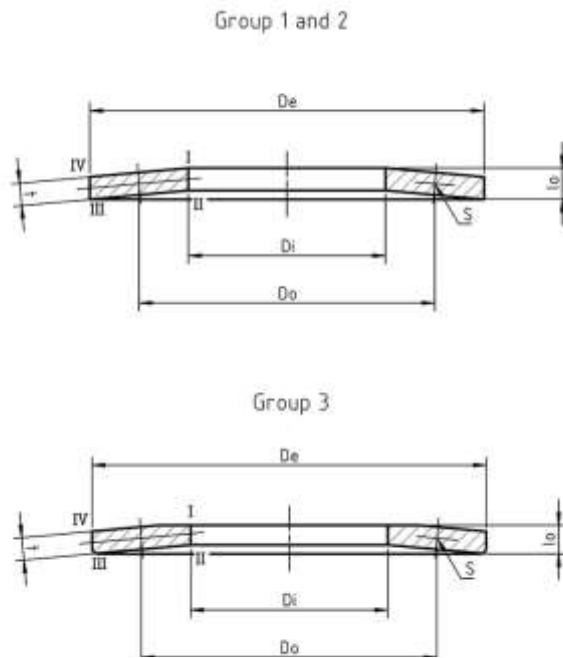


Metric DIN 2093 Disc Spring Washers

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Dimensions of Metric DIN 2093 Disc Spring Washers

Group	De h12	Di H12	t or (t')	h0	l0	F (N)	s	l0 - s	? OM (N/mm ²)	? II (N/mm ²)
1	8	4.2	0.4	0.2	0.6	210	0.15	0.45	1200	1220
	10	5.2	0.5	0.25	0.75	329	0.19	0.56	1210	1240
	12.5	6.2	0.7	0.3	1	673	0.23	0.77	1280	1420
	14	7.2	0.8	0.3	1.1	813	0.23	0.87	1190	1340
	16	8.2	0.9	0.35	1.25	1000	0.26	0.99	1160	1290
	18	9.2	1	0.4	1.4	1250	0.3	1.1	1170	1300
	20	10.2	1.1	0.45	1.55	1530	0.34	1.21	1180	1300

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Group	De h12	Di H12	t or (t')	h0	l0	F (N)	s	l0 - s	? OM (N/mm2)	? II (N/mm2)
2	22.5	11.2	1.25	0.5	1.75	1950	0.38	1.37	1170	1320
	25	12.2	1.5	0.55	2.05	2910	0.41	1.64	1210	1410
	28	14.2	1.5	0.65	2.15	2580	0.49	1.66	1180	1280
	31.5	16.3	1.75	0.7	2.45	3900	0.53	1.92	1190	1310
	35.5	18.3	2	0.8	2.8	5190	0.6	2.2	1210	1330
	40	20.1	2.25	0.9	3.15	6540	0.68	2.47	1210	1340
	45	22.4	2.5	1	3.5	7720	0.75	2.75	1150	1300
	50	25.4	3	1.1	4.1	12000	0.83	3.27	1250	1430
	56	28.5	3	1.3	4.3	11400	0.98	3.32	1180	1280
	63	31	3.5	1.4	4.9	15000	1.05	3.85	1140	1300
	71	36	4	1.6	5.6	20500	1.2	4.4	1200	1330
	80	41	5	1.7	6.7	33700	1.28	5.42	1260	1460
	90	46	5	2	7	31400	1.5	5.5	1170	1300
	100	51	6	2.2	8.2	48000	1.65	6.55	1250	1420
112	57	6	2.5	8.5	43800	1.88	6.62	1130	1240	
3	125	64	8 (7.5)	2.6	10.6	85900	1.95	8.65	1280	1330
	140	72	8 (7.5)	3.2	11.2	85300	2.4	8.8	1260	1280
	160	82	10 (9.4)	3.5	13.5	139000	2.63	10.87	1320	1340
	180	92	10 (9.4)	4	14	125000	3	11	1180	1200
	200	102	12 (11.25)	4.2	16.2	183000	3.15	13.05	1210	1230
	225	112	12 (11.25)	5	17	171000	3.75	13.25	1120	1140
	250	127	14 (13.1)	5.6	19.6	249000	4.2	15.4	1200	1220

Metric DIN 2093 Disc Spring Washers (aka Belleville washers) are conical shaped washers that act as spring discs that are designed to be loaded in the axial direction. They can be statically loaded (either continuously or intermittently), or cyclically deflected i.e. dynamically loaded. Because these washers can be arranged in stacked columns, an infinite combination of spring characteristics can be achieved. The DIN 2093 specification classifies disc springs into three groups:

Group 1; Under 1.25mm thick: cold formed, radiused edges, without contact flats

Group 2; 1.25mm up to and including 6mm: cold formed-machined (or fine blanked), radiused edges, without contact flats

Group 3; Over 6mm thick: Fully machined from forged blanks, with contact flats, thickness reduced

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 Distribution Centers: Boston MA; Chicago IL; Cincinnati KY; Dallas TX; Denver CO; Houston TX; Jersey City NJ; Los Angeles CA; Miami FL;
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Aspen Fasteners offers one of the most complete ranges of metric washers and other inch and metric industrial fasteners for immediate delivery from stock. The following sizes of metric DIN 2093 Disc Spring Washers are available for immediate shipping from stock: Diameters ranging from M6 to M40 in 301 stainless steel. View parts by clicking on the following link: [DIN 2093 Disc Spring Washers](#)

DIN (**D**eutsches **I**nstitut für **N**ormung - German Institute for Standardization) standards are issued for a variety of components including industrial fasteners as Metric DIN 2093 Disc Spring Washers. The DIN standards remain common in Germany, Europe and globally even though the transition to ISO standards is taking place. DIN standards continue to be used for parts which do not have ISO equivalents or for which there is no need for standardization.

1) Mechanical properties of stainless steel for metric DIN 2093 Disc Spring Washers

Stainless steels can be divided into three groups of steel - austenitic, ferritic and martensitic. Austenitic steel is by far the most common type (>90% of commercial fasteners). The steel groups and strength classes are designated by a four-digit sequence of letters and numbers (eg A2-70) as shown in the following table. DIN EN ISO 3506 governs screws and nuts made from stainless steel.

Steel group	Steel grade	Strength class	Screws, Nuts and Bolts			
			Tensile strength N/mm ²	Tensile strength PSI	Dia range	Nut Load N/mm ²
Austenitic	A2 and A4	50	500	70,000	<=M39	500
		70	700	100,000	<=M20	700
		80	800	118,000	<=M20	800

The tensile stress is calculated with reference to the tensile stress area (see DIN EN ISO 3506-1979). Nuts to be paired with same grade of stainless steel screws

Steel group	Property Strength class	Made From	Characteristics
Austenitic	50	A1, A2	Soft; cold worked, turned and soft pressed fasteners
	70	A2, A4	Cold worked, normal strength formed fasteners
	80	A2, A4	Extreme cold worked, high strength, special applications

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2) Chemical composition of stainless steel metric DIN 2093 Disc Spring Washers

Grade	USA Grade	Material designation	Material no.	C %	Si ≤ %	Mn ≤ %	Cr %	Mo %	Ni %
A 2	304	X 5Cr Ni 1810	1.4301	≤ 0.07	1.0	2.0	17.5 to 19.5	-	8.0 to 10.5
		X 2 Cr Ni 1811	1.4306	≤ 0.03	1.0	2.0	18.0 to 20.0	-	10 to 12.0
		X 8 Cr Ni 19/10	1.4303	≤ 0.07	1.0	2.0	17.0 to 19.0	-	11.0 to 13.0
A 4	316	X 5 Cr Ni Mo 1712	1.4401	≤ 0.07	1.0	2.0	16.5 to 18.5	2.0 to 2.5	10.0 to 13.0
		X 2 Cr Ni Mo 1712	1.4404	≤ 0.03	1.0	2.0	16.5 to 18.5	2.0 to 2.5	10 to 13

3) Chemical composition of steel metric DIN 2093 Disc Spring Washers

PROPERTY CLASS	MATERIAL AND TREATMENT	CHEMICAL COMPOSITION LIMITS %				TEMPERING TEMP °C MIN.
		C		P	S	
		min.	max.	max.	max.	
4.6, 4.8, 5.8, 6.8	Low or medium carbon steel	-	0.55	0.05	0.06	-
8.8	Medium carbon steel quenched, tempered	0.25	0.55	0.04	0.05	425
9.8	Medium carbon steel quenched, tempered	0.25	0.55	0.04	0.05	425
10.9	Medium carbon steel additives e.g. boron, Mn, Cr or Alloy steel - quenched, tempered	0.20	0.55	0.04	0.05	425
12.9	Alloy steel - quenched, tempered	0.20	0.50	0.035	0.035	380

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4) Mechanical properties of steel for metric DIN 2093 Disc Spring Washers

MECHANICAL PROPERTY		PROPERTY CLASS									
		4.8	5.6	5.8	6.8	8.8		9.8	10.9	12.9	
						Up to M 16	Over M 16				
Tensile Strength (Rm, N/mm ²)	nom.	400	500		600	800		900	1000	1200	
	min.	420	500	520	600	800	830	900	1040	1220	
Vickers Hardness	min.	130	155	160	190	250	255	290	320	385	
	max.	250				320	336	360	380	435	
Brinell Hardness	min.	124	147	152	181	319	242	266	295	353	
	max.	238				385	319	342	363	412	
Rockwell Hardness	min. HR	71	79	82	89	-					
	HRC	-	-	-	-	20	23	28	32	39	
	HR	95				99	-				
	max. HRC	-	-	-	-	32	34	37	39	44	
Yield Stress ReL. N/mm ²	nom.	320	300	400	480	-					
	min.	340	300	420	480	-					
Stress at permanent set limit N/mm ²	nom.	-				640		720	900	1080	
	min.	-				640	660	720	940	1100	

Disclaimer

Dimensional data and technical information for Metric DIN 2093 Disc Spring Washers was obtained from publicly available sources and not acquired through standards agencies. It has been completed and compiled for reference purposes only; where discrepancies are found they are subject to change without notice. Aspen Fasteners makes no warranties or representations regarding the accuracy and validity of the compiled information and data. Contact the relevant standards authorities for accurate and detailed information.

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