	233	594	402	856	607	1095	847	1312	1123	1505								
DS4.2X8X0.4	4.20	8.00	0.40		0.20	0.60	0.50	0.11	0.03	48	0.06	93	0.09	134	0.12	173	0.15	210	0.18	245								
									198	268	419	522	663	761	929	985	1218	1194	1530	1389								
DS3.2X10X0.3	3.20	10.00	0.30		0.35	0.65	1.17	0.17	0.05	34	0.11	59	0.16	77	0.21	90	0.26	98	0.32	105								
									39	234	124	447	254	638	430	808	652	957	919	1085								
DS3.2X10X0.4	3.20	10.00	0.40		0.30	0.70	0.75	0.22	0.05	48	0.09	88	0.14	123	0.18	153	0.23	179	0.27	204								
									160	214	353	412	579	595	840	762	1134	913	1461	1048								
DS3.2X10X0.5	3.20	10.00	0.50		0.25	0.75	0.50	0.28	0.04	64	0.08	123	0.11	178	0.15	229	0.19	279	0.23	326								
									238	189	500	368	784	535	1092	692	1424	838	1779	972								
DS4.2X10X0.4	4.20	10.00	0.40		0.30	0.70	0.75	0.20	0.05	50	0.09	93	0.14	129	0.18	161	0.23	189	0.27	215								
									134	249	300	480	497	693	727	888	988	1066	1282	1225								
DS4.2X10X0.5	4.20	10.00	0.50		0.25	0.75	0.50	0.25	0.04	68	0.08	130	0.11	188	0.15	242	0.19	294	0.23	344								
									208	221	438	430	690	626	964	810	1260	981	1578	1140								
DS4.2X10X0.6	4.20	10.00	0.60		0.25	0.85	0.42	0.30	0.04	111	0.08	216	0.11	315	0.15	410	0.19	502	0.23	592								
									277	250	575	487	896	712	1239	925	1604	1125	1991	1313								
DS5.2X10X0.25	5.20	10.00	0.25		0.30	0.55	1.20	0.11	0.05	20	0.09	35	0.14	45	0.18	53	0.23	58	0.27	61								
									2	235	37	449	104	642	203	814	336	965	500	1095								
DS5.2X10X0.4	5.20	10.00	0.40		0.30	0.70	0.75	0.18	0.05	56	0.09	103	0.14	143	0.18	178	0.23	209	0.27	238								
									124	298	280	575	468	832	690	1067	943	1281	1230	1474								
DS5.2X10X0.5	5.20	10.00	0.50		0.25	0.75	0.50	0.22	0.04	75	0.08	144	0.11	208	0.15	268	0.19	325	0.23	381								
									198	266	419	517	663	753	929	975	1218	1182	1529	1375								
DS4.2X12X0.4	4.20	12.00	0.40		0.40	0.80	1.00	0.31	0.06	55	0.12	98	0.18	132	0.24	158	0.3	178	0.36	195								
									76	238	193	455	350	653	548	830	786	988	1064	1125								
DS4.2X12X0.5	4.20	12.00	0.50		0.35	0.85	0.70	0.39	0.05	73	0.11	136	0.16	191	0.21	240	0.26	284	0.32	325								
									165	219	361	423	589	612	847	785	1136	943	1456	1086								
DS4.2X12X0.6	4.20	12.00	0.60		0.40	1.00	0.67	0.47	0.06	141	0.12	263	0.18	372	0.24	468	0.3	557	0.36	640								
									239	295	519	569	839	824	1199	1058	1600	1273	2041	1467								
DS5.2X12X0.5	5.20	12.00	0.50		0.40	0.90	0.80	0.36	0.06	96	0.12	176	0.18	243	0.24	300	0.3	350	0.36	395								
									137	303	314	584	530	842	785	1078	1080	1291	1414	1482								
DS5.2X12X0.6	5.20	12.00	0.60		0.35	0.95	0.58	0.43	0.05	122	0.11	231	0.16	330	0.21	421	0.26	506	0.32	588								
									213	279	456	540	730	785	1033	1012	1367	1222	1730	1415								
DS6.2X12X0.5	6.20	12.00	0.50		0.35	0.85	0.70	0.33	0.05	84	0.11	157	0.16	220	0.21	276	0.26	326	0.32	374								
									139	291	308	563	509	815	740	1047	1001	1259	1294	1452								
DS6.2X12X0.6	6.20	12.00	0.60		0.35	0.95	0.58	0.39	0.05	133	0.11	252	0.16	360	0.21	459	0.26	552	0.32	640								
									204	325	440	631	706	916	1002	1182	1329	1429	1687	1655								
DS5.2X12.5X0.5	5.20	12.50	0.50		0.35	0.85	0.70	0.40	0.05	70	0.11	131	0.16	183	0.21	230	0.26	272	0.32	312								
									138	224	304	432	497	625	718	803	967	965	1244	1112								
DS6.2X12.5X0.35	6.20	12.50	0.35		0.45	0.80	1.29	0.25	0.07	55	0.14	95	0.2	123	0.27	141	0.34	151	0.41	157								
									-14	314	18	598	97	854	222	1080	393	1278	611	1446								

Disc Springs to DIN 2093

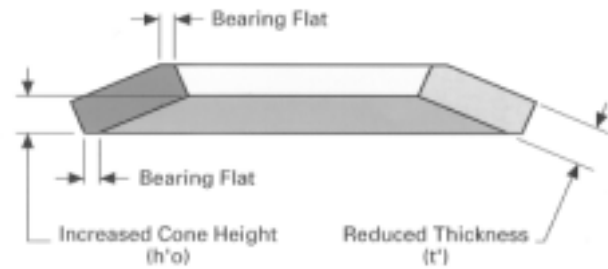


Townsend Bearings

Disc Spring without Bearing Flats



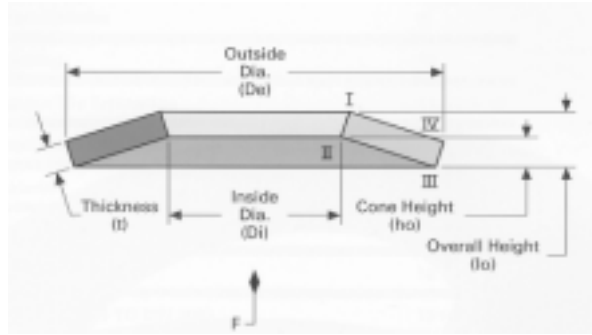
Disc Spring with Bearing Flats



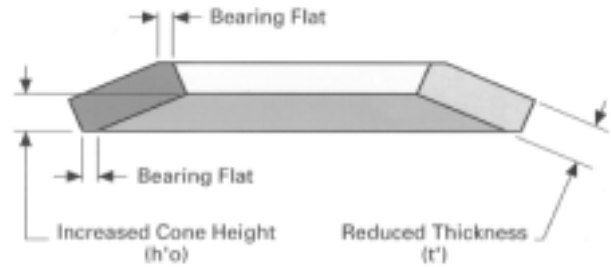
Product Code	Inner Dia. (Di) mm	Outer Dia. (De) mm	Thick. (t) mm	Reduced Thick. (t') mm	Cone Ht. (ho) mm	Overall Ht. (lo) mm	Cone Ht. To Thickness Ratio	Weight per 1000 pieces	15% Deflection		30% Deflection		45% Deflection		60% Deflection		75% Deflection		90% Deflection													
									Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N										
									Stress δ_{II} δ_{III} N/mm ²		Stress δ_{II} δ_{III} N/mm ²		Stress δ_{II} δ_{III} N/mm ²		Stress δ_{II} δ_{III} N/mm ²		Stress δ_{II} δ_{III} N/mm ²		Stress δ_{II} δ_{III} N/mm ²													
DS6.2X12.5X0.5	6.20	12.50	0.50		0.35	0.85	0.70	0.36	0.05	76	0.11	141	0.16	198	0.21	248	0.26	293	0.32	336	129	258	286	498	471	721	684	926	925	1114	1194	1284
DS6.2X12.5X0.6	6.20	12.50	0.60		0.35	0.95	0.58	0.44	0.05	119	0.11	227	0.16	324	0.21	413	0.26	496	0.32	576	189	288	407	558	652	811	926	1046	1227	1264	1557	1464
DS6.2X12.5X0.7	6.20	12.50	0.70		0.30	1.00	0.43	0.51	0.05	147	0.09	284	0.14	415	0.18	539	0.23	660	0.27	777	235	259	491	505	767	739	1064	959	1382	1167	1720	1361
DS6.2X12.5X1	6.20	12.50	1.00		0.20	1.20	0.20	0.73	0.03	257	0.06	510	0.09	760	0.12	1008	0.15	1254	0.18	1499	289	206	586	407	893	602	1209	791	1534	975	1868	1152
DS7.2X14X0.35	7.20	14.00	0.35		0.45	0.80	1.29	0.31	0.07	45	0.14	78	0.2	100	0.27	115	0.34	123	0.41	128	-13	259	12	494	74	705	173	892	309	1055	482	1195
DS7.2X14X0.5	7.20	14.00	0.50		0.40	0.90	0.80	0.44	0.06	76	0.12	140	0.18	194	0.24	239	0.3	279	0.36	315	94	258	217	497	370	717	553	919	764	1101	1005	1265
DS7.2X14X0.8	7.20	14.00	0.80		0.30	1.10	0.38	0.71	0.05	173	0.09	338	0.14	496	0.18	648	0.23	797	0.27	943	228	235	473	460	735	674	1013	878	1308	1071	1619	1253
DS5.2X15X0.4	5.20	15.00	0.40		0.55	0.95	1.38	0.49	0.08	67	0.17	115	0.25	147	0.33	166	0.41	176	0.5	180	-15	249	19	473	103	674	235	850	417	1002	647	1130
DS5.2X15X0.5	5.20	15.00	0.50		0.50	1.00	1.00	0.61	0.08	86	0.15	154	0.23	206	0.3	246	0.38	278	0.45	305	77	236	195	453	353	650	551	826	790	983	1070	1119
DS5.2X15X0.6	5.20	15.00	0.60		0.45	1.05	0.75	0.73	0.07	108	0.14	200	0.2	278	0.27	347	0.34	407	0.41	463	151	222	334	428	551	618	800	792	1082	949	1397	1090
DS5.2X15X0.7	5.20	15.00	0.70		0.40	1.10	0.57	0.85	0.06	133	0.12	252	0.18	361	0.24	461	0.3	555	0.36	645	206	206	439	399	697	579	981	746	1291	901	1627	1043
DS6.2X15X0.5	6.20	15.00	0.50		0.50	1.00	1.00	0.58	0.08	89	0.15	160	0.23	214	0.3	256	0.38	289	0.45	317	64	262	168	501	311	719	494	915	716	1089	977	1242
DS6.2X15X0.6	6.20	15.00	0.60		0.45	1.05	0.75	0.69	0.07	112	0.14	208	0.2	290	0.27	360	0.34	424	0.41	482	135	246	302	475	501	685	732	878	994	1054	1289	1212
DS6.2X15X0.7	6.20	15.00	0.70		0.40	1.10	0.57	0.81	0.06	138	0.12	262	0.18	376	0.24	480	0.3	578	0.36	671	189	228	402	443	642	643	906	829	1195	1002	1510	1160
DS8.2X15X0.5	8.20	15.00	0.50		0.50	1.00	1.00	0.49	0.08	103	0.15	184	0.23	247	0.3	295	0.38	334	0.45	365	51	334	142	640	275	919	448	1171	662	1396	917	1593
DS8.2X15X0.7	8.20	15.00	0.70		0.40	1.10	0.57	0.68	0.06	159	0.12	303	0.18	433	0.24	553	0.3	666	0.36	774	178	293	382	569	612	827	868	1067	1150	1291	1459	1496
DS8.2X15X0.8	8.20	15.00	0.80		0.40	1.20	0.50	0.78	0.06	226	0.12	434	0.18	628	0.24	809	0.3	982	0.36	1150	226	320	478	622	757	906	1061	1173	1392	1423	1749	1655
DS8.2X16X0.4	8.20	16.00	0.40		0.50	0.90	1.25	0.47	0.08	55	0.15	96	0.23	124	0.3	143	0.38	154	0.45	162	-6	247	23	471	88	673	187	852	322	1009	491	1143
DS8.2X16X0.6	8.20	16.00	0.60		0.45	1.05	0.75	0.70	0.07	109	0.14	201	0.2	280	0.27	349	0.34	410	0.41	466	109	258	246	498	412	720	607	924	830	1109	1081	1276
DS8.2X16X0.7	8.20	16.00	0.70		0.45	1.15	0.64	0.81	0.07	159	0.14	298	0.2	422	0.27	534	0.34	637	0.41	735	156	283	341	547	555	793	796	1021	1067	1230	1366	1422
DS8.2X16X0.8	8.20	16.00	0.80		0.40	1.20	0.50	0.93	0.06	190	0.12	365	0.18	527	0.24	680	0.3	825	0.36	966	199	262	420	509	663	742	929	960	1218	1164	1529	1354
DS8.2X16X0.9	8.20	16.00	0.90		0.35	1.25	0.39	1.05	0.05	221	0.11	431	0.16	632	0.21	825	0.26	1013	0.32	1197	226	238	469	465	729	681	1006	886	1301	1080	1613	1263
DS6.2X18X0.4	6.20	18.00	0.40		0.60	1.00	1.50	0.70	0.09	57	0.18	96	0.27	121	0.36	134	0.45	139	0.54	138	-32	198	-23	376	26	534	116	673	247	791	418	890
DSX6.2X18X0.5	6.20	18.00	0.50		0.60	1.10	1.20	0.88	0.09	85	0.18	149	0.27	194	0.36	225	0.45	245	0.54	259	23	217	86	414	190	591	335	748	520	885	746	1003
DS6.2X18X0.6	6.20	18.00	0.60		0.60	1.20	1.00	1.06	0.09	124	0.18	221	0.27	296	0.36	355	0.45	400	0.54	438	78	236	196	452	354	647	554	823	794	980	1074	1116
DS6.2X18X0.7	6.20	18.00	0.70		0.55	1.25	0.79	1.23	0.08	150	0.17	276	0.25	382	0.33	473	0.41	553	0.5	625	140	224	315	431	523	622	766	795	1043	953	1354	1093



Disc Spring without Bearing Flats



Disc Spring with Bearing Flats



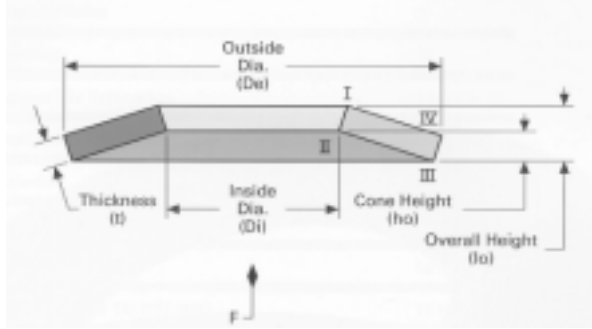
Product Code	Inner Dia. (Di) mm	Outer Dia. (De) mm	Thick. (t) mm	Reduced Thick. (t') mm	Cone Ht. (ho) mm	Overall Ht. (lo) mm	Cone Ht. To Thickness Ratio	Weight per 1000 pieces	15% Deflection		30% Deflection		45% Deflection		60% Deflection		75% Deflection		90% Deflection		
									Defl. Force		Defl. Force		Defl. Force		Defl. Force		Defl. Force		Defl. Force		
									mm	N	mm	N	mm	N	mm	N	mm	N	mm	N	mm
Stress		Stress		Stress		Stress		Stress		Stress		Stress		Stress		Stress		Stress			
δII		δIII		δII		δIII		δII		δIII		δII		δIII		δII		δIII		δII	
N/mm2		N/mm2		N/mm2		N/mm2		N/mm2		N/mm2		N/mm2		N/mm2		N/mm2		N/mm2		N/mm2	
DS6.2X18X0.8	6.20	18.00	0.80	0.50	1.30	0.63	1.41	0.08	179	0.15	337	0.23	479	0.3	607	0.38	726	0.45	838	190	211
DS8.2X18X0.5	8.20	18.00	0.50	0.60	1.10	1.20	0.79	0.09	92	0.18	161	0.27	209	0.36	243	0.45	265	0.54	280	9	258
DS8.2X18X0.7	8.20	18.00	0.70	0.55	1.25	0.79	1.11	0.08	161	0.17	297	0.25	412	0.33	510	0.41	596	0.5	674	118	267
DS8.2X18X0.8	8.20	18.00	0.80	0.50	1.30	0.63	1.27	0.08	193	0.15	364	0.23	516	0.3	655	0.38	783	0.45	904	166	252
DS8.2X18X1	8.20	18.00	1.00	0.40	1.40	0.40	1.58	0.06	260	0.12	505	0.18	739	0.24	963	0.3	1181	0.36	1395	227	216
DS9.2X18X0.45	9.20	18.00	0.45	0.60	1.05	1.33	0.66	0.09	80	0.18	138	0.27	176	0.36	200	0.45	214	0.54	220	-22	272
DS9.2X18X0.7	9.20	18.00	0.70	0.50	1.20	0.71	1.03	0.08	147	0.15	274	0.23	383	0.3	480	0.38	566	0.45	647	120	258
DS9.2X18X1	9.20	18.00	1.00	0.40	1.40	0.40	1.48	0.06	276	0.12	536	0.18	784	0.24	1023	0.3	1254	0.36	1481	223	240
DS8.2X20X0.6	8.20	20.00	0.60	0.70	1.30	1.17	1.20	0.11	141	0.21	246	0.32	322	0.42	375	0.53	412	0.63	438	23	267
DS8.2X20X0.7	8.20	20.00	0.70	0.65	1.35	0.93	1.40	0.1	168	0.2	303	0.29	411	0.39	498	0.49	569	0.59	630	84	257
DS8.2X20X0.8	8.20	20.00	0.80	0.60	1.40	0.75	1.60	0.09	199	0.18	369	0.27	514	0.36	639	0.45	751	0.54	854	136	245
DSX8.2X20X0.9	8.20	20.00	0.90	0.55	1.45	0.61	1.80	0.08	233	0.17	441	0.25	627	0.33	796	0.41	954	0.5	1103	177	232
DS8.2X20X1	8.20	20.00	1.00	0.55	1.55	0.55	2.10	0.08	306	0.17	583	0.25	837	0.33	1073	0.41	1294	0.5	1508	216	247
DS10.2X20X0.4	10.20	20.00	0.40	0.50	0.90	1.25	0.70	0.08	35	0.15	61	0.23	79	0.3	91	0.38	99	0.45	103	-4	157
DS10.2X20X0.5	10.20	20.00	0.50	0.65	1.15	1.30	0.90	0.1	94	0.2	161	0.29	208	0.39	237	0.89	254	0.59	264	-15	261
DS10.2X20X0.8	10.20	20.00	0.80	0.55	1.35	0.69	1.50	0.08	191	0.17	357	0.25	502	0.33	631	0.41	748	0.5	858	129	258
DS10.2X20X0.9	10.20	20.00	0.90	0.55	1.45	0.61	1.60	0.08	257	0.17	485	0.25	690	0.33	877	0.41	1050	0.5	1215	166	277
DS10.2X20X1	10.20	20.00	1.00	0.55	1.55	0.55	1.80	0.08	337	0.17	642	0.25	922	0.33	1181	0.41	1425	0.5	1660	203	296
DS10.2X20X1.1	10.20	20.00	1.10	0.45	1.55	0.41	2.00	0.07	335	0.14	652	0.2	953	0.27	1241	0.34	1521	0.41	1795	222	242
DS10.2X20X1.25	10.20	20.00	1.25	0.50	1.75	0.40	2.30	0.08	544	0.15	1059	0.23	1549	0.3	2020	0.38	2477	0.45	2925	283	303
DS10.2X20X1.5	10.20	20.00	1.50	0.30	1.80	0.20	2.70	0.05	517	0.09	1026	0.14	1529	0.18	2027	0.23	2521	0.27	3013	254	187
DS11.2X22.5X0.6	11.20	22.50	0.60	0.80	1.40	1.33	1.40	0.12	160	0.24	274	0.36	351	0.48	399	0.6	425	0.72	439	-23	302
DS11.2X22.5X0.8	11.20	22.50	0.80	0.65	1.45	0.81	1.90	0.1	195	0.2	357	0.29	493	0.39	608	0.49	707	0.59	798	93	253
DS11.2X22.5X1	11.20	22.50	1.00	0.65	1.65	0.65	2.30	0.1	334	0.2	627	0.29	887	0.39	1121	0.49	1335	0.59	1538	162	288
DS11.2X22.5X1.25	11.20	22.50	1.25	0.50	1.75	0.40	2.90	0.08	424	0.15	824	0.23	1206	0.3	1573	0.38	1929	0.45	2278	224	234
DS8.2X23X0.7	8.20	23.00	0.70	0.80	1.50	1.14	2.00	0.12	183	0.24	321	0.36	422	0.48	493	0.6	544	0.72	581	37	245

Disc Springs to DIN 2093

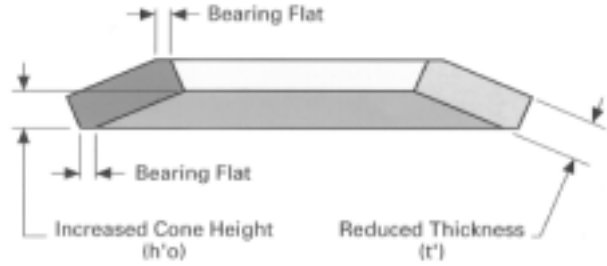


Townsend Bearings

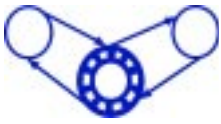
Disc Spring without Bearing Flats



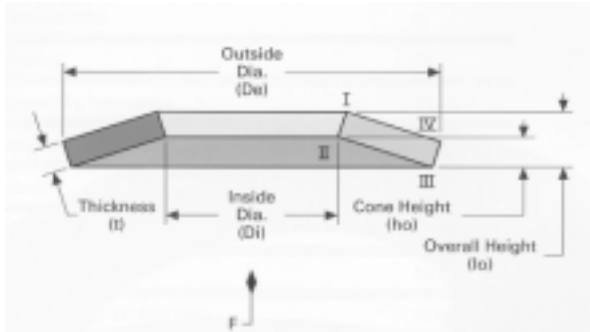
Disc Spring with Bearing Flats



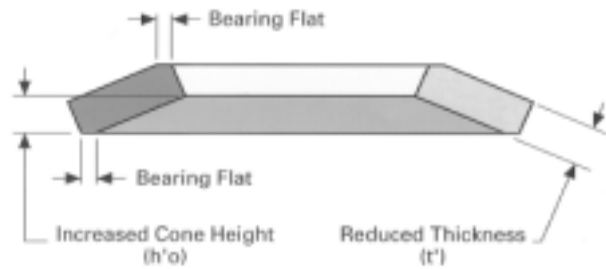
Product Code	Inner Dia. (Di) mm	Outer Dia. (De) mm	Thick. (t) mm	Reduced Thick. (t') mm	Cone Ht. (ho) mm	Overall Ht. (lo) mm	Cone Ht. To Thickness Ratio	Weight per 1000 pieces	15% Deflection		30% Deflection		45% Deflection		60% Deflection		75% Deflection		90% Deflection				
									Defl. Force		Defl. Force		Defl. Force		Defl. Force		Defl. Force		Defl. Force				
									mm	N	mm	N	mm	N	mm	N	mm	N	mm	N	mm	N	mm
									Stress		Stress		Stress		Stress		Stress		Stress				
									δ_{II}	δ_{III}	δ_{II}	δ_{III}	δ_{II}	δ_{III}	δ_{II}	δ_{III}	δ_{II}	δ_{III}	δ_{II}	δ_{III}			
									N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²				
DS8.2X23X0.8	8.20	23.00	0.80	0.75	1.55	0.94	2.30	2.30	0.11	214	0.23	385	0.34	521	0.45	630	0.56	719	0.68	795	0.86	1041	
									92	237	223	454	392	653	600	831	846	991	1131	1131			
DS8.2X23X0.9	8.20	23.00	0.90	0.70	1.60	0.78	2.60	2.60	0.11	248	0.21	457	0.32	634	0.42	785	0.53	919	0.63	1041	0.86	1340	1112
									139	227	312	438	519	632	759	808	1032	969	1340	1112			
DS8.2X23X1	8.20	23.00	1.00	0.70	1.70	0.70	2.80	2.80	0.11	309	0.21	595	0.32	835	0.42	1048	0.53	1240	0.63	1419	0.86	1894	1512
									178	241	389	465	634	673	913	863	1225	1037	1571	1194			
DS10.2X23X0.9	10.20	23.00	0.90	0.75	1.65	0.83	2.40	2.40	0.11	295	0.23	539	0.34	742	0.45	912	0.56	1058	0.68	1189	0.86	1489	1204
									115	289	269	555	459	800	687	1024	953	1225	1257	1404			
DS10.2X23X1	10.20	23.00	1.00	0.70	1.70	0.70	2.60	2.60	0.11	339	0.21	631	0.32	886	0.42	1112	0.53	1315	0.63	1506	0.86	1941	1577
									158	277	349	535	573	774	829	994	1119	1195	1441	1377			
DS10.2X23X1.25	10.20	23.00	1.25	0.65	1.90	0.52	3.30	3.30	0.1	537	0.2	1029	0.29	1483	0.39	1907	0.49	2310	0.59	2699	0.86	3489	2812
									244	287	516	557	816	810	1145	1048	1502	1269	1887	1473			
DS12.2X23X1	12.20	23.00	1.00	0.60	1.60	0.60	2.30	2.30	0.09	296	0.18	560	0.27	797	0.36	1015	0.45	1217	0.54	1410	0.86	1894	1512
									155	263	334	510	538	740	767	954	1020	1152	1299	1334			
DS12.2X23X1.25	12.20	23.00	1.25	0.60	1.85	0.48	2.90	2.90	0.09	532	0.18	1023	0.27	1483	0.36	1916	0.45	2331	0.54	2734	0.86	3584	2917
									231	304	488	591	768	862	1074	1117	1404	1356	1760	1579			
DS12.2X23X1.5	12.20	23.00	1.50	0.50	2.00	0.33	3.50	3.50	0.08	705	0.15	1382	0.23	2036	0.3	2673	0.38	3297	0.45	3912	0.86	4912	4012
									278	273	573	535	886	785	1215	1025	1562	1253	1926	1470			
DS10.2X25X1	10.20	25.00	1.00	0.75	1.75	0.75	3.20	3.20	0.11	311	0.23	575	0.34	801	0.45	997	0.56	1172	0.68	1333	0.86	1733	1404
									136	244	304	470	504	679	736	871	1000	1045	1295	1201			
DS12.2X25X0.7	12.20	25.00	0.70	0.90	1.60	1.29	2.10	2.10	0.14	219	0.27	378	0.41	487	0.54	558	0.68	800	0.81	924	0.86	1134	924
									-13	309	20	589	99	841	225	1064	0.96	1259	614	1425			
DS12.2X25X0.9	12.20	25.00	0.90	0.70	1.60	0.78	2.60	2.60	0.11	233	0.21	429	0.32	595	0.42	737	0.53	862	0.63	977	0.86	1134	924
									99	239	227	461	382	666	565	853	776	1023	1015	1176			
DS12.2X25X1	12.20	25.00	1.00	0.80	1.80	0.80	2.90	2.90	0.12	371	0.24	682	0.36	943	0.48	1165	0.6	1359	0.72	1534	0.86	1941	1577
									120	308	276	593	469	855	699	1095	965	1312	1267	1507			
DS12.2X25X1.25	12.20	25.00	1.25	0.70	1.95	0.56	3.70	3.70	0.11	526	0.21	1002	0.32	1436	0.42	1837	0.53	2214	0.63	2577	0.86	3347	2712
									205	291	438	564	699	821	988	1059	1305	1281	1649	1485			
DS12.2X25X1.5	12.20	25.00	1.50	0.55	2.05	0.37	4.40	4.40	0.08	634	0.17	1238	0.25	1818	0.33	2379	0.41	2926	0.5	3464	0.86	4464	3612
									249	239	516	468	800	686	1101	894	1419	1091	1755	1277			
DS10.2X28X0.8	10.20	28.00	0.80	0.95	1.75	1.19	3.40	3.40	0.14	229	0.29	399	0.43	521	0.57	605	0.71	862	0.86	1016	0.86	1134	924
									23	232	88	443	195	633	343	802	532	950	763	1076			
DS10.2X28X1	10.20	28.00	1.00	0.90	1.90	0.90	4.20	4.20	0.14	328	0.27	595	0.41	810	0.54	984	0.68	1130	0.81	1257	0.86	1489	1204
									101	238	239	456	415	656	628	837	878	998	1166	1141			
DS10.2X28X1.25	10.20	28.00	1.25	0.80	2.05	0.64	5.20	5.20	0.12	460	0.24	866	0.36	1227	0.48	1553	0.6	1853	0.72	2137	0.86	2712	2212
									186	226	402	438	647	634	921	616	1225	982	1559	1134			
DS10.2X28X1.5	10.20	28.00	1.50	0.70	2.20	0.47	6.30	6.30	0.11	617	0.21	1190	0.32	1726	0.42	2235	0.53	2723	0.63	3197	0.86	4012	3262
									247	211	517	411	809	600	1124	777	1461	943	1821	1097			
DS12.2X28X1	12.20	28.00	1.00	0.95	1.95	0.95	3.90	3.90	0.14	380	0.29	683	0.43	923	0.57	1114	0.71	1268	0.86	1400	0.86	1733	1404
									80	288	201	553	362	765	564	1013	807	1208	1090	1379			
DS12.2X28X1.25	12.20	28.00	1.25	0.85	2.10	0.68	4.90	4.90	0.13	530	0.26	991	0.38	1395	0.51	1755	0.64	2083	0.77	2390	0.86	3012	2462
									169	277	371	534	605	774	872	994	1172	1196	1504	1379			
DS12.2X28X1.5	12.20	28.00	1.50	0.75	2.25	0.50	5.90	5.90	0.11	709	0.23	1361	0.34	1966	0.45	2535	0.56	3077	0.68	3603	0.86	4512	3662
									235	261	496	506	782	738	1094	955	1431	1157	1793	1345			
DS14.2X28X0.8	14.20	28.00	0.80	1.00	1.80	1.25	2.90	2.90	0.15	287	0.3	497	0.45	644	0.6	741	0.75	801	0.9	939	0.86	1134	924
									-7	319	31	609	116	870	246	1101	422	1304	643	1477			
DS14.2X28X1	14.20	28.00	1.00	0.80	1.80	0.80	3.60	3.60	0.12	303	0.24	556	0.36	769	0.48	949	0.6	1107	0.72	1250	0.86	1489	1204
									94	254	218	490	371	707	553	906	765	1086	1006	1247			
DS14.2X28X1.25	14.20	28.00	1.25	0.85	2.10	0.68	4.50	4.50	0.13	570	0.26	1065	0.38	1500	0.51	1887	0.64	2240	0.77	2570	0.86	3262	2612
									161	315	356	609	583	882	844	1134	1138	1365	1465	1574			
DS14.2X28X1.5	14.20	28.00	1.50	0.65	2.15	0.43	5.40	5.40	0.1	633	0.2	1227	0.29	1789	0.39	2324	0.49	2841	0.59	3346	0.86	4246	3496
									216	246	451	479	706	701	980	910	1274	1106	1586	1291			



Disc Spring without Bearing Flats



Disc Spring with Bearing Flats



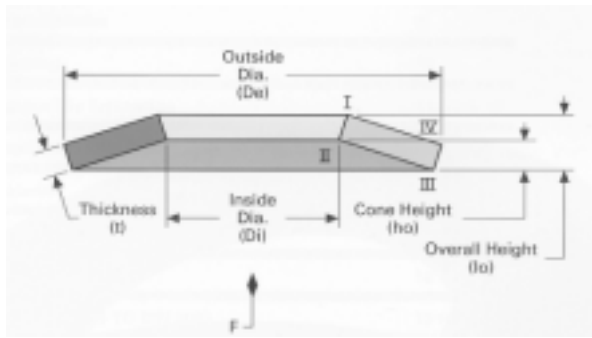
Product Code	Inner Dia. (Di) mm	Outer Dia. (De) mm	Thick. (t) mm	Reduced Thick. (t') mm	Cone Ht. (ho) mm	Overall Ht. (lo) mm	Cone Ht. To Thickness Ratio	Weight per 1000 pieces	15% Deflection		30% Deflection		45% Deflection		60% Deflection		75% Deflection		90% Deflection	
									Defl. Force		Defl. Force		Defl. Force		Defl. Force		Defl. Force		Defl. Force	
									mm	N	mm	N	mm	N	mm	N	mm	N	mm	N
Stress		Stress		Stress		Stress		Stress		Stress		Stress		Stress		Stress		Stress		
δ_{II}		δ_{III}		δ_{II}		δ_{III}		δ_{II}		δ_{III}		δ_{II}		δ_{III}		δ_{II}		δ_{III}		
N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²		
DS12.2X31.5X1.25	12.20	31.50	1.25	0.95	2.20	0.76	6.50	0.14	481	0.29	890	0.43	1238	0.57	1539	0.71	1805	0.86	2050	
DS12.2X31.5X1.5	12.20	31.50	1.50	0.85	2.35	0.57	7.80	0.13	641	0.26	1219	0.38	1746	0.51	2232	0.64	2688	0.77	3126	
DS16.3X31.5X0.8	16.30	31.50	0.80	1.05	1.85	1.31	3.60	0.16	255	0.32	438	0.47	563	0.63	642	0.79	687	0.95	711	
DS16.3X31.5X1.25	16.30	31.50	1.25	0.90	2.15	0.72	5.60	0.14	498	0.27	926	0.41	1296	0.54	1621	0.68	1913	0.81	2184	
DS16.3X31.5X1.5	16.30	31.50	1.50	0.90	2.40	0.60	6.70	0.14	785	0.27	1485	0.41	2116	0.54	2693	0.68	3230	0.81	3742	
DS16.3X31.5X1.75	16.30	31.50	1.75	0.70	2.45	0.40	7.80	0.11	850	0.21	1655	0.32	2421	0.42	3157	0.53	3871	0.63	4572	
DS16.3X31.5X2	16.30	31.50	2.00	0.75	2.75	0.38	9.00	0.11	1342	0.23	2618	0.34	3841	0.45	5022	0.56	6173	0.68	7304	
DS12.2X34X1	12.20	34.00	1.00	1.25	2.25	1.25	6.20	0.19	420	0.38	727	0.56	942	0.75	1084	0.94	1172	1.13	1228	
DS12.2X34X1.25	12.20	34.00	1.25	1.10	2.35	0.88	7.80	0.17	521	0.33	946	0.5	1292	0.66	1576	0.83	1815	0.99	2026	
DS12.2X34X1.5	12.20	34.00	1.50	1.00	2.50	0.67	9.30	0.15	687	0.3	1287	0.45	1816	0.6	2288	0.75	2721	0.9	3127	
DS14.2X34X1.25	14.20	34.00	1.25	1.15	2.40	0.92	7.40	0.17	585	0.35	1056	0.52	1434	0.69	1738	0.86	1989	1.04	2206	
DS14.2X34X1.5	14.20	34.00	1.50	1.05	2.55	0.70	8.80	0.16	768	0.32	1432	0.47	2010	0.63	2521	0.79	2984	0.95	3415	
DS16.3X34X1.5	16.30	34.00	1.50	1.05	2.55	0.70	8.20	0.16	812	0.32	1514	0.47	2126	0.63	2666	0.79	3155	0.95	3612	
DS16.3X34X2	16.30	34.00	2.00	0.85	2.85	0.43	11.00	0.13	1284	0.26	2491	0.38	3634	0.51	4727	0.64	5783	0.77	6816	
DS18.3X35.5X0.9	18.30	35.50	0.90	1.15	2.05	1.28	5.10	0.17	303	0.35	523	0.52	675	0.69	773	0.86	832	1.04	867	
DS18.3X35.5X1.25	18.30	35.50	1.25	1.00	2.25	0.80	7.10	0.15	464	0.3	853	0.45	1179	0.6	1457	0.75	1699	0.9	1918	
DS18.3X35.5X2	18.30	35.50	2.00	0.80	2.80	0.40	11.40	0.12	1139	0.24	2217	0.36	3243	0.48	4230	0.6	5187	0.72	6126	
DS14.2X40X1.25	14.20	40.00	1.25	1.40	2.65	1.12	11.00	0.21	590	0.42	1038	0.63	1369	0.84	1607	1.05	1778	1.26	1907	
DS14.2X40X1.5	14.20	40.00	1.50	1.25	2.75	0.83	13.00	0.19	709	0.38	1296	0.56	1783	0.75	2191	0.94	2542	1.13	2857	
DS14.2X40X2	14.20	40.00	2.00	1.05	3.05	0.53	17.00	0.16	1111	0.32	2126	0.47	3062	0.63	3935	0.79	4763	0.95	5563	
DS16.3X40X1.5	16.30	40.00	1.50	1.05	2.55	0.70	12.00	0.16	551	0.32	1027	0.47	1442	0.63	1808	0.79	2140	0.95	2449	
DS16.3X40X2	16.30	40.00	2.00	1.10	3.10	0.55	16.00	0.17	1222	0.33	2329	0.5	3343	0.66	4283	0.83	5169	0.99	6021	
DS18.3X40X2	18.30	40.00	2.00	1.15	3.15	0.58	16.00	0.17	1355	0.35	2574	0.52	3682	0.69	4701	0.86	5656	1.04	6571	
DS20.4X40X1	20.40	40.00	1.00	1.30	2.30	1.30	7.00	0.2	375	0.39	645	0.59	830	0.78	948	0.98	1017	1.17	1055	
DS20.4X40X1.5	20.40	40.00	1.50	1.15	2.65	0.77	11.00	0.17	702	0.35	1296	0.52	1801	0.69	2237	0.86	2621	1.04	2974	
DS20.4X40X2	20.40	40.00	2.00	1.10	3.10	0.55	15.00	0.17	1348	0.33	2569	0.5	3687	0.66	4724	0.83	5701	0.99	6641	

Disc Springs to DIN 2093

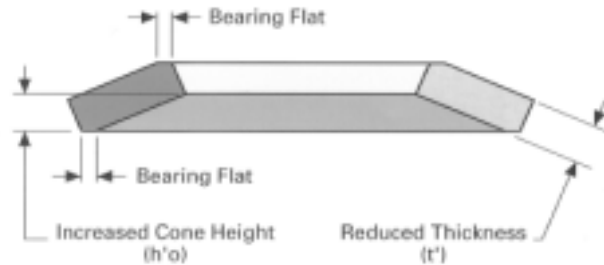


Townsend Bearings

Disc Spring without Bearing Flats



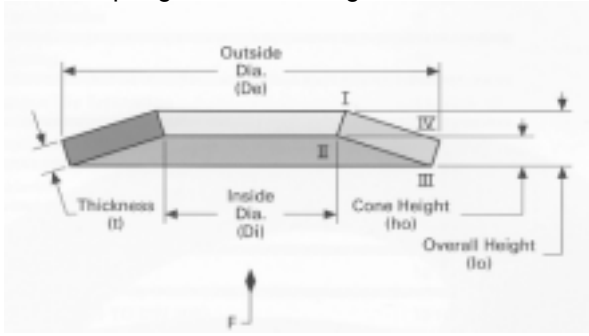
Disc Spring with Bearing Flats



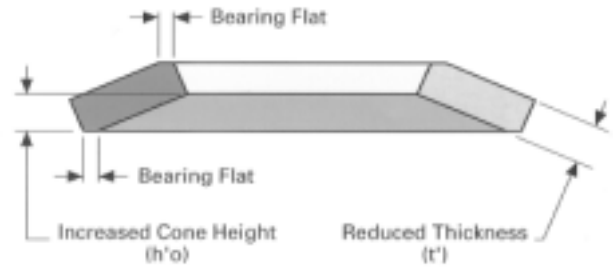
Product Code	Inner Dia. (Di) mm	Outer Dia. (De) mm	Thick. (t) mm	Reduced Thick. (t') mm	Cone Ht. (ho) mm	Overall Ht. (lo) mm	Cone Ht. To Thickness Ratio	Weight per 1000 pieces	15% Deflection		30% Deflection		45% Deflection		60% Deflection		75% Deflection		90% Deflection												
									Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N									
Stress		Stress		Stress		Stress		Stress		Stress		Stress		Stress		Stress		Stress													
δ_{II}		δ_{III}		δ_{II}		δ_{III}		δ_{II}		δ_{III}		δ_{II}		δ_{III}		δ_{II}		δ_{III}		δ_{II}											
N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²		N/mm ²													
DS20.4X40X2.25	20.40	40.00	2.25	0.90	3.15	0.40	16.00	0.14	1428	0.27	2778	0.41	4064	0.54	5301	0.68	6500	0.81	7677	229	246	476	480	742	702	1026	913	1328	1112	1648	1300
DS20.4X40X2.5	20.40	40.00	2.50	0.95	3.45	0.38	18.00	0.14	2045	0.29	3989	0.43	5849	0.57	7643	0.71	9390	0.86	11106	275	284	571	555	887	813	1223	1058	1579	1290	1956	1510
DS22.4X45X1.25	22.40	45.00	1.25	1.60	2.85	1.28	12.00	0.24	689	0.48	1189	0.72	1534	0.96	1757	1.2	1891	1.44	1969	-13	307	20	586	98	837	221	1060	389	1253	602	1419
DS22.4X45X1.75	22.40	45.00	1.75	1.30	3.05	0.74	16.00	0.2	963	0.39	1783	0.59	2488	0.78	3100	0.98	3646	1.17	4150	119	266	267	514	446	742	654	952	892	1144	1160	1316
DS22.4X45X2.5	22.40	45.00	2.50	1.00	3.50	0.40	23.00	0.15	1695	0.3	3298	0.45	4825	0.6	6292	0.75	7716	0.9	9113	224	234	465	457	724	669	1001	869	1296	1059	1608	1237
DS18.3X50X1.25	18.30	50.00	1.25	1.60	2.85	1.28	17.00	0.24	500	0.48	864	0.72	1114	0.96	1276	1.2	1373	1.44	1430	3	201	42	382	118	545	232	689	382	814	569	920
DS18.3X50X1.5	18.30	50.00	1.50	1.80	3.30	1.20	20.00	0.27	906	0.54	1578	0.81	2058	1.08	2386	1.35	2603	1.62	2752	23	261	92	498	208	711	371	900	581	1066	837	1208
DS18.3X50X2	18.30	50.00	2.00	1.50	3.50	0.75	27.00	0.23	1211	0.45	2241	0.68	3123	0.9	3887	1.13	4567	1.35	5193	145	229	323	441	533	636	776	815	1051	977	1358	1123
DS18.3X50X2.5	18.30	50.00	2.50	1.60	4.10	0.64	33.00	0.24	2312	0.48	4351	0.72	6163	0.96	7799	1.2	9305	1.44	10731	233	285	503	551	809	798	1153	1026	1533	1236	1951	1426
DS18.3X50X3	18.30	50.00	3.00	1.40	4.40	0.47	40.00	0.21	3097	0.42	5975	0.63	8670	0.84	11224	1.05	13673	1.26	16058	309	266	647	518	1013	755	1407	977	1829	1186	2280	1379
DS20.4X50X2	20.40	50.00	2.00	1.50	3.50	0.75	26.00	0.23	1243	0.45	2300	0.68	3205	0.9	3990	1.13	4687	1.35	5330	136	244	304	470	504	679	736	871	1000	1045	1295	1201
DS20.4X50X2.5	20.40	50.00	2.50	1.35	3.85	0.54	32.00	0.2	1862	0.41	3555	0.61	5109	0.81	6554	1.01	7919	1.22	9234	215	240	456	467	723	679	1015	876	1334	1060	1678	1229
DS22.4X50X2	22.40	50.00	2.00	1.60	3.60	0.80	25.00	0.24	1427	0.48	2622	0.72	3625	0.96	4478	1.2	5222	1.44	5897	125	286	285	552	482	796	715	1018	985	1220	1290	1401
DS22.4X50X2.5	22.40	50.00	2.50	1.40	3.90	0.56	31.00	0.21	2023	0.42	3850	0.63	5518	0.84	7060	1.05	8510	1.26	9903	209	270	447	525	711	763	1004	984	1324	1190	1672	1379
DS25.4X50X1.25	25.40	50.00	1.25	1.60	2.85	1.28	14.00	0.24	565	0.48	975	0.72	1258	0.96	1440	1.2	1550	1.44	1615	-11	254	15	484	77	691	176	875	312	1035	485	1172
DS25.4X50X1.5	25.40	50.00	1.50	1.60	3.10	1.07	17.00	0.24	808	0.48	1431	0.72	1900	0.96	2250	1.2	2512	1.44	2719	32	276	101	528	207	757	349	963	528	1145	744	1304
DS25.4X50X2	25.40	50.00	2.00	1.40	3.40	0.70	23.00	0.21	1226	0.42	2285	0.63	3208	0.84	4024	1.05	4762	1.26	5451	128	264	285	510	470	738	682	948	923	1140	1193	1315
DS25.4X50X2.25	25.40	50.00	2.25	1.50	3.75	0.67	26.00	0.23	1821	0.45	3413	0.68	4816	0.9	6070	1.13	7217	1.35	8296	165	312	362	603	591	874	853	1124	1147	1353	1473	1562
DS25.4X50X2.5	25.40	50.00	2.50	1.40	3.90	0.56	29.00	0.21	2154	0.42	4101	0.63	5877	0.84	7519	1.05	9063	1.26	10546	204	302	436	587	696	853	984	1102	1301	1332	1646	1545
DS25.4X50X3	25.40	50.00	3.00	1.10	4.10	0.37	34.00	0.17	2594	0.33	5067	0.5	7441	0.66	9737	0.83	11976	0.99	14180	249	249	515	487	798	714	1099	930	1418	1135	1753	1328
DS28.5X56X1.5	28.50	56.00	1.50	1.95	3.45	1.30	21.00	0.29	966	0.59	1664	0.88	2141	1.17	2445	1.46	2622	1.76	2721	-17	299	9	571	79	814	193	1030	350	1218	551	1379
DS28.5X56X2	28.50	56.00	2.00	1.60	3.60	0.80	29.00	0.24	1213	0.48	2228	0.72	3081	0.96	3806	1.2	4438	1.44	5012	94	255	218	492	371	710	553	909	765	1090	1006	1251
DS28.5X56X2.5	28.50	56.00	2.50	1.70	4.20	0.68	36.00	0.26	2283	0.51	4270	0.77	6014	1.02	7565	1.28	8978	1.53	10303	161	316	356	611	583	885	844	1138	1138	1369	1464	1580
DS28.5X56X3	28.50	56.00	3.00	1.30	4.30	0.43	43.00	0.2	2539	0.39	4920	0.59	7170	0.78	9316	0.98	11388	1.17	13414	216	247	451	481	706	703	980	913	1274	1110	1586	1296
DS20.4X60X2	20.40	60.00	2.00	2.10	4.10	1.05	39.00	0.32	1505	0.63	2671	0.95	3556	1.26	4221	1.58	4727	1.89	5132	69	252	184	483	343	692	547	878	796	1044	1090	1187
DS20.4X60X2.5	20.40	60.00	2.50	1.80	4.30	0.72	49.00	0.27	1900	0.54	3533	0.81	4945	1.08	6184	1.35	7297	1.62	8331	168	225	368	434	602	627	868	804	1168	965	1501	1110



Disc Spring without Bearing Flats



Disc Spring with Bearing Flats

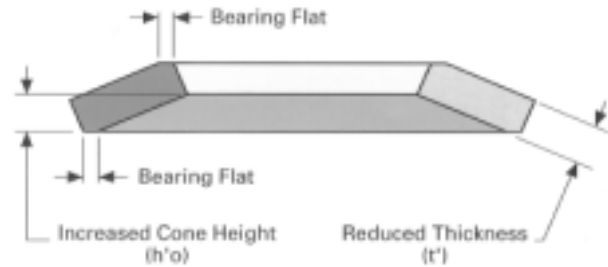
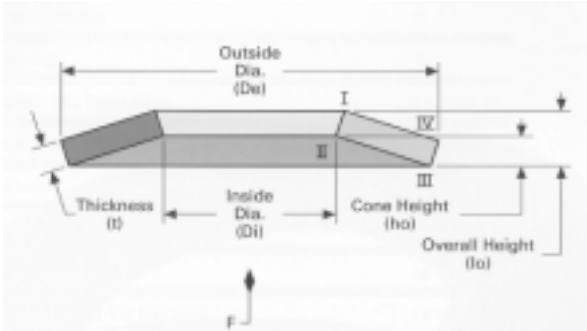


Product Code	Inner Dia. (Di) mm	Outer Dia. (De) mm	Thick. (t) mm	Reduced Thick. (t') mm	Cone Ht. (ho) mm	Overall Ht. (lo) mm	Cone Ht. To Thickness Ratio	Weight per 1000 pieces	15% Deflection		30% Deflection		45% Deflection		60% Deflection		75% Deflection		90% Deflection			
									Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N
									Stress δ_{II} N/mm ²	Stress δ_{III} N/mm ²	Stress δ_{II} N/mm ²	Stress δ_{III} N/mm ²	Stress δ_{II} N/mm ²	Stress δ_{III} N/mm ²	Stress δ_{II} N/mm ²	Stress δ_{III} N/mm ²	Stress δ_{II} N/mm ²	Stress δ_{III} N/mm ²	Stress δ_{II} N/mm ²	Stress δ_{III} N/mm ²	Stress δ_{II} N/mm ²	Stress δ_{III} N/mm ²
DS20.4X60X3	20.40	60.00	3.00		1.70	4.70	0.57	59.00	0.26	2760	0.51	5248	0.77	7515	1.02	9605	1.28	11569	1.53	13453		
DS25.4X60X2.5	25.40	60.00	2.50		1.90	4.40	0.76	46.00	0.29	2178	0.57	4025	0.86	5599	1.14	6959	1.43	8164	1.71	9271		
DS25.4X60X3	25.40	60.00	3.00		1.65	4.65	0.55	55.00	0.25	2782	0.5	5304	0.74	7611	0.99	9751	1.24	11768	1.49	13709		
DS30.5X60X2.5	30.50	60.00	2.50		1.80	4.30	0.72	41.00	0.27	2172	0.54	4039	0.81	5653	1.08	7070	1.35	8342	1.62	9524		
DS30.5X60X2.75	30.50	60.00	2.75		2.00	4.75	0.73	45.00	0.3	3232	0.6	6002	0.9	8391	1.2	10482	1.5	12356	1.8	14093		
DS30.5X60X3	30.50	60.00	3.00		1.70	4.70	0.57	59.00	0.26	3155	0.51	6000	0.77	8591	1.02	10981	1.28	13226	1.53	15380		
DS30.5X60X3.5	30.50	60.00	3.50		1.50	5.00	0.43	58.00	0.23	4039	0.45	7830	0.68	11417	0.9	14843	1.13	18153	1.35	21389		
DS31X63X1.8	31.00	63.00	1.80		2.35	4.15	1.31	33.00	0.35	1566	0.71	2697	1.06	3467	1.41	3955	1.76	4238	2.12	4393		
DS31X63X2.5	31.00	63.00	2.50		1.75	4.25	0.70	46.00	0.26	1850	0.53	3450	0.79	4843	1.05	6075	1.31	7189	1.58	8229		
DS31X63X3	31.00	63.00	3.00		1.80	4.80	0.60	56.00	0.27	3046	0.54	5764	0.81	8214	1.08	10452	1.35	12536	1.62	14525		
DS31X63X3.5	31.00	63.00	3.50		1.40	4.90	0.40	65.00	0.21	3301	0.42	6422	0.63	9395	0.84	12253	1.05	15025	1.26	17746		
DS25.5X70X2	25.50	70.00	2.00		2.50	4.50	1.25	52.00	0.38	1590	0.75	2753	1.13	3565	1.5	4101	1.88	4437	2.25	4647		
DS30.5X70X2.5	30.50	70.00	2.50		2.40	4.90	0.96	61.00	0.36	2421	0.72	4348	1.08	5866	1.44	7065	1.8	8031	2.16	8851		
DS30.5X70X3	30.50	70.00	3.00		2.10	5.10	0.70	73.00	0.32	2941	0.63	5483	0.95	7698	1.26	9656	1.58	11426	1.89	13080		
DS35.5X70X3	35.50	70.00	3.00		2.10	5.10	0.70	67.00	0.32	3162	0.63	5897	0.95	8278	1.26	10384	1.58	12287	1.89	14065		
DS35.5X70X4	35.50	70.00	4.00		1.80	5.80	0.45	90.00	0.27	5376	0.54	10393	0.81	15115	1.08	19604	1.35	23923	1.62	28137		
DS40.5X70X4	40.50	70.00	4.00		1.60	5.60	0.40	80.00	0.24	5130	0.48	9980	0.72	14601	0.96	19042	1.2	23351	1.44	27579		
DS40.5X70X5	40.50	70.00	5.00		1.20	6.20	0.24	100.00	0.18	6977	0.36	13806	0.54	20515	0.72	27128	0.9	33672	1.08	40173		
DS36X71X2	36.00	71.00	2.00		2.60	4.60	1.30	46.00	0.39	1895	0.78	3265	1.17	4201	1.56	4796	1.95	5144	2.34	5337		
DS36X71X2.5	36.00	71.00	2.50		2.00	4.50	0.80	58.00	0.3	1838	0.6	3377	0.9	4669	1.2	5768	1.5	6725	1.8	7595		
DS36.71X4	36.00	71.00	4.00		1.60	5.60	0.40	92.00	0.24	4511	0.48	8776	0.72	12840	0.96	16745	1.2	20535	1.44	24252		
DS31X80X2.5	31.00	80.00	2.50		2.80	5.30	1.12	84.00	0.42	2404	0.84	4228	1.26	5573	1.68	6543	2.1	7239	2.52	7764		
DS31X80X3	31.00	80.00	3.00		2.50	5.50	0.83	101.00	0.38	2887	0.75	5279	1.13	7261	1.5	8923	1.88	10352	2.25	11634		
DS31X80X4	31.00	80.00	4.00		2.10	6.10	0.53	134.00	0.32	4525	0.63	8657	0.95	12467	1.26	16023	1.58	19394	1.89	22651		
DS36X80X3	36.00	80.00	3.00		2.70	5.70	0.90	94.00	0.41	3464	0.81	6271	1.22	8540	1.62	10383	2.03	11919	2.43	13261		
DS36X80X4	36.00	80.00	4.00		2.20	6.20	0.55	126.00	0.33	5059	0.66	9645	0.99	13841	1.32	17732	1.65	21400	1.98	24929		



Disc Spring without Bearing Flats

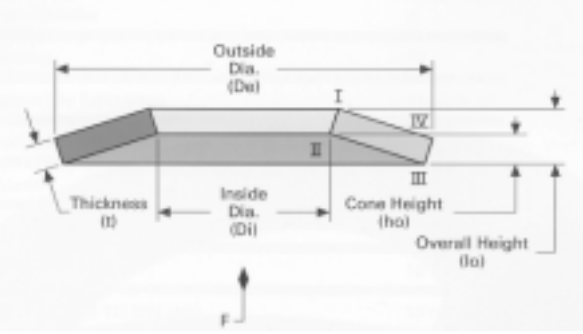
Disc Spring with Bearing Flats



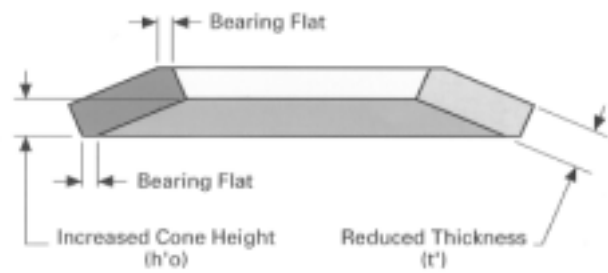
Product Code	Inner Dia. (Di) mm	Outer Dia. (De) mm	Thick. (t) mm	Reduced Thick. (t') mm	Cone Ht. (ho) mm	Overall Ht. (ho) mm	Cone Ht. To Thickness Ratio	Weight per 1000 pieces	15% Deflection		30% Deflection		45% Deflection		60% Deflection		75% Deflection		90% Deflection			
									Defl. mm		Defl. mm		Defl. mm		Defl. mm		Defl. mm		Defl. mm		Defl. mm	
									Force N	Stress N/mm ²	Force N	Stress N/mm ²	Force N	Stress N/mm ²	Force N	Stress N/mm ²	Force N	Stress N/mm ²	Force N	Stress N/mm ²	Force N	Stress N/mm ²
DS41X80X2.25	41.00	80.00	2.25	2.95	5.20	1.31	65.00	0.44	2452	0.89	4218	1.33	5419	1.77	6177	2.21	6613	2.66	6846			
DS41X80X3	41.00	80.00	3.00	2.30	5.30	0.77	87.00	0.35	2817	0.69	5201	1.04	7228	1.38	8975	1.73	10518	2.07	11933			
DS41X80X4	41.00	80.00	4.00	2.20	6.20	0.55	116.00	0.33	5407	0.66	10309	0.99	14795	1.32	18953	1.65	22874	1.98	26646			
DS46X90X2.5	46.00	90.00	2.50	3.20	5.70	1.28	92.00	0.48	2800	0.96	4833	1.44	6234	1.92	7140	2.4	7684	2.88	8003			
DS46X90X3.5	46.00	90.00	3.50	2.50	6.00	0.71	129.00	0.38	3675	0.75	6839	1.13	9581	1.5	11991	1.88	14131	2.25	16180			
DS46X90X5	46.00	90.00	5.00	2.00	7.00	0.40	184.00	0.3	6888	0.6	13401	0.9	19605	1.2	25568	1.5	31354	1.8	37031			
DS41X100X4	41.00	100.00	4.00	3.20	7.20	0.80	205.00	0.48	5535	0.96	10168	1.44	14059	1.92	17367	2.4	20251	2.88	22870			
DS41X100X5	41.00	100.00	5.00	2.75	7.75	0.55	256.00	0.41	7650	0.93	14585	1.24	20931	1.65	26814	2.06	32361	2.48	37698			
DS51X100X2.7	51.00	100.00	2.70	3.50	6.20	1.30	123.00	0.53	3165	1.05	5454	1.58	7021	2.1	8021	2.63	8609	3.15	8938			
DS51X100X3.5	51.00	100.00	3.50	2.80	6.30	0.80	160.00	0.42	3572	0.84	6563	1.26	9074	1.68	11209	2.1	13070	2.52	14760			
DS51X100X4	51.00	100.00	4.00	3.00	7.00	0.75	182.00	0.45	5482	0.9	10145	1.35	14136	1.8	17597	2.25	20674	2.7	23510			
DS51X100X5	51.00	100.00	5.00	2.80	7.80	0.56	228.00	0.42	8637	0.84	16442	1.26	23563	1.68	30147	2.1	36339	2.52	42287			
DS51X100X6	51.00	100.00	6.00	2.20	8.20	0.37	274.00	0.33	10401	0.66	20318	0.99	29837	1.32	39043	1.65	48022	1.98	56858			
DS51X100X7	51.00	100.00	7.00	6.55	9.20	0.40	319.00	0.33	13882	0.66	27110	0.99	39775	1.32	51972	1.65	63793	1.98	75331			
DS57X112X3	57.00	112.00	3.00	3.90	6.90	1.30	172.00	0.59	3865	1.17	6657	1.76	8565	2.34	9779	2.93	10489	3.51	10883			
DS57X112X4	57.00	112.00	4.00	3.20	7.20	0.80	229.00	0.48	4852	0.96	8914	1.44	12325	1.92	15224	2.4	17752	2.88	20048			
DS57X112X6	57.00	112.00	6.00	2.50	8.50	0.42	344.00	0.38	9672	0.75	18779	1.13	27421	1.5	35697	1.88	43707	2.25	51551			
DS41X125X4	41.00	125.00	4.00	4.20	8.20	1.05	344.00	0.63	5525	1.26	9801	1.89	13050	2.52	15492	3.15	17346	3.78	18833			
DS51X125X4	51.00	125.00	4.00	4.50	8.50	1.13	321.00	0.68	6602	1.35	11602	2.03	15283	2.7	17927	3.38	19817	4.05	21236			
DS51X125X5	51.00	125.00	5.00	3.90	8.90	0.78	401.00	0.59	8281	1.17	15258	1.76	21161	2.34	26222	2.93	30669	3.51	34732			
DS51X125X6	51.00	125.00	6.00	3.40	9.40	0.57	482.00	0.51	10568	1.02	20101	1.53	28779	2.04	36787	2.55	44307	3.06	51523			
DS61X125X5	61.00	125.00	5.00	4.00	9.00	0.80	367.00	0.6	9283	1.2	17054	1.8	23581	2.4	29129	3	33965	3.6	38358			
DS61X125X6	61.00	125.00	6.00	3.60	9.60	0.60	440.00	0.54	12323	1.08	23323	1.62	32234	2.16	42289	2.7	50722	3.24	58766			
DS61X125X8	61.00	125.00	8.00	7.50	10.90	0.45	587.00	0.435	21142	0.87	40862	1.305	59369	1.74	76871	2.175	93577	2.61	109695			
DS64X125X3.5	64.00	125.00	3.50	4.50	8.00	1.29	249.00	0.68	5635	1.35	9721	2.03	12530	2.7	14338	3.38	15416	4.05	16038			
DS64X125X5	64.00	125.00	5.00	3.50	8.50	0.70	355.00	0.53	7897	1.05	14352	1.58	20150	2.1	25274	2.63	29908	3.15	34236			



Disc Spring without Bearing Flats



Disc Spring with Bearing Flats

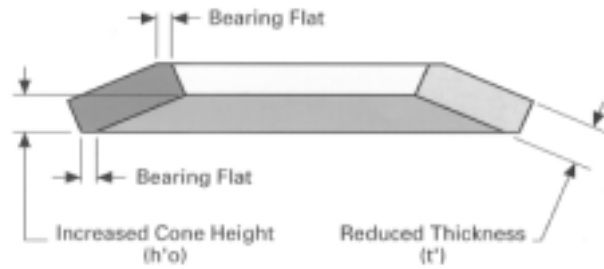
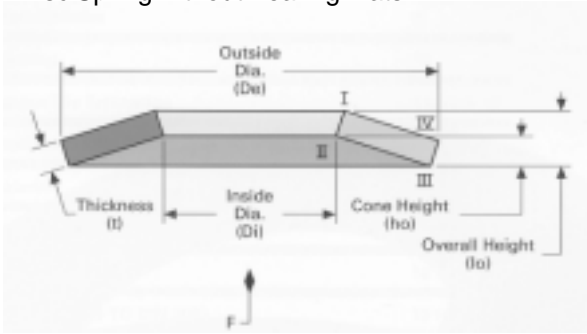


Product Code	Inner Dia. (Di) mm	Outer Dia. (De) mm	Thick. (t) mm	Reduced Thick. (t') mm	Cone Ht. (ho) mm	Overall Ht. (to) mm	Cone Ht. To Thickness Ratio	Weight per 1000 pieces	15% Deflection		30% Deflection		45% Deflection		60% Deflection		75% Deflection		90% Deflection			
									Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N
									Stress δ_{II} δ_{III} N/mm ²		Stress δ_{II} δ_{III} N/mm ²		Stress δ_{II} δ_{III} N/mm ²		Stress δ_{II} δ_{III} N/mm ²		Stress δ_{II} δ_{III} N/mm ²		Stress δ_{II} δ_{III} N/mm ²			
DS64X125X6	64.00	125.00	6.00		3.60	9.60	0.60	426.00	0.54	12671	1.08	23982	1.62	34172	2.16	43484	2.7	52155	3.24	60426		
DS64X125X7	64.00	125.00	7.00	6.55	3.45	10.00	0.49	498.00	0.45	15783	0.9	30190	1.35	43427	1.8	55700	2.25	67216	2.7	78182		
DS64X125X8	64.00	125.00	8.00	7.50	3.10	10.60	0.39	569.00	0.39	19037	0.78	36993	1.17	54023	1.56	70281	1.95	85926	2.34	101111		
DS71X125X6	71.00	125.00	6.00		3.30	9.30	0.55	392.00	0.5	12107	0.96	23083	1.49	33127	1.98	42438	2.48	51217	2.97	59663		
DS71X125X8	71.00	125.00	8.00	7.40	3.00	10.40	0.38	522.00	0.36	18866	0.72	36709	1.08	53668	1.44	69883	1.8	85494	2.16	100639		
DS71X125X10	71.00	125.00	10.00	9.20	2.60	11.80	0.26	653.00	0.27	26003	0.54	51340	0.81	76087	1.08	100323	1.35	124124	1.62	147567		
DS72X140X3.8	72.00	140.00	3.80		4.90	8.70	1.29	338.00	0.74	6299	1.47	10861	2.21	13994	2.94	16003	3.68	17195	4.41	17877		
DS72X140X5	72.00	140.00	5.00		4.00	9.00	0.80	444.00	-16	306	1.3	585	2.85	834	202	1056	362	1249	567	1414		
DS72X140X8	72.00	140.00	8.00	7.50	3.70	11.20	0.46	711.00	0.6	7631	1.2	14019	1.8	19384	2.4	23944	3	27920	3.6	31530		
DS61X150X5	61.00	150.00	5.00		5.30	10.30	1.06	579.00	0.48	19662	0.96	37789	1.44	54611	1.92	70355	2.4	85251	2.88	99527		
DS61X150X6	61.00	150.00	6.00		4.80	10.80	0.80	695.00	199	285	419	556	662	813	926	1055	1213	1284	1521	1498		
DS71X150X6	71.00	150.00	6.00		4.80	10.80	0.80	646.00	0.8	9947	1.59	17623	2.39	23431	3.18	27770	3.98	31041	4.77	33645		
DS71X150X8	71.00	150.00	8.00	7.50	4.50	12.00	0.56	861.00	0.72	12424	1.44	22824	2.16	31558	2.88	38983	3.6	45456	4.32	51334		
DS81X150X8	81.00	150.00	8.00	7.50	4.20	11.70	0.53	786.00	131	267	299	515	503	742	744	950	1020	1138	1333	1306		
DS81X150X10	81.00	150.00	10.00	9.30	3.70	13.00	0.37	983.00	0.72	13161	1.44	24179	2.16	33432	2.88	41298	3.6	48155	4.32	54382		
DS82X160X4.3	82.00	160.00	4.30		5.60	9.90	1.30	500.00	121	299	279	577	473	832	704	1066	970	1277	1274	1466		
DS82X160X6	82.00	160.00	6.00		4.50	10.50	0.75	698.00	0.6	21981	1.2	41592	1.8	59198	2.4	75163	3	89851	3.6	103628		
DS82X160X10	82.00	160.00	10.00	9.40	4.10	13.50	0.41	1164.00	183	307	395	596	636	867	906	1121	1205	1357	1534	1575		
DS92X180X4.8	92.00	180.00	4.80		6.20	11.00	1.29	708.00	0.555	21412	1.11	40756	1.665	58348	2.22	74501	2.775	89532	3.33	103754		
DS91X180X6	91.00	180.00	6.00		5.10	11.10	0.85	892.00	178	316	383	614	612	895	868	1160	1150	1407	1457	1637		
DS92X180X10	92.00	180.00	10.00	9.40	4.60	14.00	0.46	1476.00	0.45	30598	0.9	59586	1.35	87189	1.8	113629	2.25	139128	2.7	163909		
DS82X200X8	82.00	200.00	8.00	7.50	6.70	14.20	0.84	1641.00	233	289	484	566	753	832	1039	1086	1342	1329	1663	1559		
DS82X200X10	82.00	200.00	10.00	9.40	6.10	15.50	0.61	2052.00	0.84	8058	1.68	13877	2.52	17850	3.36	20373	4.2	21843	5.04	22653		
DS82X200X12	82.00	200.00	12.00	11.25	5.35	16.60	0.45	2462.00	-18	304	8	580	78	828	192	1047	350	1238	553	1401		
DS92X200X10	92.00	200.00	10.00	9.40	6.20	15.60	0.62	1944.00	0.68	10873	1.35	20124	2.03	28040	2.7	34905	3.38	41008	5.05	46633		
DS92X180X13	92.00	180.00	13.00	12.10	4.40	16.50	0.34	1918.00	109	258	246	498	412	720	607	924	830	1109	1081	1276		
DS82X200X8	82.00	200.00	8.00	7.50	6.70	14.20	0.84	1641.00	0.525	30988	1.05	60029	1.575	87409	2.1	113414	2.625	138331	3.15	162444		
DS82X200X10	82.00	200.00	10.00	9.40	6.10	15.50	0.61	2052.00	0.93	9698	1.86	16718	2.79	21534	3.72	24618	4.65	26442	5.58	27479		
DS82X200X12	82.00	200.00	12.00	11.25	5.35	16.60	0.45	2462.00	-15	295	12	562	82	802	194	1015	350	1201	548	1360		
DS92X200X10	92.00	200.00	10.00	9.40	6.20	15.60	0.62	1944.00	0.77	10498	1.53	19145	2.3	26269	3.06	32196	3.83	37252	4.59	41764		
DS92X180X13	92.00	180.00	13.00	12.10	4.40	16.50	0.34	1918.00	77	241	183	464	317	669	481	856	673	1024	894	1174		
DS82X200X8	82.00	200.00	8.00	7.50	6.70	14.20	0.84	1641.00	0.6	28864	1.2	55504	1.8	80254	2.4	103447	3	125417	3.6	146498		
DS82X200X10	82.00	200.00	10.00	9.40	6.10	15.50	0.61	2052.00	189	266	400	520	630	760	881	987	1153	1201	1446	1402		
DS82X200X12	82.00	200.00	12.00	11.25	5.35	16.60	0.45	2462.00	0.525	51515	1.05	100753	1.575	148021	2.1	193628	2.625	237883	3.15	281094		
DS92X200X10	92.00	200.00	10.00	9.40	6.20	15.60	0.62	1944.00	258	280	532	549	822	808	1129	1056	1452	1294	1791	1521		
DS92X200X10	92.00	200.00	10.00	9.40	6.20	15.60	0.62	1944.00	0.93	22758	1.86	41253	2.79	56173	3.72	68204	4.65	78034	5.58	86350		
DS92X200X10	92.00	200.00	10.00	9.40	6.20	15.60	0.62	1944.00	85	282	207	542	369	782	568	1000	806	1198	1083	1374		
DS92X200X10	92.00	200.00	10.00	9.40	6.20	15.60	0.62	1944.00	0.825	32576	1.65	61189	2.475	86458	3.3	109003	4.125	129445	4.95	148403		
DS92X200X10	92.00	200.00	10.00	9.40	6.20	15.60	0.62	1944.00	172	273	374	530	607	770	870	992	1164	1198	1489	1387		
DS92X200X10	92.00	200.00	10.00	9.40	6.20	15.60	0.62	1944.00	0.69	41757	1.38	80456	2.07	116551	2.76	150494	3.45	182737	4.14	213734		
DS92X200X10	92.00	200.00	10.00	9.40	6.20	15.60	0.62	1944.00	228	246	479	481	751	703	1045	913	1361	1111	1699	1297		
DS92X200X10	92.00	200.00	10.00	9.40	6.20	15.60	0.62	1944.00	0.84	34868	1.68	65390	2.52	92246	3.36	116118	4.2	137688	5.04	157635		
DS92X200X10	92.00	200.00	10.00	9.40	6.20	15.60	0.62	1944.00	163	305	357	591	583	858	841	1106	1130	1336	1451	1547		

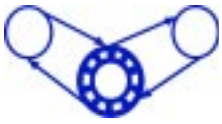


Disc Spring without Bearing Flats

Disc Spring with Bearing Flats



Product Code	Inner Dia. (Di) mm	Outer Dia. (De) mm	Thick. (t) mm	Reduced Thick. (t') mm	Cone Ht. (ho) mm	Overall Ht. (lo) mm	Cone Ht. To Thickness Ratio	Weight per 1000 pieces	15% Deflection		30% Deflection		45% Deflection		60% Deflection		75% Deflection		90% Deflection													
									Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N	Defl. mm	Force N												
									Stress		Stress		Stress		Stress		Stress		Stress													
								δ_{II}	δ_{III}	δ_{II}	δ_{III}	δ_{II}	δ_{III}	δ_{II}	δ_{III}	δ_{II}	δ_{III}	δ_{II}	δ_{III}	δ_{II}	δ_{III}											
DS92X200X12	92.00	200.00	12.00	11.25	5.55	16.80	0.46	2333.00	0.72	45959	1.44	88331	2.16	127650	2.88	164451	3.6	199269	4.32	232639	223	283	470	553	741	808	1035	1049	1354	1276	1696	1488
DS92X200X14	92.00	200.00	14.00	13.10	5.00	18.10	0.36	2722.00	0.615	58344	1.23	113839	1.845	166885	2.46	217881	3.075	267227	3.69	315322	261	262	540	513	836	754	1150	984	1481	1204	1830	1413
DS102X200X5.5	102.00	200.00	5.50		7.00	12.50	1.27	1004.00	1.05	13104	2.1	22637	3.15	29229	4.2	33510	5.25	36111	6.3	37662	-12	306	20	583	96	833	216	1054	381	1247	589	1412
DS102X200X8	102.00	200.00	8.00	7.50	6.10	13.60	0.76	1460.00	0.84	21220	1.68	38903	2.52	53614	3.36	65917	4.2	76378	5.04	85661	86	291	348	563	352	813	534	1044	747	1254	992	1443
DS102X200X10	102.00	200.00	10.00	9.40	6.20	15.60	0.62	1825.00	0.84	36810	1.26	69032	2.52	97384	3.36	122586	4.2	145357	5.04	166415	158	335	541	649	570	943	824	1216	1111	1468	1430	1700
DS102X200X12	102.00	200.00	12.00	11.25	4.95	16.20	0.41	2190.00	0.63	41077	1.26	19535	1.89	115757	2.52	150125	3.15	183020	3.78	214824	208	263	421	514	680	753	944	981	1227	1196	1528	1400
DS102X200X14	102.00	200.00	14.00	13.10	5.10	18.20	0.36	2555.00	0.63	63356	1.05	123500	1.89	180883	2.52	235959	3.15	289181	3.78	341001	261	296	469	581	839	854	1156	1114	1492	1363	1847	1600
DS112X200X12	112.00	200.00	12.00	11.10	5.10	16.20	0.43	2031.00	0.63	44382	0.84	85728	1.89	124466	2.52	161024	3.15	195830	3.78	229311	201	298	477	584	661	855	921	1113	1201	1358	1501	1589
DS112X200X14	112.00	200.00	14.00	12.90	4.60	17.50	0.33	2370.00	0.525	55407	1.05	108486	1.575	159538	2.1	208862	2.625	256758	3.15	303527	228	271	469	532	725	784	994	1026	1278	1259	1575	1483
DS112X200X16	112.00	200.00	16.00	14.80	4.00	18.80	0.25	2708.00	0.42	63667	0.84	125835	1.26	186679	1.68	246375	2.1	305100	2.52	363030	234	231	477	457	729	676	990	889	1260	1096	1539	1297
DS112X225X6.5	112.00	225.00	6.50	6.20	6.80	13.00	1.05	1526.00	0.975	13079	1.9	23081	2.925	30521	3.9	35914	4.875	39775	5.85	42618	14	242	61	463	140	664	251	845	394	1006	569	1147
DS112X225X8	112.00	225.00	8.00	7.50	7.00	14.50	0.88	1878.00	0.975	21136	1.9	38104	2.925	51580	3.9	62236	4.875	70749	5.85	77791	51	277	136	533	254	768	406	983	591	1176	810	1348
DS112X225X12	112.00	225.00	12.00	11.25	5.75	17.00	0.48	2817.00	0.75	39817	1.5	76333	2.25	110040	3	141437	3.75	171016	4.5	199275	176	253	372	493	589	721	826	935	1084	1137	1363	1326
DS102X250X10	102.00	250.00	10.00	9.40	8.60	18.00	0.86	3212.00	1.2	37336	2.4	67476	3.6	91587	4.8	110835	6	126387	7.2	139411	82	293	205	563	368	811	572	1037	817	1241	1102	1422
DS102X250X12	102.00	250.00	12.00	11.25	7.75	19.00	0.65	3854.00	1.05	47155	2.1	88047	3.15	123658	4.2	154969	5.25	182962	6.3	206618	155	273	342	529	560	767	811	987	1093	1190	1407	1376
DS127X250X7	127.00	250.00	7.00	6.70	8.10	14.80	1.16	2001.00	1.17	17689	2.34	30808	3.51	40130	4.68	46425	5.85	50466	7.02	53023	-7	271	24	518	92	741	197	940	340	1116	519	1268
DS127X250X10	127.00	250.00	10.00	9.40	7.60	17.00	0.76	2859.00	1.05	28005	2.1	51720	3.15	71833	4.2	89032	5.25	104004	6.3	117438	94	265	216	512	367	741	546	952	752	1146	987	1321
DS127X250X12	127.00	250.00	12.00	11.25	8.05	19.30	0.67	3431.00	1.195	55205	2.19	102670	3.285	143612	4.38	179251	5.475	210806	6.57	239494	139	345	313	668	522	968	766	1246	1045	1502	1359	1736
DS127X250X14	127.00	250.00	14.00	13.10	6.50	19.60	0.46	4003.00	0.84	57478	1.68	110428	2.52	159521	3.36	205431	4.2	248828	5.04	290385	190	271	401	529	633	773	886	1004	1160	1221	1455	1425
DS127X250X16	127.00	250.00	16.00	15.00	6.80	21.80	0.43	4574.00	0.87	86536	1.74	167252	2.61	243002	3.48	314639	4.35	383017	5.22	448990	241	311	504	609	789	891	1098	1160	1429	1414	1782	1653



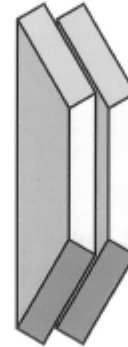
1 Single Disc Spring



Total Force = Force of single disc spring

Total Deflection = Deflection of single disc spring

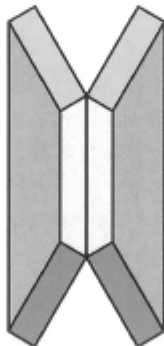
2 Disc Springs in Parallel



Total Force = 2 x Force of single disc spring

Total Deflection = Deflection of single disc spring

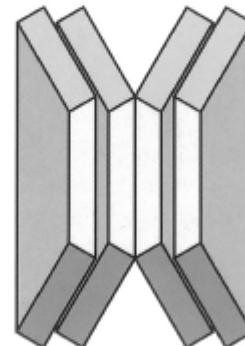
3 Disc Springs in Series



Total Force = Force of single disc spring

Total Deflection = 2 x Deflection of single disc spring

4 Disc Springs in Series and Parallel



Total Force = 2 x Force of single disc spring

Total Deflection = 2 x Deflection of single disc spring



**Townsend
Bearings**

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