



INTERNATIONAL  
INDUSTRIAL SPRINGS

# SHAPING SPRINGS FOR LIFE



# "STRESS RELIEVED STRENGTH GAINED"



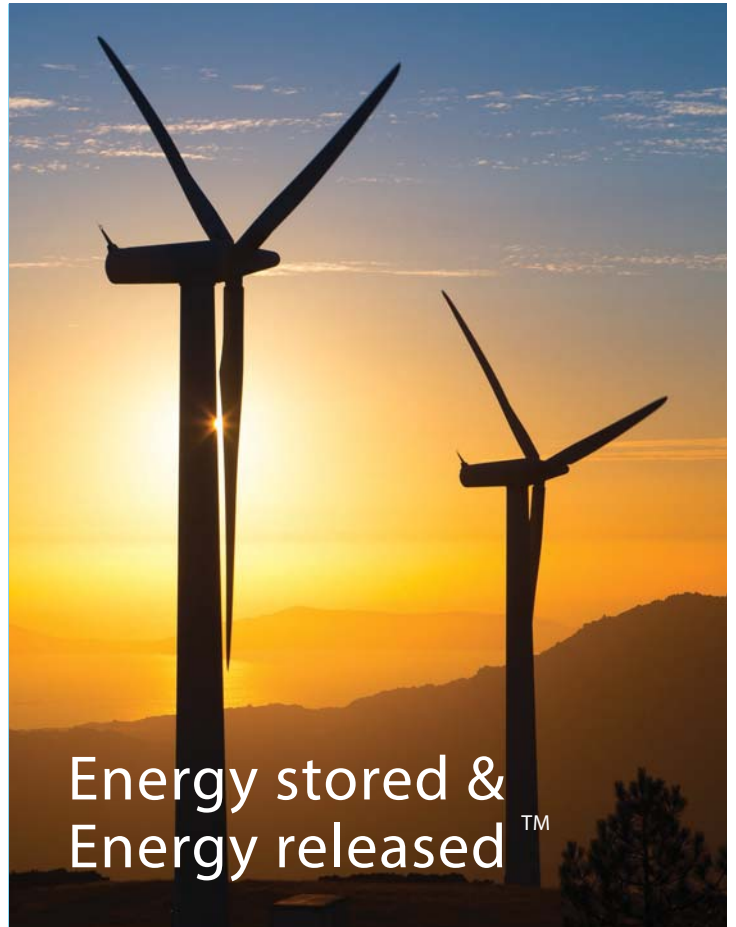
IIS is synonymous to Impetus Movements, Repeatability, Force, Support in various areas of life. We at IIS are Shaping Springs since 5 Decades. IIS provides solutions to 'Empower Machines to Live Longer'. Adaptability to ever changing industry needs drive our organisation goals. Competence in every process and efficient use of resources are the key to improve our productivity. Leveraging our Vast experience in products across various applications helps us offer Smart Engineering Solutions. We believe in connecting with customers and fulfilling their requirements effectively.



# IIS

Shaping Springs For Life™

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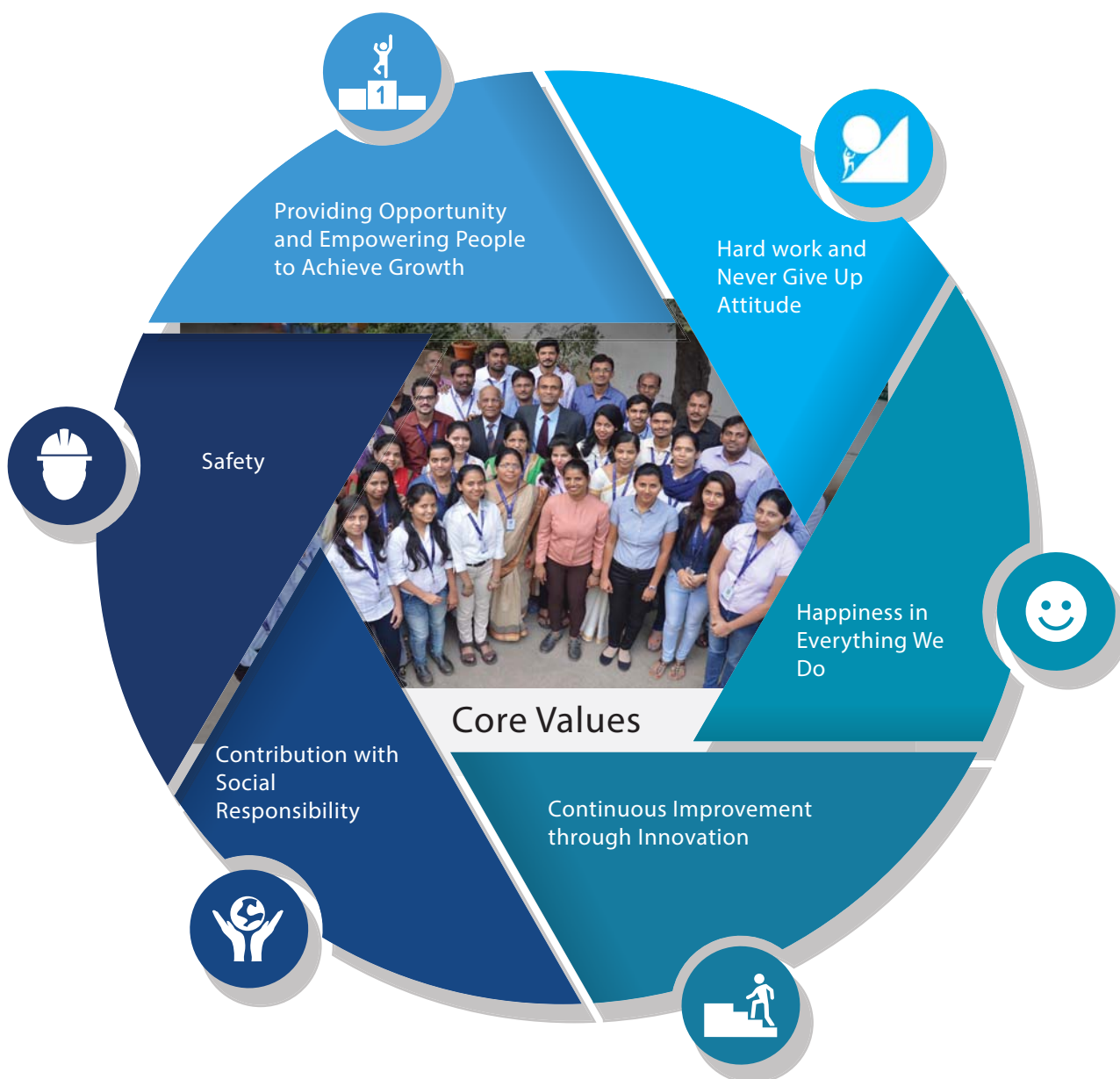
Energy stored &  
Energy released™



Ensuring  
Constant  
Movement...™

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"To become the Largest Manufacturer and Supplier of Disc Springs, Belleville Washers & LockRite Washers in India by the year 2025."



# Company Information

Located in Mumbai, India International Industrial Springs (IIS) was established in the year 1968. We are known for our expert manufacturing techniques for products like Coil Springs, Disc Springs, LockRite Washers, Belleville Washers, E-Clips, Circlips, Serrated Washers, Contact Washers, Rings, Shims, Precision Sheet Metal Components, Flapper Valves Reeds, Stampings and Assemblies, etc. We have a strong customer base across 5 Continents and Employee base of more than 200 people. All of us have an entrepreneurial spirit in us that give us the driving force to deliver a magnitude of work.



We want our customers to be successful in their markets and this has driven us to implement modern manufacturing methods, technology and infrastructure. We back our products with the IIS Culture of Reliability and Responsibility. We strive hard to balance cost through High Productivity in every product, Process and System.

Our Strategy includes growth for all our Stake Holders, Customers, Suppliers, Employees, Investors & Communities with respect to Social, Environmental and Economic Balance.



# Why IIS ?



## ▶ **450 MT**

of Raw Material always available for Production

▶ Stock of over **30** Million

Pieces of Standard Products

▶ Cycle Testing and Rapid Prototyping Facilities available

▶ Disc Springs up to **1000mm**

▶ Custom Sizes and Small Quantities are our Expertise

▶ Coil Springs starting from 0.2mm Wire Diameter to 70mm Wire Diameter. OD up to 500mm and Length 1560mm

▶ High Temperature Material like Inconel, Nimonic, X22CrMoV 12-1, etc. Available in Stock

▶ More than **9000** Parts in Stock with a Variety of Surface Finish

▶ R & D Team helps to improve Product Life



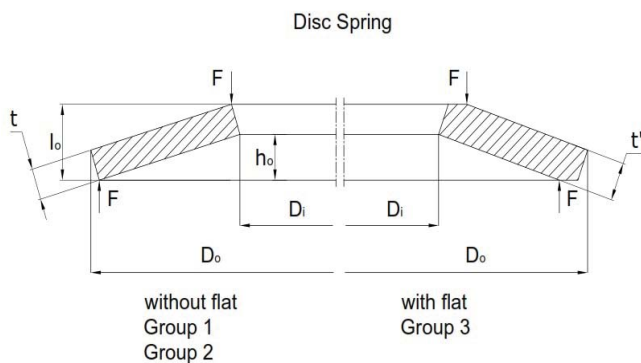


- › Total 1, 05, 000 Sq. ft. of Plant Area with more than 190 Machines
- › Production Capacity of more than 150 Tons Per Month
- › 10 Ton to 500 Ton Power Presses
- › Salt Bath Hardening Plant (Capacity 5 Ton Per Day)
- › Austempering Plant ( Capacity 1.5 Ton Per Day)
- › High Temperature Aging Furnace up to 1200°C
- › CNC & VMC Machining Centres
- › Shot Peening and Scragging Machines
- › In-house Tool Room with EDM, Sparking and Wire Cut Machine
- › Surface Technology Plant - GEOMET®(Zinc Flake Coating), Mechanical Zinc Coating, Electroplating, Nickel Plating, Phosphating, Powder Coating etc.
- › Automatic Spring Coiling and Grinding Machines



## 1. Disc Spring

Disc Springs are Conical in shape and have an unique combination of high force in small space with customised deflection. Normally Disc Springs are loaded in Axial Direction. IIS Disc Springs offer a well-developed solution to many engineering problems.



IIS Disc Springs can be used as Single or arranged in Stacks. Disc Springs Stack can consist of Disc Springs either used in Series or Parallel Sets. Disc Springs are available with or without contact flats. Disc Springs are manufactured to DIN 2093/DIN EN16983 Standards and Designed as per DIN 2092/ DIN EN16984 Standards. Group 1 and 2 Disc Springs are Austempered, this method of Heat Treatment is particularly effective for High Fatigue Disc Springs.

IIS produces & stocks standard DIN 2093 Disc Springs as well as Imperial (inch) & Metric (mm) sizes. We offer Disc Springs with special sizes & load ratings with widest material options.

IIS Disc Springs are manufactured using special processes which reduce edge stresses leading to machine uptime. Group 2 and 3 Disc Springs are 100% machined & checked for OD, ID and Height using gauges. We have our in-house Tool manufacturing facility which enables us to produce precise Disc Springs confirming to DIN Standards. IIS Disc Springs are certified to EN10204 3.1. We have a product design team to assist our customer for their specific application. IIS is one of the few Disc Spring manufacturer's having in-house surface technology plant with the widest coating options demanded by variety of Industrial Applications. Our SAP system ensures traceability of all Disc Springs manufactured from each raw material batch to finish good at every stage of production.





## Why IIS Disc Springs?

1. 100% Conforming to DIN & EN Standards
2. IIS Disc Springs are made from a quality cold rolled material with higher tensile strength and precise thickness tolerances
3. Our Deburring and Surface Finishing processes produce smooth and burr-free edges which reduces stresses on internal and external diameters
4. Disc Springs are Shot Peened resulting in higher fatigue life
5. Group 1 and 2 Disc Springs are Austempered resulting in fine grain size and uniform hardness
6. Ready to use Preassembled Stacks with 100% load testing
7. We offer customized small and large packing options with individual product marking and box labelling
8. We also offer Express Shipping of Standard / Stock Disc Springs

## IIS Disc Spring in applications



Disc Springs Used in CNC Spindles



Disc Springs Used in Cable Rope Way Brakes



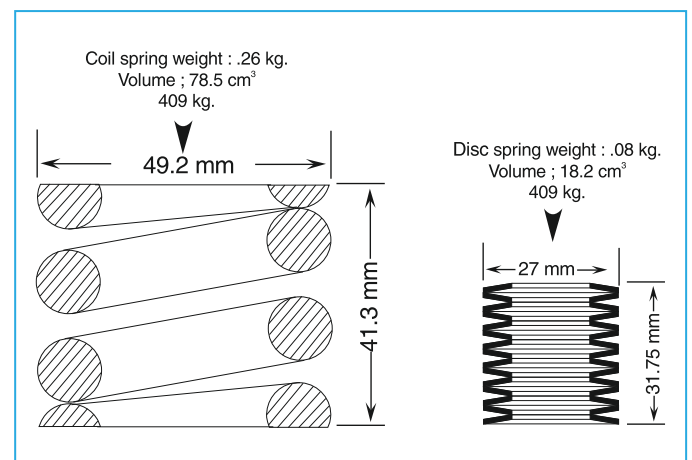
Disc Springs used in Tool Clamping



Disc Springs Stack used in Transformer

## Advantages of Disc Springs:

1. No Deformation or Fatigue under normal loads
2. High Energy Storage Capacity
3. Long Service Life
4. Stock keeping is minimised as the individual spring sizes can be combined universally
5. Space Saving
6. Largely Self-dampening, giving good shock absorption and energy dissipation
7. Efficient use of space and high spring force with small deflections
8. Adaptable to stacking in numerous configurations
9. Combination use as a modular spring element
10. Low Maintenance cost & Greater Security
11. Low height/thickness ratio employed reduces stresses



Comparison of Coil Spring v/s Disc Springs

SAP Code	Dimensions												
	Series	D <sub>e</sub> (mm)	D <sub>i</sub> (mm)	t (mm)	l <sub>o</sub> (mm)	t' (mm)	Group	0.25 ho		0.50 ho		0.75 ho	
								F (N)	S (mm)	F (N)	S (mm)	F (N)	S (mm)
DS6X3.2X0.3XC75PH		6.0	3.2	0.30	0.45	-	1	45	0.038	84	0.075	119	0.113
DS8X3.2X0.2XC75PH		8.0	3.2	0.20	0.40	-	1	12	0.050	21	0.100	26	0.150
DS8X3.2X0.3XC75PH		8.0	3.2	0.30	0.55	-	1	46	0.063	79	0.125	104	0.188
DS8X3.2X0.4XC75PH		8.0	3.2	0.40	0.60	-	1	69	0.050	130	0.100	186	0.150
DS8X3.2X0.5XC75PH		8.0	3.2	0.50	0.70	-	1	128	0.050	246	0.100	357	0.150
DS8X4.2X0.2XC75PH	C	8.0	4.2	0.20	0.45	-	1	21	0.063	33	0.125	39	0.188
DS8X4.2X0.3XC75PH	B	8.0	4.2	0.30	0.55	-	1	52	0.063	89	0.125	118	0.188
DS8X4.2X0.4XC75PH	A	8.0	4.2	0.40	0.60	-	1	78	0.050	147	0.100	210	0.150
DS10X3.2X0.3XC75PH		10.0	3.2	0.30	0.65	-	1	51	0.088	82	0.175	98	0.263
DS10X3.2X0.4XC75PH		10.0	3.2	0.40	0.70	-	1	75	0.075	133	0.150	179	0.225
DS10X3.2X0.5XC75PH		10.0	3.2	0.50	0.75	-	1	104	0.063	196	0.125	279	0.188
DS10X4.2X0.4XC75PH		10.0	4.2	0.40	0.70	-	1	79	0.075	140	0.150	189	0.225
DS10X4.2X0.5XC75PH		10.0	4.2	0.50	0.75	-	1	110	0.063	206	0.125	294	0.188
DS10X4.2X0.6XC75PH		10.0	4.2	0.60	0.85	-	1	175	0.060	360	0.125	508	0.190
DS10X5.2X0.25XC75PH	C	10.0	5.2	0.25	0.55	-	1	31	0.075	48	0.150	58	0.225
DS10X5.2X0.4XC75PH	B	10.0	5.2	0.40	0.70	-	1	88	0.075	155	0.150	209	0.225
DS10X5.2X0.5XC75PH	A	10.0	5.2	0.50	0.75	-	1	122	0.063	228	0.125	325	0.188
DS12X4.2X0.4XC75PH		12.0	4.2	0.40	0.80	-	1	85	0.100	141	0.200	178	0.300
DS12X4.2X0.5XC75PH		12.0	4.2	0.50	0.85	-	1	116	0.088	208	0.175	284	0.263
DS12X4.2X0.6XC75PH		12.0	4.2	0.60	1.00	-	1	224	0.100	405	0.200	557	0.300
DS12X5.2X0.5XC75PH		12.0	5.2	0.50	0.90	-	1	151	0.100	263	0.200	350	0.300
DS12X5.2X0.6XC75PH		12.0	5.2	0.60	0.95	-	1	196	0.088	361	0.175	506	0.263
DS12X6.2X0.5XC75PH		12.0	6.2	0.50	0.85	-	1	134	0.088	239	0.175	326	0.263
DS12X6.2X0.6XC75PH		12.0	6.2	0.60	0.95	-	1	214	0.088	394	0.175	552	0.263
DS12.5X5.2X0.5XC75PH		12.5	5.2	0.50	0.85	-	1	111	0.088	200	0.175	272	0.263
DS12.5X6.2X0.35XC75PH	C	12.5	6.2	0.35	0.80	-	1	84	0.113	130	0.225	151	0.338
DS12.5X6.2X0.5XC75PH	B	12.5	6.2	0.50	0.85	-	1	120	0.088	215	0.175	294	0.263
DS12.5X6.2X0.7XC75PH	A	12.5	6.2	0.70	1.00	-	1	240	0.075	457	0.150	660	0.225
DS14X7.2X0.35XC75PH	C	14.0	7.2	0.35	0.80	-	1	68	0.113	106	0.225	123	0.338
DS14X7.2X0.5XC75PH	B	14.0	7.2	0.50	0.90	-	1	120	0.100	210	0.200	279	0.300
DS14X7.2X0.8XC75PH	A	14.0	7.2	0.80	1.10	-	1	284	0.075	547	0.150	797	0.225
DS15X5.2X0.4XC75PH		15.0	5.2	0.40	0.95	-	1	101	0.138	154	0.275	176	0.413
DS15X5.2X0.5XC75PH		15.0	5.2	0.50	1.00	-	1	133	0.125	221	0.250	278	0.375
DS15X5.2X0.6XC75PH		15.0	5.2	0.60	1.05	-	1	171	0.113	302	0.225	407	0.338
DS15X5.2X0.7XC75PH		15.0	5.2	0.70	1.10	-	1	214	0.100	395	0.200	555	0.300
DS15X6.2X0.5XC75PH		15.0	6.2	0.50	1.00	-	1	138	0.125	230	0.250	289	0.375
DS15X6.2X0.6XC75PH		15.0	6.2	0.60	1.05	-	1	178	0.113	314	0.225	424	0.338
DS15X6.2X0.7XC75PH		15.0	6.2	0.70	1.10	-	1	222	0.100	411	0.200	578	0.300
DS15X8.2X0.7XC75PH		15.0	8.2	0.70	1.10	-	1	256	0.100	474	0.200	666	0.300
DS15X8.2X0.8XC75PH		15.0	8.2	0.80	1.20	-	1	367	0.100	689	0.200	982	0.300
DS16X8.2X0.4XC75PH	C	16.0	8.2	0.40	0.90	-	1	84	0.125	131	0.250	154	0.375
DS16X8.2X0.6XC75PH	B	16.0	8.2	0.60	1.05	-	1	172	0.113	304	0.225	410	0.338



SAP Code	Dimensions													
	Series	D <sub>e</sub> (mm)	D <sub>i</sub> (mm)	t (mm)	l <sub>o</sub> (mm)	t' (mm)	Group	0.25 ho		0.50 ho		0.75 ho		
								F (N)	S (mm)	F (N)	S (mm)	F (N)	S (mm)	
DS16X8.2X0.7XC75PH	A	16.0	8.2	0.70	1.15	-	1	254	0.113	461	0.225	637	0.338	
DS16X8.2X0.8XC75PH		16.0	8.2	0.80	1.20	-	1	308	0.100	579	0.200	825	0.300	
DS16X8.2X0.9XC75PH		16.0	8.2	0.90	1.25	-	1	363	0.088	697	0.175	1013	0.263	
DS18X6.2X0.4XC75PH		18.0	6.2	0.40	1.00	-	1	85	0.150	126	0.300	139	0.450	
DS18X6.2X0.5XC75PH		18.0	6.2	0.50	1.10	-	1	130	0.150	206	0.300	246	0.450	
DS18X6.2X0.6XC75PH		18.0	6.2	0.60	1.20	-	1	191	0.150	317	0.300	400	0.450	
DS18X6.2X0.7XC75PH		18.0	6.2	0.70	1.25	-	1	236	0.138	414	0.275	553	0.413	
DS18X6.2X0.8XC75PH		18.0	6.2	0.80	1.30	-	1	286	0.125	523	0.250	726	0.375	
DS18X8.2X0.5XC75PH		18.0	8.2	0.50	1.10	-	1	140	0.150	222	0.300	265	0.450	
DS18X8.2X0.7XC75PH		18.0	8.2	0.70	1.25	-	1	255	0.138	446	0.275	596	0.413	
DS18X8.2X0.8XC75PH	18.0	8.2	0.80	1.30	-	1	309	0.125	564	0.250	783	0.375		
DS18X8.2X1XC75PH	18.0	8.2	1.00	1.40	-	1	425	0.100	815	0.200	1181	0.300		
DS18X9.2X0.45XC75PH	C	18.0	9.2	0.45	1.05	-	1	121	0.150	186	0.300	214	0.450	
DS18X9.2X0.7XC75PH	B	18.0	9.2	0.70	1.20	-	1	233	0.125	417	0.250	566	0.375	
DS18X9.2X1XC75PH	A	18.0	9.2	1.00	1.40	-	1	451	0.100	865	0.200	1254	0.300	
DS20X8.2X0.5XC75PH		20.0	8.2	0.50	1.15	-	1	127	0.163	200	0.325	231	0.490	
DS20X8.2X0.6XC75PH		20.0	8.2	0.60	1.30	-	1	214	0.175	342	0.350	412	0.525	
DS20X8.2X0.7XC75PH		20.0	8.2	0.70	1.35	-	1	262	0.163	442	0.325	569	0.488	
DS20X8.2X0.8XC75PH		20.0	8.2	0.80	1.40	-	1	315	0.150	557	0.300	751	0.450	
DS20X8.2X0.9XC75PH		20.0	8.2	0.90	1.45	-	1	374	0.138	685	0.275	954	0.413	
DS20X8.2X1XC75PH		20.0	8.2	1.00	1.55	-	1	494	0.138	918	0.275	1295	0.413	
DS20X10.2X0.4XC75PH		C	20.0	10.2	0.40	0.90	-	1	55	0.130	84	0.250	99	0.380
DS20X10.2X0.5XC75PH			20.0	10.2	0.50	1.15	-	1	141	0.163	219	0.325	254	0.488
DS20X10.2X0.8XC75PH	B		20.0	10.2	0.80	1.35	-	1	304	0.138	547	0.275	748	0.413
DS20X10.2X0.9XC75PH	A	20.0	10.2	0.90	1.45	-	1	412	0.138	754	0.275	1050	0.413	
DS20X10.2X1XC75PH		20.0	10.2	1.00	1.55	-	1	544	0.138	1010	0.275	1425	0.413	
DS20X10.2X1.1X51CPH		20.0	10.2	1.10	1.55	-	1	548	0.113	1050	0.225	1521	0.338	
DS20X10.2X1.25X51CPH		20.0	10.2	1.25	1.75	-	1	890	0.125	1708	0.250	2477	0.375	
DS20X10.2X1.5X51CPH		20.0	10.2	1.50	1.80	-	2	857	0.075	1695	0.150	2521	0.225	
DS22.5X11.2X0.6XC75PH	C	22.5	11.2	0.60	1.40	-	1	241	0.200	370	0.400	426	0.600	
DS22.5X11.2X0.8XC75PH	B	22.5	11.2	0.80	1.45	-	1	306	0.163	533	0.325	708	0.488	
DS22.5X11.2X1.25X51CPH	A	22.5	11.2	1.25	1.75	-	2	693	0.125	1330	0.250	1929	0.375	
DS23X8.2X0.7XC75PH		23.0	8.2	0.70	1.50	-	1	280	0.200	448	0.400	544	0.600	
DS23X8.2X0.8XC75PH		23.0	8.2	0.80	1.55	-	1	332	0.188	560	0.375	719	0.563	
DS23X8.2X0.9XC75PH		23.0	8.2	0.90	1.60	-	1	391	0.175	687	0.350	919	0.525	
DS23X8.2X1XC75PH		23.0	8.2	1.00	1.70	-	1	507	0.175	909	0.350	1240	0.525	
DS23X10.2X0.9XC75PH		23.0	10.2	0.90	1.65	-	1	463	0.188	802	0.375	1058	0.563	
DS23X10.2X1XC75PH		23.0	10.2	1.00	1.70	-	1	538	0.175	964	0.350	1315	0.525	
DS23X10.2X1.25X51CPH		23.0	10.2	1.25	1.90	-	2	870	0.163	1627	0.325	2310	0.488	
DS23X12.2X1XC75PH		23.0	12.2	1.00	1.60	-	1	475	0.150	872	0.300	1217	0.450	
DS23X12.2X1.25X51CPH		23.0	12.2	1.25	1.85	-	2	864	0.150	1630	0.300	2331	0.450	
DS23X12.2X1.5X51CPH		23.0	12.2	1.50	2.00	-	2	1159	0.125	2250	0.250	3297	0.375	
DS25X10.2X1XC75PH		25.0	10.2	1.00	1.75	-	1	492	0.188	870	0.375	1172	0.563	
DS25X12.2X0.7XC75PH		C	25.0	12.2	0.70	1.60	-	1	331	0.225	515	0.450	600	0.675
DS25X12.2X0.9XC75PH		B	25.0	12.2	0.90	1.60	-	1	367	0.175	644	0.350	862	0.525
DS25X12.2X1XC75PH		25.0	12.2	1.00	1.80	-	1	585	0.200	1021	0.400	1359	0.600	

SAP Code	Dimensions												
	Series	D <sub>e</sub> (mm)	D <sub>i</sub> (mm)	t (mm)	l <sub>o</sub> (mm)	t' (mm)	Group	0.25 ho		0.50 ho		0.75 ho	
								F (N)	S (mm)	F (N)	S (mm)	F (N)	S (mm)
DS25X12.2X1.25X51CPH	A	25.0	12.2	1.25	1.95	-	2	848	0.175	1573	0.350	2214	0.525
DS25X12.2X1.5X51CPH		25.0	12.2	1.50	2.05	-	2	1040	0.138	2007	0.275	2926	0.413
DS28X10.2X0.8XC75PH		28.0	10.2	0.80	1.75	-	1	348	0.238	553	0.475	662	0.713
DS28X10.2X1XC75PH		28.0	10.2	1.00	1.90	-	1	512	0.225	872	0.450	1130	0.675
DS28X10.2X1.25X51CPH		28.0	10.2	1.25	2.05	-	2	737	0.200	1339	0.400	1853	0.600
DS28X10.2X1.5X51CPH		28.0	10.2	1.50	2.20	-	2	1003	0.175	1899	0.350	2723	0.525
DS28X12.2X1XC75PH		28.0	12.2	1.00	1.95	-	1	590	0.238	992	0.475	1268	0.713
DS28X12.2X1.25X51CPH		28.0	12.2	1.25	2.10	-	2	844	0.213	1519	0.425	2083	0.638
DS28X12.2X1.5X51CPH		28.0	12.2	1.50	2.25	-	2	1149	0.188	2159	0.375	3077	0.563
DS28X14.2X0.8XC75PH		C	28.0	14.2	0.80	1.80	-	1	435	0.250	681	0.500	801
DS28X14.2X1XC75PH	B	28.0	14.2	1.00	1.80	-	1	476	0.200	832	0.400	1107	0.600
DS28X14.2X1.25X51CPH	A	28.0	14.2	1.25	2.10	-	2	907	0.213	1634	0.425	2240	0.638
DS28X14.2X1.5X51CPH		28.0	14.2	1.50	2.15	-	2	1033	0.163	1970	0.325	2841	0.488
DS31.5X12.2X1XC75PH		31.5	12.2	1.00	2.10	-	1	587	0.275	951	0.550	1167	0.825
DS31.5X12.2X1.25X51CPH		31.5	12.2	1.25	2.20	-	2	761	0.238	1343	0.475	1805	0.713
DS31.5X12.2X1.5X51CPH		31.5	12.2	1.50	2.35	-	2	1033	0.213	1912	0.425	2688	0.638
DS31.5X16.3X0.8XC75PH	C	31.5	16.3	0.80	1.85	-	1	384	0.263	594	0.525	687	0.788
DS31.5X16.3X1.25X51CPH	B	31.5	16.3	1.25	2.15	-	2	791	0.225	1409	0.450	1913	0.675
DS31.5X16.3X1.5X51CPH	A	31.5	16.3	1.50	2.40	-	2	1260	0.225	2314	0.450	3230	0.675
DS31.5X16.3X1.75X51CPH		31.5	16.3	1.75	2.45	-	2	1391	0.175	2669	0.350	3871	0.525
DS31.5X16.3X2X51CPH		31.5	16.3	2.00	2.75	-	2	2199	0.188	4239	0.375	6173	0.563
DS34X12.3X1XC75PH		34.0	12.3	1.00	2.25	-	1	637	0.313	998	0.625	1174	0.938
DS34X12.3X1.25X51CPH		34.0	12.3	1.25	2.35	-	2	815	0.275	1395	0.550	1818	0.825
DS34X12.3X1.5X51CPH		34.0	12.3	1.50	2.50	-	2	1097	0.250	1982	0.500	2725	0.750
DS34X14.3X1.25X51CPH		34.0	14.3	1.25	2.40	-	2	913	0.288	1546	0.575	1993	0.863
DS34X14.3X1.5X51CPH		34.0	14.3	1.50	2.55	-	2	1224	0.263	2192	0.525	2990	0.788
DS34X16.3X1.5X51CPH		34.0	16.3	1.50	2.55	-	2	1291	0.263	2313	0.525	3155	0.788
DS34X16.3X2X51CPH		34.0	16.3	2.00	2.85	-	2	2097	0.213	4003	0.425	5783	0.638
DS35.5X18.3X0.9XC75PH	C	35.5	18.3	0.90	2.05	-	1	458	0.288	712	0.575	832	0.863
DS35.5X18.3X1.25X51CPH	B	35.5	18.3	1.25	2.25	-	2	731	0.250	1277	0.500	1699	0.750
DS35.5X18.3X2X51CPH	A	35.5	18.3	2.00	2.80	-	2	1864	0.200	3576	0.400	5187	0.600
DS40X14.3X1.25X51CPH		40.0	14.3	1.25	2.65	-	2	904	0.350	1459	0.700	1780	1.050
DS40X14.3X1.5X51CPH		40.0	14.3	1.50	2.75	-	2	1114	0.313	1929	0.625	2545	0.938
DS40X14.3X2X51CPH		40.0	14.3	2.00	3.05	-	2	1800	0.263	3363	0.525	4769	0.788
DS40X16.3X1.5X51CPH		40.0	16.3	1.50	2.80	-	2	1224	0.325	2102	0.650	2749	0.975
DS40X16.3X2X51CPH		40.0	16.3	2.00	3.10	-	2	1972	0.275	3663	0.550	5169	0.825
DS40X18.3X2X51CPH		40.0	18.3	2.00	3.15	-	2	2182	0.288	4030	0.575	5656	0.863
DS40X20.4X1XC75PH	C	40.0	20.4	1.00	2.30	-	1	565	0.325	876	0.650	1017	0.975
DS40X20.4X1.5X51CPH	B	40.0	20.4	1.50	2.65	-	2	1109	0.288	1953	0.575	2621	0.863
DS40X20.4X2X51CPH	A	40.0	20.4	2.00	3.10	-	2	2175	0.275	4041	0.550	5701	0.825
DS40X20.4X2.25X51CPH		40.0	20.4	2.25	3.15	-	2	2336	0.225	4481	0.450	6500	0.675
DS40X20.4X2.5X51CPH		40.0	20.4	2.50	3.45	-	2	3351	0.238	6453	0.475	9390	0.713
DS45X22.4X1.25X51CPH	C	45.0	22.4	1.25	2.85	-	2	1041	0.400	1620	0.800	1891	1.200



SAP Code	Dimensions												
	Series	D <sub>e</sub> (mm)	D <sub>i</sub> (mm)	t (mm)	l <sub>o</sub> (mm)	t' (mm)	Group	0.25 ho		0.50 ho		0.75 ho	
								F (N)	S (mm)	F (N)	S (mm)	F (N)	S (mm)
DS45X22.4X1.75X51CPH	B	45.0	22.4	1.75	3.05	-	2	1524	0.325	2701	0.650	3646	0.975
DS45X22.4X2.5X51CPH	A	45.0	22.4	2.50	3.50	-	2	2773	0.250	5320	0.500	7716	0.750
DS50X18.4X1.25X51CPH		50.0	18.4	1.25	2.85	-	2	757	0.400	1178	0.800	1375	1.200
DS50X18.4X1.5X51CPH		50.0	18.4	1.50	3.30	-	2	1379	0.450	2184	0.900	2606	1.350
DS50X18.4X2X51CPH		50.0	18.4	2.00	3.50	-	2	1918	0.375	3392	0.750	4572	1.125
DS50X18.4X2.5X51CPH		50.0	18.4	2.50	4.10	-	2	3703	0.400	6733	0.800	9315	1.200
DS50X18.4X3X51CPH		50.0	18.4	3.00	4.40	-	2	5043	0.350	9546	0.700	13688	1.050
DS50X20.4X2X51CPH		50.0	20.4	2.00	3.50	-	2	1966	0.375	3478	0.750	4687	1.125
DS50X20.4X2.5X51CPH		50.0	20.4	2.50	3.85	-	2	3008	0.338	5601	0.675	7919	1.013
DS50X22.4X2X51CPH		50.0	22.4	2.00	3.60	-	2	2247	0.400	3924	0.800	5222	1.200
DS50X22.4X2.5X51CPH		50.0	22.4	2.50	3.90	-	2	3261	0.350	6044	0.700	8510	1.050
DS50X25.4X1.25X51CPH	C	50.0	25.4	1.25	2.85	-	2	854	0.400	1328	0.800	1550	1.200
DS50X25.4X1.5X51CPH		50.0	25.4	1.50	3.10	-	2	1242	0.400	2028	0.800	2512	1.200
DS50X25.4X2X51CPH	B	50.0	25.4	2.00	3.40	-	2	1949	0.350	3491	0.700	4762	1.050
DS50X25.4X2.25X51CPH		50.0	25.4	2.25	3.75	-	2	2940	0.380	5249	0.750	7241	1.130
DS50X25.4X2.5X51CPH		50.0	25.4	2.50	3.90	-	2	3473	0.350	6437	0.700	9063	1.050
DS50X25.4X3X51CPH	A	50.0	25.4	3.00	4.10	-	2	4255	0.275	8214	0.550	11976	0.825
DS56X28.5X1.5X51CPH	C	56.0	28.5	1.50	3.45	-	2	1458	0.488	2259	0.975	2622	1.463
DS56X28.5X2X51CPH	B	56.0	28.5	2.00	3.60	-	2	1910	0.400	3335	0.800	4438	1.200
DS56X28.5X2.5X51CPH		56.0	28.5	2.50	4.20	-	2	3676	0.430	6550	0.850	9004	1.280
DS56X28.5X3X51CPH	A	56.0	28.5	3.00	4.30	-	2	4142	0.325	7895	0.650	11388	0.975
DS60X20.5X2X51CPH		60.0	20.5	2.00	4.10	-	2	2318	0.525	3802	1.050	4730	1.575
DS60X20.5X2.5X51CPH		60.0	20.5	2.50	4.30	-	2	3018	0.450	5379	0.900	7302	1.350
DS60X20.5X3X51CPH		60.0	20.5	3.00	4.70	-	2	4449	0.425	8234	0.850	11577	1.275
DS60X25.5X2.5X51CPH		60.0	25.5	2.50	4.40	-	2	3447	0.475	6081	0.950	8175	1.425
DS60X25.5X3X51CPH		60.0	25.5	3.00	4.65	-	2	4495	0.413	8352	0.825	11784	1.238
DS60X30.5X2.5X51CPH		60.0	30.5	2.50	4.30	-	2	3447	0.450	6145	0.900	8342	1.350
DS60X30.5X2.75X51CPH		60.0	30.5	2.75	4.75	-	2	5125	0.500	9117	1.000	12360	1.500
DS60X30.5X3X51CPH		60.0	30.5	3.00	4.70	-	2	5083	0.425	9407	0.850	13226	1.275
DS60X30.5X3.5X51CPH		60.0	30.5	3.50	5.00	-	2	6591	0.375	12574	0.750	18153	1.125
DS63X31X1.8X51CPH	C	63.0	31.0	1.80	4.15	-	2	2364	0.588	3658	1.175	4238	1.763
DS63X31X2.5X51CPH	B	63.0	31.0	2.50	4.25	-	2	2942	0.438	5270	0.875	7189	1.313
DS63X31X3X51CPH		63.0	31.0	3.00	4.80	-	2	4891	0.450	8981	0.900	12536	1.350
DS63X31X3.5X51CPH	A	63.0	31.0	3.50	4.90	-	2	5399	0.350	10359	0.700	15025	1.050
DS70X25.5X2X51CPH		70.0	25.5	2.00	4.50	-	2	2408	0.625	3771	1.250	4437	1.875
DS70X30.5X2.5X51CPH		70.0	30.5	2.50	4.90	-	2	3755	0.600	6297	1.200	8031	1.800
DS70X30.5X3X51CPH		70.0	30.5	3.00	5.10	-	2	4676	0.525	8376	1.050	11426	1.575
DS70X35.5X3X51CPH		70.0	35.5	3.00	5.10	-	2	5028	0.525	9007	1.050	12287	1.575
DS70X35.5X3.5X51CPH		70.0	35.5	3.50	5.30	-	2	6077	0.450	11380	0.900	16180	1.350
DS70X35.5X4X51CPH		70.0	35.5	4.00	5.80	-	2	8757	0.450	16634	0.900	23923	1.350
DS70X35.5X3.75X51CPH		70.0	35.5	4.00	5.80	3.75	2	9167	0.450	17020	0.900	23920	1.350
DS70X40.5X4X51CPH		70.0	40.5	4.00	5.60	-	2	8391	0.400	16099	0.800	23351	1.200
DS70X40.5X3.75X51CPH		70.0	40.5	4.00	5.60	3.75	2	8739	0.400	16430	0.800	23350	1.200
DS70X40.5X5X51CPH		70.0	40.5	5.00	6.20	-	2	11544	0.300	22728	0.600	33672	0.900

SAP Code	Dimensions												
	Series	D <sub>e</sub> (mm)	D <sub>i</sub> (mm)	t (mm)	l <sub>o</sub> (mm)	t' (mm)	Group	0.25 ho		0.50 ho		0.75 ho	
								F (N)	S (mm)	F (N)	S (mm)	F (N)	S (mm)
DS70X40.5X4.6X51CPH		70.0	40.5	5.00	6.20	4.60	2	11900	0.300	23070	0.600	33672	0.900
DS71X36X2.5X51CPH	C	71.0	36.0	2.00	4.60	-	2	2861	0.650	4432	1.300	5144	1.950
DS71X36X2.5X51CPH	B	71.0	36.0	2.50	4.50	-	2	2894	0.500	5054	1.000	6725	1.500
DS71X36X4X51CPH	A	71.0	36.0	4.00	5.60	-	2	7379	0.400	14157	0.800	20535	1.200
DS71X36X3.75X51CPH		71.0	36.0	4.00	5.60	3.75	2	7685	0.400	14440	0.800	20530	1.200
DS80X31X2.5X51CPH		80.0	31.0	2.50	5.30	-	2	3678	0.700	5933	1.400	7239	2.100
DS80X31X3X51CPH		80.0	31.0	3.00	5.50	-	2	4531	0.625	7847	1.250	10352	1.875
DS80X31X4X51CPH		80.0	31.0	4.00	6.10	-	2	7319	0.525	13677	1.050	19394	1.575
DS80X31X3.75X51CPH		80.0	31.0	4.00	6.10	3.75	2	7783	0.525	14050	1.050	19440	1.580
DS80X36X3X51CPH		80.0	36.0	3.00	5.70	-	2	5401	0.675	9196	1.350	11919	2.025
DS80X36X4X51CPH		80.0	36.0	4.00	6.20	-	2	8163	0.550	15168	1.100	21400	1.650
DS80X36X3.75X51CPH		80.0	36.0	4.00	6.20	3.75	2	8626	0.550	15600	1.100	21400	1.650
DS80X41X2.25X51CPH	C	80.0	41.0	2.25	5.20	-	2	3698	0.738	5715	1.475	6613	2.213
DS80X41X3X51CPH	B	80.0	41.0	3.00	5.30	-	2	4450	0.575	7838	1.150	10518	1.725
DS80X41X4X51CPH		80.0	41.0	4.00	6.20	-	2	8726	0.550	16213	1.100	22874	1.650
DS80X41X3.75X51CPH		80.0	41.0	4.00	6.20	3.75	2	9220	0.550	16670	1.100	22874	1.650
DS80X41X5X51CPH	A	80.0	41.0	5.00	6.70	-	2	11821	0.425	22928	0.850	33559	1.275
DS80X41X4.7X51CPH		80.0	41.0	5.00	6.70	4.70	2	12350	0.425	23300	0.850	33682	1.280
DS90X46X2.5X51CPH	C	90.0	46.0	2.50	5.70	-	2	4232	0.800	6585	1.600	7684	2.400
DS90X46X3.5X51CPH	B	90.0	46.0	3.50	6.00	-	2	5836	0.625	10416	1.250	14161	1.875
DS90X46X5X51CPH	A	90.0	46.0	5.00	7.00	-	2	11267	0.500	21617	1.000	31354	1.500
DS90X46X4.7X51CPH		90.0	46.0	5.00	7.00	4.70	2	11710	0.500	22040	1.000	31354	1.500
DS100X41X4X51CPH		100.0	41.0	4.00	7.20	-	2	8714	0.800	15219	1.600	20251	2.400
DS100X41X3.75X51CPH		100.0	41.0	4.00	7.20	3.75	2	9345	0.800	15800	1.600	20251	2.400
DS100X41X5X51CPH		100.0	41.0	5.00	7.75	-	2	12345	0.688	22937	1.375	32361	2.063
DS100X41X4.75X51CPH		100.0	41.0	5.00	7.75	4.75	2	12940	0.688	23520	1.375	32328	2.060
DS100X51X2.7X51CPH	C	100.0	51.0	2.70	6.20	-	2	4779	0.875	7410	1.750	8609	2.625
DS100X51X3.5X51CPH	B	100.0	51.0	3.50	6.30	-	2	5624	0.700	9823	1.400	13070	2.100
DS100X51X4X51CPH		100.0	51.0	4.00	7.00	-	2	8673	0.750	15341	1.500	20674	2.250
DS100X51X3.75X51CPH		100.0	51.0	4.00	7.00	3.75	2	9282	0.750	15910	1.500	20674	2.250
DS100X51X5X51CPH		100.0	51.0	5.00	7.80	-	2	13924	0.700	25810	1.400	36339	2.100
DS100X51X4.75X51CPH		100.0	51.0	5.00	7.80	4.75	2	14550	0.700	26400	1.400	36340	2.100
DS100X51X6X51CPH	A	100.0	51.0	6.00	8.20	-	2	17061	0.550	32937	1.100	48022	1.650
DS100X51X5.6X51CPH		100.0	51.0	6.00	8.20	5.60	2	17750	0.550	33590	1.100	48020	1.650
DS112X57X3X51CPH	C	112.0	57.0	3.00	6.90	-	2	5834	0.975	9038	1.950	10489	2.925
DS112X57X4X51CPH	B	112.0	57.0	4.00	7.20	-	2	7639	0.800	13341	1.600	17752	2.400
DS112X57X3.75X51CPH		112.0	57.0	4.00	7.20	3.75	2	8192	0.800	13850	1.600	17752	2.400
DS112X57X6X51CPH	A	112.0	57.0	6.00	8.50	-	2	15800	0.625	30215	1.250	43707	1.875
DS112X57X5.6X51CPH		112.0	57.0	6.00	8.50	5.60	2	16660	0.625	30910	1.250	43800	1.880
DS125X41X4X51CPH		125.0	41.0	4.00	8.20	-	2	8501	1.050	13943	2.100	17346	3.150
DS125X41X3.75X51CPH		125.0	41.0	4.00	8.20	3.75	2	9146	1.050	14540	2.100	17350	3.150
DS125X51X4X51CPH		125.0	51.0	4.00	8.50	-	2	10096	1.125	16265	2.250	19817	3.375
DS125X51X3.75X51CPH		125.0	51.0	4.00	8.50	3.75	2	10890	1.125	16970	2.250	19820	3.380
DS125X51X5X51CPH		125.0	51.0	5.00	8.90	-	2	13063	0.975	22931	1.950	30669	2.925
DS125X51X4.7X51CPH		125.0	51.0	5.00	8.90	4.70	2	14020	0.975	23760	1.950	30700	2.930
DS125X51X6X51CPH		125.0	51.0	6.00	9.40	-	2	17027	0.850	31514	1.700	44307	2.550
DS125X51X5.6X51CPH		125.0	51.0	6.00	9.40	5.60	2	18090	0.850	32500	1.700	44310	2.550



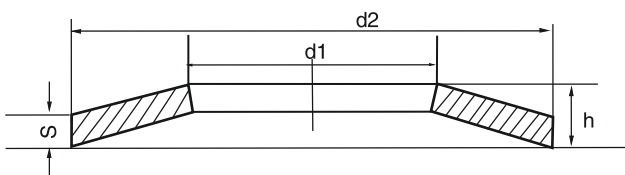
SAP Code	Dimensions												
	Series	D <sub>e</sub> (mm)	D <sub>i</sub> (mm)	t (mm)	l <sub>o</sub> (mm)	t' (mm)	Group	0.25 ho		0.50 ho		0.75 ho	
								F (N)	S (mm)	F (N)	S (mm)	F (N)	S (mm)
DS125X61X5X51CPH		125.0	61.0	5.00	9.00	-	2	14615	1.000	25526	2.000	33965	3.000
DS125X61X4.7X51CPH		125.0	61.0	5.00	9.00	4.70	2	15630	1.000	26470	2.000	33965	3.000
DS125X61X6X51CPH		125.0	61.0	6.00	9.60	-	2	19789	0.900	36336	1.800	50722	2.700
DS125X61X5.6X51CPH		125.0	61.0	6.00	9.60	5.60	2	21080	0.900	37540	1.800	50720	2.700
DS125X61X8X51CPH		125.0	61.0	8.00	10.90	-	3	34434	0.725	65305	1.450	93577	2.175
DS125X61X7.5X51CPH		125.0	61.0	8.00	10.90	7.50	3	34434	0.725	65305	1.450	93577	2.175
DS125X64X3.5X51CPH	C	125.0	64.0	3.50	8.00	-	2	8514	1.125	13231	2.250	15416	3.375
DS125X64X5X51CPH	B	125.0	64.0	5.00	8.50	-	2	12238	0.875	21924	1.750	29908	2.625
DS125X64X4.7X51CPH		125.0	64.0	5.00	8.50	4.70	2	13090	0.875	22660	1.750	29940	2.630
DS125X64X6X51CPH		125.0	64.0	6.00	9.60	-	2	20350	0.900	37360	1.800	52150	2.700
DS125X64X5.6X51CPH		125.0	64.0	6.00	9.60	5.60	2	21670	0.900	38600	1.800	52150	2.700
DS125X64X7X51CPH		125.0	64.0	7.00	10.00	-	3	25530	0.750	47610	1.500	67220	2.250
DS125X64X6.55X51CPH		125.0	64.0	7.00	10.00	6.55	3	25530	0.750	47610	1.500	67220	2.250
DS125X64X8X51CPH	A	125.0	64.0	8.00	10.60	-	3	31118	0.650	59520	1.300	85926	1.950
DS125X64X7.5X51CPH	A	125.0	64.0	8.00	10.60	7.50	3	31118	0.650	59520	1.300	85926	1.950
DS125X71X6X51CPH		125.0	71.0	6.00	9.30	-	2	19538	0.825	36302	1.650	51304	2.475
DS125X71X5.6X51CPH		125.0	71.0	6.00	9.30	5.60	2	20840	0.830	37410	1.650	51290	2.480
DS125X71X8X51CPH		125.0	71.0	8.00	10.40	-	3	30867	0.600	59149	1.200	85494	1.800
DS125X71X7.4X51CPH		125.0	71.0	8.00	10.40	7.40	3	30867	0.600	59149	1.200	85494	1.800
DS125X71X10X51CPH		125.0	71.0	10.00	11.80	-	3	42963	0.450	84219	0.900	124124	1.350
DS125X71X9.2X51CPH		125.0	71.0	10.00	11.80	9.20	3	42963	0.450	84219	0.900	124124	1.350
DS140X72X3.8X51CPH	C	140.0	72.0	3.80	8.70	-	2	9514	1.225	14773	2.450	17195	3.675
DS140X72X5X51CPH	B	140.0	72.0	5.00	9.00	-	2	12014	1.000	20982	2.000	27920	3.000
DS140X72X4.7X51CPH		140.0	72.0	5.00	9.00	4.70	2	12850	1.000	21760	2.000	27920	3.000
DS140X72X8X51CPH	A	140.0	72.0	8.00	11.20	-	3	31903	0.800	59967	1.600	85251	2.400
DS140X72X7.5X51CPH	A	140.0	72.0	8.00	11.20	7.50	3	31903	0.800	59967	1.600	85251	2.400
DS150X61X5X51CPH		150.0	61.0	5.00	10.30	-	2	15292	1.325	25021	2.650	31041	3.975
DS150X61X4.8X51CPH		150.0	61.0	5.00	10.30	4.80	2	16080	1.325	25710	2.650	31059	3.980
DS150X61X6X51CPH		150.0	61.0	6.00	10.80	-	2	19560	1.200	34161	2.400	45456	3.600
DS150X61X5.8X51CPH		150.0	61.0	6.00	10.80	5.80	2	20300	1.200	34850	2.400	45456	3.600
DS150X71X6X51CPH		150.0	71.0	6.00	10.80	-	2	20721	1.200	36189	2.400	48155	3.600
DS150X71X5.65X51CPH		150.0	71.0	6.00	10.80	5.65	2	22120	1.200	37490	2.400	48155	3.600
DS150X71X8X51CPH		150.0	71.0	8.00	12.00	-	3	35296	1.000	64684	2.000	89851	3.000
DS150X71X7.5X51CPH		150.0	71.0	8.00	12.00	7.50	3	35296	1.000	64684	2.000	89851	3.000
DS150X81X8X51CPH		150.0	81.0	8.00	11.70	-	3	34518	0.925	63877	1.850	89532	2.775
DS150X81X7.5X51CPH		150.0	81.0	8.00	11.70	7.50	3	34518	0.925	63877	1.850	89532	2.775
DS150X81X10X51CPH		150.0	81.0	10.00	13.00	-	3	50088	0.750	96121	1.500	139128	2.250
DS150X81X9.3X51CPH		150.0	81.0	10.00	13.00	9.30	3	50088	0.750	96121	1.500	139128	2.250
DS160X82X4.3X51CPH	C	160.0	82.0	4.30	9.90	-	2	12162	1.400	18832	2.800	21843	4.200
DS160X82X6X51CPH	B	160.0	82.0	6.00	10.50	-	2	17203	1.125	30431	2.250	41008	3.375
DS160X82X5.6X51CPH		160.0	82.0	6.00	10.50	5.60	2	18570	1.125	31630	2.250	41040	3.380
DS160X82X10X51CPH	A	160.0	82.0	10.00	13.50	-	3	50547	0.875	96216	1.750	138331	2.625
DS160X82X9.4X51CPH	A	160.0	82.0	10.00	13.50	9.40	3	50547	0.875	96216	1.750	138331	2.625
DS180X92X4.8X51CPH	C	180.0	92.0	4.80	11.00	-	2	14646	1.550	22731	3.100	26442	4.650
DS180X92X6X51CPH	B	180.0	92.0	6.00	11.10	-	2	16558	1.275	28552	2.550	37502	3.825
DS180X92X5.6X51CPH		180.0	92.0	6.00	11.10	5.60	2	17920	1.275	29770	2.550	37530	3.830
DS180X92X10X51CPH	A	180.0	92.0	10.00	14.00	-	3	46850	1.000	88141	2.000	125417	3.000
DS180X92X9.4X51CPH	A	180.0	92.0	10.00	14.00	9.40	3	46850	1.000	88141	2.000	125417	3.000
DS180X92X13X51CPH		180.0	92.0	13.00	16.50	-	3	85040	0.880	163400	1.750	238300	2.630
DS180X92X12.1X51CPH		180.0	92.0	13.00	16.50	12.10	3	85040	0.880	163400	1.750	238300	2.630

SAP Code	Dimensions												
	Series	D <sub>e</sub> (mm)	D <sub>i</sub> (mm)	t (mm)	l <sub>o</sub> (mm)	t' (mm)	Group	0.25 ho		0.50 ho		0.75 ho	
								F (N)	S (mm)	F (N)	S (mm)	F (N)	S (mm)
DS200X82X8X51CPH		200.0	82.0	8.00	14.20	-	3	35029	1.550	60013	3.100	78034	4.650
DS200X82X7.6X51CPH		200.0	82.0	8.00	14.20	7.60	3	35029	1.550	60013	3.100	78034	4.650
DS200X82X10X51CPH		200.0	82.0	10.00	15.50	-	3	51105	1.375	93357	2.750	129445	4.125
DS200X82X9.6X51CPH		200.0	82.0	10.00	15.50	9.60	3	51105	1.375	93357	2.750	129445	4.125
DS200X82X12X51CPH		200.0	82.0	12.00	16.60	-	3	66924	1.150	127191	2.300	182737	3.450
DS200X82X11.5X51CPH		200.0	82.0	12.00	16.60	11.50	3	66924	1.150	127191	2.300	182737	3.450
DS200X92X10X51CPH		200.0	92.0	10.00	15.60	-	3	55136	1.400	100014	2.800	137688	4.200
DS200X92X9.5X51CPH		200.0	92.0	10.00	15.60	9.50	3	55136	1.400	100014	2.800	137688	4.200
DS200X92X12X51CPH		200.0	92.0	12.00	16.80	-	3	73913	1.200	139548	2.400	199269	3.600
DS200X92X11.4X51CPH		200.0	92.0	12.00	16.80	11.40	3	73913	1.200	139548	2.400	199269	3.600
DS200X92X14X51CPH		200.0	92.0	14.00	18.10	-	3	95633	1.025	184092	2.050	267227	3.075
DS200X92X13.1X51CPH		200.0	92.0	14.00	18.10	13.10	3	95633	1.025	184092	2.050	267227	3.075
DS200X102X5.5X51CPH	C	200.0	102.0	5.50	12.50	-	2	19817	1.750	30882	3.500	36111	5.250
DS200X102X8X51CPH	B	200.0	102.0	8.00	13.60	-	3	33367	1.400	57955	2.800	76378	4.200
DS200X102X7.5X51CPH	B	200.0	102.0	8.00	13.60	7.50	3	33367	1.400	57955	2.800	76378	4.200
DS200X102X10X51CPH		200.0	102.0	10.00	15.60	-	3	58757	1.400	106099	2.800	145357	4.200
DS200X102X9.4X51CPH		200.0	102.0	10.00	15.60	9.40	3	58757	1.400	106099	2.800	145357	4.200
DS200X102X12X51CPH	A	200.0	102.0	12.00	16.20	-	3	66983	1.050	127401	2.100	183020	3.150
DS200X102X11.25PH	A	200.0	102.0	12.00	16.20	11.25	3	66983	1.050	127401	2.100	183020	3.150
DS200X102X14X51CPH		200.0	102.0	14.00	18.20	-	3	103781	1.050	199476	2.100	289181	3.150
DS200X102X13.1X51CPH		200.0	102.0	14.00	18.20	13.10	3	103781	1.050	199476	2.100	289181	3.150
DS200X112X12X51CPH		200.0	112.0	12.00	16.20	-	3	72257	1.050	136873	2.100	195830	3.150
DS200X112X11.1X51CPH		200.0	112.0	12.00	16.20	11.10	3	72257	1.050	136873	2.100	195830	3.150
DS200X112X14X51CPH		200.0	112.0	14.00	17.50	-	3	91033	0.875	176156	1.750	256758	2.625
DS200X112X12.9X51CPH		200.0	112.0	14.00	17.50	12.90	3	91033	0.875	176156	1.750	256758	2.625
DS200X112X16X51CPH		200.0	112.0	16.00	18.80	-	3	105268	0.700	206697	1.400	305100	2.100
DS200X112X14.8X51CPH		200.0	112.0	16.00	18.80	14.80	3	105268	0.700	206697	1.400	305100	2.100
DS225X112X6X51CPH		225.0	112.0	6.00	13.60	-	2	25820	1.900	39660	3.800	45500	5.700
DS225X112X6.5X51CPH	C	225.0	112.0	6.50	13.60	-	3	23582	1.775	37417	3.550	44580	5.325
DS225X112X6.2X51CPH	C	225.0	112.0	6.50	13.60	6.20	3	23582	1.775	37417	3.550	44580	5.325
DS225X112X8X51CPH	B	225.0	112.0	8.00	14.50	-	3	32870	1.625	55412	3.250	70749	4.875
DS225X112X7.5X51CPH	B	225.0	112.0	8.00	14.50	7.50	3	32870	1.625	55412	3.250	70749	4.875
DS225X112X12X51CPH	A	225.0	112.0	12.00	17.00	-	3	64497	1.250	120738	2.500	171016	3.750
DS225X112X11.25PH	A	225.0	112.0	12.00	17.00	11.25	3	64497	1.250	120738	2.500	171016	3.750
DS225X112X16X51CPH		225.0	112.0	16.00	20.50	-	3	128500	1.130	247100	2.250	360100	3.380
DS225X112X15X20.5PH		225.0	112.0	16.00	20.50	15.00	3	128500	1.130	247100	2.250	360100	3.380
DS250X102X10X51CPH		250.0	102.0	10.00	18.00	-	3	56867	2.000	97282	4.000	126387	6.000
DS250X102X9.6X51CPH		250.0	102.0	10.00	18.00	9.60	3	56867	2.000	97282	4.000	126387	6.000
DS250X102X12X51CPH		250.0	102.0	12.00	19.00	-	3	73563	1.750	133131	3.500	182962	5.250
DS250X102X11.5X51CPH		250.0	102.0	12.00	19.00	11.50	3	73563	1.750	133131	3.500	182962	5.250
DS250X127X6.5X51CPH		250.0	127.0	6.50	14.80	-	3	29700	2.080	45420	4.150	51970	6.230
DS250X127X7X51CPH	C	250.0	127.0	7.00	14.80	-	3	26895	1.950	42527	3.900	50466	5.850
DS250X127X6.7X51CPH	C	250.0	127.0	7.00	14.80	6.70	3	26895	1.950	42527	3.900	50466	5.850
DS250X127X10X51CPH	B	250.0	127.0	10.00	17.00	-	3	51871	1.750	90206	3.500	119053	5.250
DS250X127X9.4X51CPH	B	250.0	127.0	10.00	17.00	9.40	3	51871	1.750	90206	3.500	119053	5.250
DS250X127X12X51CPH		250.0	127.0	12.00	19.30	-	3	87633	1.825	156021	3.650	210806	5.475
DS250X127X11.25PH		250.0	127.0	12.00	19.30	11.25	3	87633	1.825	156021	3.650	210806	5.475
DS250X127X14X51CPH	A	250.0	127.0	14.00	19.60	-	3	93239	1.400	175145	2.800	248828	4.200
DS250X127X13.1X51CPH	A	250.0	127.0	14.00	19.60	13.10	3	93239	1.400	175145	2.800	248828	4.200
DS250X127X16X51CPH		250.0	127.0	16.00	21.80	-	3	140941	1.450	267295	2.900	383017	4.350
DS250X127X15X51CPH		250.0	127.0	16.00	21.80	15.00	3	140941	1.450	267295	2.900	383017	4.350

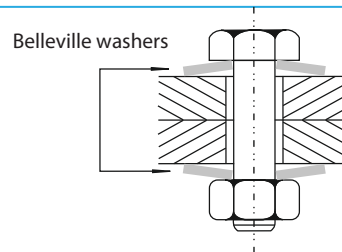
## 2. Belleville Washer

IIS Belleville Washers are manufactured in Imperial as well as Metric sizes. Belleville Washers, also called Conical Spring Washers are manufactured as per DIN 6796 and DIN 6908 Standards. IIS Belleville Washers are designed specifically for Heavy Duty Bolted Section such as Bus Bars, Transformers, Rectifiers, Heat Exchangers, Transmissions etc. These washers are intended to counteract the effect of setting which results in bolt/nut assemblies working loose. They effectively prevent loosening of the assembly under varying radial load and are designed for use with short bolts predominantly subject to thrust. Belleville Washers are high stressed components and cannot be used for Dynamic Loading and Infrequent Varying Load Applications.

IIS has ready Stock of all Standard Sizes of Belleville Washers in High Carbon Steel, Stainless Steel 300 series, Inconel®, 17-7 PH etc. with a variety of surface finishes.



**Belleville Washer DIN 6796**



**Application of Belleville Washer**

**Dimension Table for Belleville Washer Din 6796**

SAP Code	Nominal Bolt Size (mm)	Outer Diameter d2 H14 (mm)	Inner Diameter d1 H14 (mm)	Thickness s (mm)	h max (mm)	h min after permanent set Test (mm)	Flattening Force N	Residual Spring Force N
BW5X2.2X0.4XC75PH	2.0	5.0	2.2	0.40	0.60	0.50	920	-
BW6X2.7X0.5XC75PH	2.5	6.0	2.7	0.50	0.72	0.61	1540	-
BW7X3.2X0.6XC75PH	3.0	7.0	3.2	0.60	0.85	0.72	2350	-
BW8X3.7X0.8XC75PH	3.5	8.0	3.7	0.80	1.06	0.92	3160	-
BW9X4.3X1.1XC75PH	4.0	9.0	4.3	1.00	1.30	1.12	4050	1400
BW11X5.3X1.2XC75PH	5.0	11.0	5.3	1.20	1.55	1.35	6700	2300
BW14X6.4X1.5XC75PH	6.0	14.0	6.4	1.50	2.00	1.70	9400	4200
BW17X7.4X1.75XC75PH	7.0	17.0	7.4	1.75	2.30	2.00	13700	6200
BW18X8.4X2XC75PH	8.0	18.0	8.4	2.00	2.60	2.24	17200	7700
BW23X10.5X2.5XC75PH	10.0	23.0	10.5	2.50	3.20	2.80	27500	12400
BW29X13X3XC75PH	12.0	29.0	13.0	3.00	3.95	3.43	40000	18000
BW35X15X3.5XC75PH	14.0	35.0	15.0	3.50	4.65	4.04	55000	25000
BW39X17X4X51CPH	16.0	39.0	17.0	4.00	5.25	4.58	75000	34000
BW42X19X4.5X51CPH	18.0	42.0	19.0	4.50	5.80	5.08	95000	57000
BW45X21X5X51CPH	20.0	45.0	21.0	5.00	6.40	5.60	122000	73000
BW49X23X5.5X51CPH	22.0	49.0	23.0	5.50	7.05	6.15	152000	91000
BW56X25X6X51CPH	24.0	56.0	25.0	6.00	7.75	6.77	175000	122000
BW60X28X6.5X51CPH	27.0	60.0	28.0	6.50	8.35	7.30	230000	161000
BW70X31X7X51CPH	30.0	70.0	31.0	7.00	9.20	8.00	280000	196000

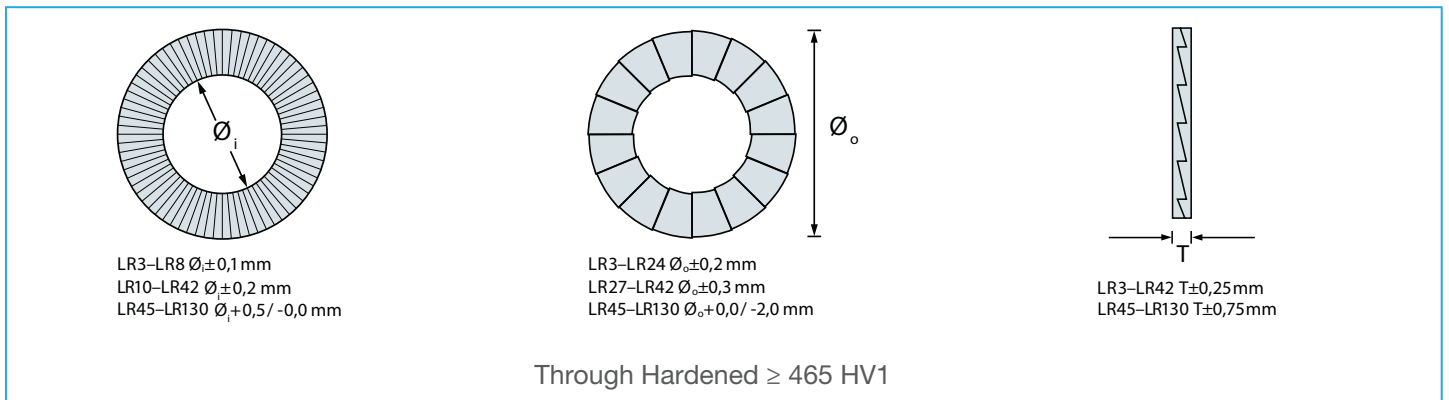


## 3. LockRite™ - Wedge Lock Washer

LockRite Washers deliver maximum joint security under extreme vibrations and Dynamic Loads. LockRite Washers are used along with bolts and offer resistance to self loosening behaviour during vibration and fluctuating loads. The Inner Wedges of LockRite Washers lock themselves with each other and Outer Serrations get locked on the respective mating surfaces leading to a secure Bolted Joint. Using LockRite Washers reduces self loosening of bolts.

LockRite Washers are available in Alloy Steel coated with GEOMET® 720, Stainless Steel (Surface Hardened) 316L, Inconel 718 and Duplex.

LockRite Washers are 100% manufactured and tested in India. We produce LockRite Washer to fit standard bolts sizes as well as with enlarged outer diameter used for flanged bolts. Custom Sizes available on request.



### Advantages and Features

1. To solve the problem of fastener failure due to Bolt Loosening
2. Simple, Reusable & Reduces Maintenance Cost
3. No lubrication required and no failure in locking if there is lubrication
4. Available is Stock to fit Standard Bolt Size
5. No friction during Locking and Vibration thus No Damage Wear and Tear to bolts
6. Available in variety of material to suit similar working temperature of bolts
7. Results in joint integrity

# Product - LockRite™ - Wedge Lock Washer

Alloy steel 51 Crv4 or C75 Coated Geomet 720®

SAP Code	Bolt size Metric	UNC	øi [mm]	øo [mm]	Thickness T [mm]
LR7X3.4X1.8M3ZF	M3	#5	3.40	7.00	1.80
LR7.6X3.9X1.8M3.5ZF	M3.5	#6	3.90	7.60	1.80
LR9X3.9X1.8M3.5ZF	M3.5	#6	3.90	9.00	1.80
LR7.6X4.4X1.8M4ZF	M4	#8	4.40	7.60	1.80
LR9X4.4X1.8M4ZF	M4	#8	4.40	9.00	1.80
LR9X5.4X1.8M5ZF	M5	#10	5.40	9.00	1.80
LR10.8X5.4X1.8M5ZF	M5	#10	5.40	10.80	1.80
LR10.8X6.5X1.8M6ZF	M6	-	6.50	10.80	1.80
LR13.5X6.5X2.5M6ZF	M6	-	6.50	13.50	2.50
LR11.5X7.2X1.8X1/4	-	1/4"	7.20	11.50	1.80
LR13.5X7.2X2.5X1/4	-	1/4"	7.20	13.50	2.50
LR13.5X8.7X2.5M8ZF	M8	5/16"	8.70	13.50	2.50
LR16.6X8.7X2.5M8ZF	M8	5/16"	8.70	16.60	2.50
LR16.6X10.3X2.53/8ZF	-	3/8"	10.30	16.60	2.50
LR21.1X10.4X2.53/8ZF	-	3/8"	10.30	21.10	2.50
LR16.6X10.7X2.5M10ZF	M10	-	10.70	16.60	2.50
LR21X10.7X2.5M10ZF	M10	-	10.70	21.00	2.50
LR18.5X11.4X2.5M11ZF	M11	7/16"	11.40	18.50	2.50
LR19.5X13X2.5M12ZF	M12	-	13.00	19.50	2.50
LR25.4X13X3.4M12ZF	M12	-	13.00	25.40	3.40
LR19.5X13.5X2.51/2ZF	-	1/2"	13.50	19.50	2.50
LR25.4X13.5X3.41/2ZF	-	1/2"	13.50	25.40	3.40
LR23X15.2X3.4M14ZF	M14	9/16"	15.20	23.00	3.40
LR30.7X15.2X3.4M14ZF	M14	9/16"	15.20	30.70	3.40
LR25.4X17X3.4M16ZF	M16	5/8"	17.00	25.40	3.40
LR30.7X17X3.4M16ZF	M16	5/8"	17.00	30.70	3.40
LR29X19.5X3.4M18ZF	M18	-	19.50	29.00	3.40
LR34.5X19.5X3.4M18ZF	M18	-	19.50	34.50	3.40
LR30.7X20X3.4X3/4	-	3/4"	20.00	30.70	3.40
LR39X20X3.4X3/4	-	3/4"	20.00	39.00	3.40
LR30.7X21.4X3.4M20ZF	M20	-	21.40	30.70	3.40
LR39X21.4X3.4M20ZF	M20	-	21.40	39.00	3.40
LR34.5X23.4X3.4M22ZF	M22	7/8"	23.40	34.50	3.40
LR42X23.4X4.6N22ZF	M22	7/8"	23.40	42.00	4.60
LR39X25.3X3.4M24ZF	M24	-	25.30	39.00	3.40
LR48.5X25.3X4.6M24ZF	M24	-	25.30	48.50	4.60
LR39X27.9X3.4X1	-	1"	27.90	39.00	3.40
LR48.5X27.9X4.6X1	-	1"	27.90	48.50	4.60
LR42X28.4X5.8M27ZF	M27	-	28.40	42.00	5.80
LR48.5X28.4X5.8M27ZF	M27	-	28.40	48.50	5.80
LR47X31.4X5.8M30ZF	M30	1.1/8"	31.40	47.00	5.80
LR58.5X31.5X6.6M30ZF	M30	1.1/8"	31.40	58.50	6.60
LR48.5X34.4X5.8M33ZF	M33	1.1/4"	34.40	48.50	5.80
LR58.5X34.4X6.6M33ZF	M33	1.1/4"	34.40	58.50	6.60
LR55X37.4X6.6M36ZF	M36	1.3/8"	37.40	55.00	6.60
LR63X37.3X6.6M36ZF	M36	1.3/8"	37.40	63.00	6.60
LR58.5X40.4X6.6M39ZF	M39	1.1/2"	40.40	58.50	6.60
LR63X43.2X6.6M42ZF	M42	-	43.20	63.00	6.60
LR70X46.2X7M45ZF	M45	1.3/4"	46.20	70.00	7.00
LR75X49.6X7M48ZF	M48	-	49.60	75.00	7.00
LR80X53.6X7M52ZF	M52	2"	53.60	80.00	7.00
LR85X59.1X7M56ZF	M56	2.1/4"	59.10	85.00	7.00
LR90X63.1X7M60ZF	M60	-	63.10	90.00	7.00
LR95X67.1X7M64ZF	M64	2.1/2"	67.10	95.00	7.00
LR100X71.1X9.5M68ZF	M68	-	71.10	100.00	9.50
LR105X75.1X9.5M72ZF	M72	-	75.10	105.00	9.50
LR110X79X9.4M76ZF	M76	3"	79.10	110.00	9.40
LR115X83.1X9.4M80ZF	M80	-	83.10	115.00	9.40
LR120X88.1X9.4M85ZF	M85	-	88.10	120.00	9.40
LR130X92.5X9.4M90ZF	M90	-	92.40	130.00	9.40
LR135X97.3X9.4M95ZF	M95	-	97.40	135.00	9.40
LR145X103.4X9.4ZF	M100	-	103.40	145.00	9.40
LR150X108.5X9.4ZF	M105	-	108.40	150.00	9.40
LR155X113.3X9.4ZF	M110	-	113.40	155.00	9.40
LR165X118.4X9.4ZF	M115	-	118.40	165.00	9.40
LR170X123.4X9.4ZF	M120	-	123.40	170.00	9.40
LR173X128.5X9.4ZF	M125	-	128.40	173.00	9.40
LR178X133.3X9.4ZF	M130	-	133.40	178.00	9.40

## 4. Serrated Washer

IIS Serrated Washers are Coned Washers with Trapezoidal Ribs across the cross section on both sides for gripping. IIS Serrated Safety Washers are ready to fit washers to sustain preload and avoid loosening. As the bolt is tightened the serrations crunch into the mating surfaces and prevent the screw from loosening due to vibration. Also the disc shape holds the necessary pre-tension. They are available in various sizes to fit bolts or screws. The diameters for Serrated Washers are matched to screw dimensions. The outer diameter of washer is matched to the diameter of screw head. This allows using screw and bolt including recessed heads, except countersunk screw.

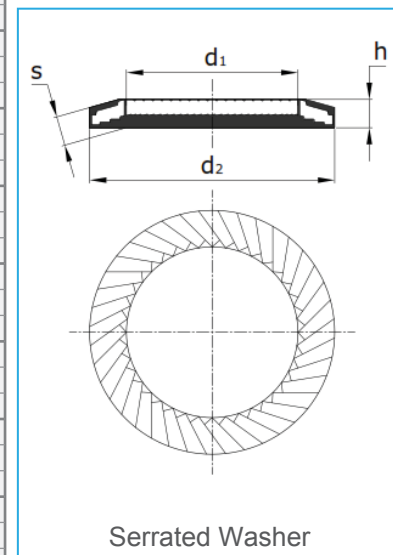
The advantages of IIS Serrated Safety Washers are:

1. Used for high vibration resistance due to positive rib contact
2. Excellent pre-tensioning
3. No splitting/cracking occurs during tightening
4. The concentric force of the washer eliminates the chances of bending fasteners



Dimension table for "L" (Light Series) Safety Washers

SAP Code	Size (Nominal) [mm]	d <sub>1</sub> H14 [mm]	d <sub>2</sub> H14 [mm]	s [mm]	h max. [mm]	h min. [mm]	for bolts	
							metric [mm]	imperial [mm]
SD3.2X1.7X0.35XC75PH	1.60	1.70	3.20	0.35	0.60	0.38	1.60	-
SD4X2.2X0.35XC75PH	2.00	2.20	4.00	0.35	0.60	0.39	2.00	-
SD4.8X2.7X0.45XC75PH	2.50	2.70	4.80	0.45	0.90	0.49	2.50	-
SD5.5X3.2X0.45XC75PH	3.00	3.20	5.50	0.45	0.90	0.51	3.00	1/8"
SD6X3.7X0.45XC75PH	3.50	3.70	6.00	0.45	0.90	0.52	3.50	-
SD7X4.3X0.5XC75PH	4.00	4.30	7.00	0.50	1.00	0.59	4.00	5/32"
SD9X5.3X0.6XC75PH	5.00	5.30	9.00	0.60	1.10	0.73	5.00	3/16"
SD10X6.4X0.7XC75PH	6.00	6.40	10.00	0.70	1.20	0.82	6.00	-
SD9.5X6.7X0.7XC75PH	6.35	6.70	9.50	0.70	1.20	0.79	0.00	1/4"
SD12X7.4X0.7XC75PH	7.00	7.40	12.00	0.70	1.30	0.89	7.00	-
SD13X8.4X0.8XC75PH	8.00	8.40	13.00	0.80	1.40	0.98	8.00	5/16"
SD16X10.5X1XC75PH	10.00	10.50	16.00	1.00	1.60	1.21	10.00	3/8"
SD15.9X11.6X1XC75PH	11.10	11.60	15.90	1.00	1.60	1.18	0.00	7/16"
SD18X13X1.1XC75PH	12.00	13.00	18.00	1.10	1.70	1.31	12.00	-
SD19X13.7X1.1XC75PH	12.70	13.70	19.00	1.10	1.80	1.33	0.00	-
SD22X15X1.2XC75PH	14.00	15.00	22.00	1.20	2.00	1.52	14.00	9/16"
SD24X17X1.3XC75PH	16.00	17.00	24.00	1.30	2.10	1.63	16.00	5/8"
SD27X19X1.5XC75PH	18.00	19.00	27.00	1.50	2.30	1.85	18.00	-
SD30X20X1.5XC75PH	19.00	20.00	30.00	1.50	2.50	1.98	0.00	3/4"
SD30X21X1.5XC75PH	20.00	21.00	30.00	1.50	2.50	1.94	20.00	-
SD33X23X1.5XC75PH	22.00	23.00	33.00	1.50	2.70	2.08	22.00	7/8"
SD36X25.6X1.8XC75PH	24.00	25.60	36.00	1.80	2.90	2.32	24.00	-
SD38X27X2XC75PH	25.40	27.00	38.00	2.00	3.10	2.52	0.00	1"
SD39X28.6X2XC75PH	27.00	28.60	39.00	2.00	3.10	2.52	27.00	-
SD45X31.6X2XC75PH	30.00	31.60	45.00	2.00	3.60	2.78	30.00	1 1/8"
SD54X38X2.5XC75PH	36.00	38.00	54.00	2.50	4.20	3.38	36.00	1 3/8"



Serrated Washer

Dimension table for "H" (Heavy Series) Safety Washers

SAP Code	Size (Nominal) [mm]	d <sub>1</sub> H14 [mm]	d <sub>2</sub> H14 [mm]	s [mm]	h max. [mm]	h min. [mm]	for bolts	
							metric [mm]	imperial [mm]
ST9X5.3X1XC75PH	5.0	5.3	9.0	1.0	1.3	1.07	5.0	3/16"
ST10X6.4X1XC75PH	6.0	6.4	10.0	1.0	1.4	1.08	6.0	-
ST13X8.4X1.2XC75PH	8.0	8.4	13.0	1.2	1.7	1.32	8.0	5/16"
ST16X10.5X1.5XC75PH	10.0	10.5	16.0	1.5	2.0	1.64	10.0	3/8"
ST18X13X1.5XC75PH	12.0	13.0	18.0	1.5	2.1	1.65	12.0	-
ST22X15X1.5XC75PH	14.0	15.0	22.0	1.5	2.2	1.76	14.0	9/16"
ST24X17X2XC75PH	16.0	17.0	24.0	2.0	2.6	2.21	16.0	5/8"
ST27X19X2XC75PH	18.0	19.0	27.0	2.0	2.7	2.27	18.0	-
ST30X21X2XC75PH	20.0	21.0	30.0	2.0	2.8	2.34	20.0	-
ST33X23X2XC75PH	22.0	23.0	33.0	2.0	3.0	2.42	22.0	7/8"
ST36X25.6X2.5XC75PH	24.0	25.6	36.0	2.5	3.4	2.87	24.0	-
ST38X27X2.5XC75PH	25.4	27.0	38.0	2.5	5.8	5.35	25.4	1"
ST39X28.6X2.5XC75PH	27.0	28.6	39.0	2.5	3.5	2.91	27.0	-
ST45X31.6X2.5XC75PH	30.0	31.6	45.0	2.5	3.8	3.12	30.0	1 1/8"
ST54X38X3XC75PH	36.0	38.0	54.0	3.0	7.5	6.76	36.0	1 3/8"



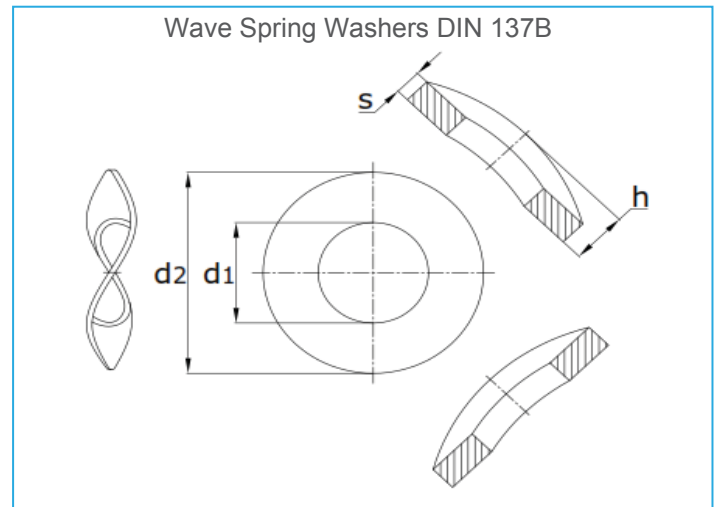
## 5. Wave Washer

### 5a. Wave Spring Washers DIN 137B

They are intended to counteract the effect of setting which results in bolt/nut assemblies working loose. They are used for short bolts which are predominantly subject to thrust. They effectively prevent loosening of the assembly under varying radial load.



Dimension Table for Wave Washer DIN 137B

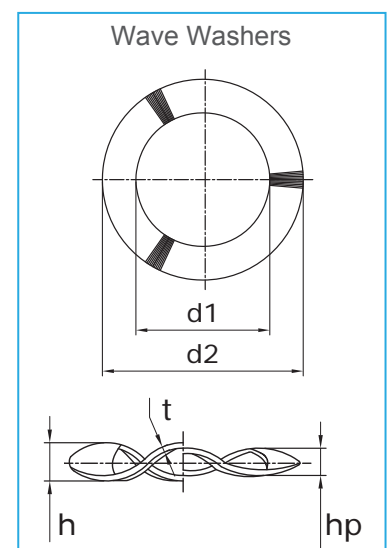


SAP Code	Nominal size	d <sub>1</sub> 1) H14	d <sub>2</sub> 1) js16	s		h	
				Nominal size	Limit deviations	min.	max.
WW8X3.2X0.5XC75PH	3.0	3.2	8	0.5	- +0.05	0.5	1.6
WW8X3.7X0.5XC75PH	3.5	3.7	8	0.5	- +0.05	0.5	1.8
WW9X4.3X0.5XC75PH	4.0	4.3	9	0.5	- +0.05	0.5	2.0
WW11X5.3X0.5XC75PH	5.0	5.3	11	0.5	- +0.05	0.5	2.2
WW12X6.4X0.5XC75PH	6.0	6.4	12	0.5	- +0.05	0.5	2.6
WW14X7.4X0.8XC75PH	7.0	7.4	14	0.8	- +0.06	0.8	3.0
WW15X8.4X0.8XC75PH	8.0	8.4	15	0.8	- +0.06	0.8	3.0
WW21X10.5X1XC75PH	10.0	10.5	21	1.0	- +0.07	1.0	4.2
WW24X13X1.2XC75PH	12.0	13.0	24	1.2	- +0.07	1.2	5.0
WW28X15X1.6XC75PH	14.0	15.0	28	1.6	- +0.08	1.6	6.0
WW30X17X1.6XC75PH	16.0	17.0	30	1.6	- +0.08	1.6	6.4
WW34X19X1.6XC75PH	18.0	19.0	34	1.6	- +0.08	1.6	6.6
WW36X21X1.6XC75PH	20.0	21.0	36	1.6	- +0.08	1.6	7.4
WW40X23X1.8XC75PH	22.0	23.0	40	1.8	- +0.10	1.8	7.8
WW44X25X1.8XC75PH	24.0	25.0	44	1.8	- +0.10	1.8	8.2
WW50X28X2XC75PH	27.0	28.0	50	2.0	- +0.10	2.0	9.4
WW56X31X2.2XC75PH	30.0	31.0	56	2.2	- +0.10	2.2	10.0
WW60X34X2.2XC75PH	33.0	34.0	60	2.2	- +0.10	2.2	10.6
WW68X37X2.5XC75PH	36.0	37.0	68	2.5	- +0.15	2.5	11.6

- 1) The diameter tolerances specified apply to spring washers when pressed flat. The tolerance on coaxiality between d<sub>1</sub> and d<sub>2</sub> (related to d<sub>2</sub>) shall be 1/2 IT 14  
 2) Values to be complied with in the spring force test as described in DIN 267 Part 26 have not as yet been specified for this size.

### 5b. Wave Washers

Wave Washers have continuous outer edge to prevent backlash in assemblies. IIS Wave Washers are installed in bearing housings and works by maintaining force and compensating axial tolerances up to 1.5mm thereby ensuring smooth and quiet running. Wave Washers are generally made in High Carbon Spring Steel as per EN10132-4 Standard and Stainless Steel grades. Typical devices where Wave Washers are used are Motors, Gearboxes or Speed-reducers, Connectors etc.



# Product - Wave Washer

Dimension Table for Wave Washer

SAP Code	d1 (mm)	d2 (mm)	t (mm)	h (mm)	No. of waves n	Test Force (F) at Test Height (h)		Ball Bearing Type		
						hp (mm)	F (N)			
WB6.6X4.5X0.1XC75PH	4.50	6.60	0.10	0.9	3.0	0.40	13.00	-	-	--
WB8.2X5.2X0.1XC75PH	5.20	8.20	0.10	0.9	3.0	0.40	16.00	-	-	--
WB8.2X5.6X0.2XC75PH	5.60	8.20	0.20	1.1	3.0	0.45	70.00	-	-	--
WB9.8X6.4X0.1XC75PH	6.40	9.80	0.10	1.2	3.0	0.55	15.00	-	-	--
WB9.8X6.4X0.2XC75PH	6.40	9.80	0.20	1.3	3.0	0.55	80.00	-	-	--
WB11.8X7.6X0.1XC75PH	7.60	11.80	0.10	1.2	3.0	0.55	15.00	624(EL4)	-	--
WB11.95X7.5X0.2PH	7.50	11.95	0.20	1.2	3.0	0.50	65.00	624(EL4)	-	--
WB12X7.4X0.3XC75PH	7.40	12.00	0.30	1.4	3.0	0.55	220.00	624	-	--
WB12X8.4X0.1XC75PH	8.40	12.00	0.10	1.2	3.0	0.55	7.00	-	-	--
WB11.9X8.3X0.15PH	8.30	11.90	0.15	1.2	3.0	0.55	24.00	-	-	--
WB11.8X8.3X0.2xC75PH	8.30	11.80	0.20	1.2	3.0	0.55	66.00	-	-	--
WB13.4X8.4X0.2xC75PH	8.40	13.40	0.20	1.3	3.0	0.55	65.00	-	-	--
WB14.1X10.35X0.15PH	10.35	14.10	0.15	1.4	3.0	0.60	20.00	-	-	--
WB15.3X10.4X0.1PH	10.40	15.30	0.10	1.7	3.0	0.75	12.00	625	-	--
WB15.4X10.4X0.15PH	10.40	15.40	0.15	1.6	3.0	0.70	40.00	625	-	--
WB15.25X10.2X0.2PH	10.20	15.25	0.20	1.7	3.0	0.75	80.00	625	-	--
WB15.4X10.3X0.3PH	10.30	15.40	0.30	1.8	3.0	0.75	180.00	634	625	--
WB18.5X11.2X0.2PH	11.20	18.50	0.20	1.5	3.0	0.65	38.00	635	626	607
WB18.5X11.2X0.3PH	11.20	18.50	0.30	1.4	3.0	0.55	18.00	635	626	607
WB17X12.3X0.15xC75PH	12.30	17.00	0.15	1.5	3.0	0.70	17.00	-	-	--
WB17.1X12.3X0.25PH	12.30	17.10	0.25	1.6	3.0	0.65	80.00	-	-	--
WB17.1X12.3X0.3PH	12.30	17.10	0.30	1.6	3.0	0.60	115.00	-	-	--
WB18.3X13.2X0.2PH	13.20	18.30	0.20	1.8	3.0	0.80	40.00	635	-	--
WB18.5X13.3X0.25PH	13.30	18.50	0.25	1.7	3.0	0.60	66.00	635	-	--
WB18.3X13.2X0.3PH	13.20	18.30	0.30	1.7	3.0	0.70	100.00	635	626	607
WB21.5X14.3X0.2PH	14.30	21.50	0.20	1.4	3.0	0.60	40.00	608	-	--
WB21.5X14.3X0.25PH	14.30	21.50	0.25	1.6	3.0	0.65	85.00	608	-	--
WB21.4X14.15X0.3PH	14.15	21.40	0.30	1.6	3.0	0.75	140.00	608	-	--
WB18.5X15.2X0.2PH	15.20	18.50	0.20	1.5	3.0	0.65	18.00	-	-	--
WB21.4X15.55X0.2PH	15.55	21.40	0.20	1.8	3.0	0.80	33.00	627	-	--
WB21.4X15.5X0.25PH	15.50	21.40	0.25	1.8	3.0	0.80	55.00	627	-	--
WB23.35X17.25X0.25PH	17.25	23.35	0.25	1.5	3.0	0.80	35.00	609(EL9)	-	--
WB23.35X17.3X0.3PH	17.30	23.35	0.30	1.5	3.0	0.75	60.00	609(EL9)	-	--
WB20.7X18.1X0.2PH	18.10	20.70	0.20	1.9	3.0	0.85	12.00	-	-	--
WB25.4X19.1X0.25PH	19.10	25.40	0.25	1.8	3.0	0.75	35.00	6000	629	--
WB25.4X19.1X0.3PH	19.10	25.40	0.30	1.8	3.0	0.75	65.00	6000	-	--
WB25.4X19.1X0.35PH	19.10	25.40	0.35	1.9	3.0	0.85	110.00	629(R9)	-	--
WB25.05X20.8X0.3PH	20.80	25.05	0.30	1.8	3.0	0.55	40.00	-	-	--
WB26.6X21.25X0.3PH	21.25	26.60	0.30	1.5	3.0	0.60	40.00	6001	-	--
WB26.7X21.4X0.4PH	21.40	26.70	0.40	1.6	3.0	0.60	115.00	6001	-	--

n = Number of waves

d2 = Outer diameter

h = Height by contact of all waves

d1 = Inner diameter

t = Thickness

F = Testforce at test height hp

# Product - Wave Washer

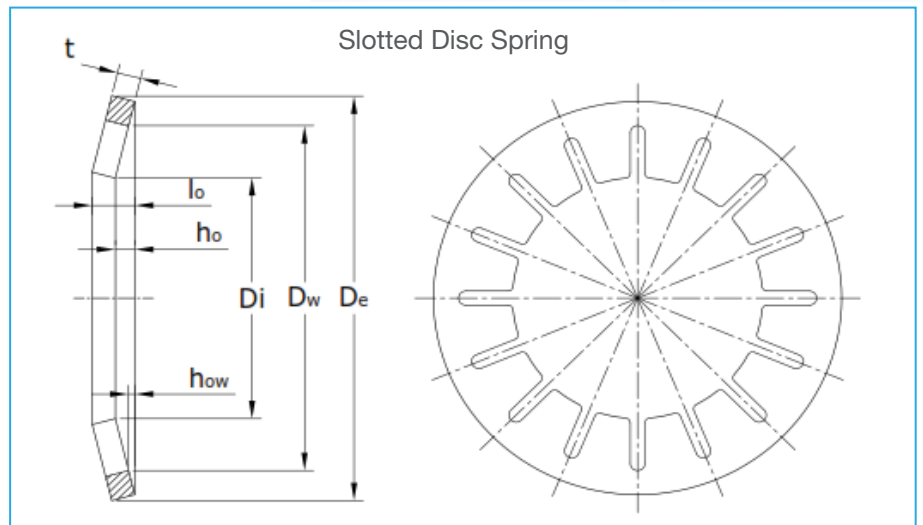
Dimension Table for Wave Washer

SAP Code	d2 (mm)	d1 (mm)	t (mm)	h (mm)	No. of waves	Test Force (F) at Test Height (h)		Ball Bearing Type				
					n	hp (mm)	F (N)					
WB26.65X21.3X0.5PH	21.30	26.65	0.50	2.00	3.0	0.76	200.00	6001	-	-	-	-
WB27.5X22.45X0.5PH	22.45	27.50	0.50	2.50	3.0	1.00	180.00	-	-	-	-	-
WB29.6X22.35X0.25PH	22.35	29.60	0.25	2.00	3.0	0.90	60.00	6200	-	-	-	-
WB29.6X22.35X0.3PH	22.35	29.60	0.30	2.00	3.0	0.85	65.00	6200	-	-	-	-
WB31.15X24.1X0.2PH	24.10	31.15	0.20	2.40	3.0	0.95	20.00	6002	6201	16002	-	-
WB31.3X24.1X0.35PH	24.10	31.30	0.35	2.30	3.0	1.00	80.00	6201	-	-	-	-
WB31.4X24.2X0.4PH	24.20	31.40	0.40	2.40	3.0	1.00	100.00	6201	-	-	-	-
WB31.4X24.2X0.5PH	24.20	31.40	0.50	2.40	3.0	1.00	250.00	6201	-	-	-	-
WB33.7X24X0.5XC75PH	24.00	33.70	0.50	2.50	4.0	1.25	650.00	6300	-	-	-	-
WB31.3X26.4X0.4PH	26.40	31.30	0.40	2.10	3.0	1.05	45.00	6001	6002	16002	-	-
WB31.4X26.6X0.5PH	26.60	31.40	0.50	2.20	3.0	1.00	90.00	6002	6201	16002	-	-
WB33.85X28.1X0.3PH	28.10	33.85	0.30	3.00	3.0	1.35	30.00	6003	-	-	-	-
WB33.85X28.1X0.4PH	28.10	33.85	0.40	3.10	3.0	1.30	75.00	6003	-	-	-	-
WB33.8X28X0.5XC75PH	28.00	33.80	0.50	3.00	3.0	1.25	150.00	6003	-	-	-	-
WB34.45X28.5X0.6PH	34.45	28.50	0.60	3.00	3.0	1.25	250.00	6003	-	-	-	-
WB35.9X30.2X0.5PH	35.90	30.20	0.50	2.50	4.0	1.00	360.00	3601	-	-	-	-
WB39.3X30.1X0.5PH	30.10	39.30	0.50	3.00	3.0	1.05	180.00	6302	-	-	-	-
WB41.4X30.15X0.5PH	30.15	41.40	0.50	3.00	3.0	1.25	180.00	6004	-	-	-	-
WB41.45X30.2X0.6PH	30.20	41.45	0.60	3.00	3.0	1.20	291.50	6004	-	-	-	-
WB35.4X29.7X0.4PH	29.70	35.40	0.40	3.20	3.0	1.40	210.00	6301	-	-	-	-
WB39X33.1X0.3XC75PH	33.10	39.00	0.30	2.80	4.0	1.25	70.00	6203	-	-	-	-
WB38.9X33.1X0.4PH	33.10	38.90	0.40	2.80	4.0	1.35	130.00	6203	-	-	-	-
WB39X33.3X0.5XC75PH	33.30	39.00	0.50	2.90	4.0	1.20	275.00	6203	-	-	-	-
WB40.7X35X0.35XC75PH	35.00	40.70	0.35	3.10	4.0	1.30	80.00	16004	-	-	-	-
WB44.8X37X0.5X42JPH	37.00	44.80	0.50	3.00	5.0	1.25	700.00	6204	-	-	-	-
WB46X39.9X0.4XC75PH	39.90	46.00	0.40	3.00	4.0	1.30	80.00	6303	6005	-	-	-
WB46.3X40X0.5XC75PH	40.00	46.30	0.50	3.00	4.0	1.25	185.00	6303	6005	-	-	-
WB50.5X41.7X0.5PH	41.70	50.50	0.50	3.40	5.0	1.45	550.00	6205	-	-	-	-
WB50.6X43.6X0.4PH	43.60	50.60	0.40	3.80	4.0	1.70	120.00	6304	-	-	-	-
WB53.6X44.8X0.4PH	44.80	53.60	0.40	3.70	4.0	1.65	110.00	16006	-	-	-	-
WB53.7X44.8X0.5PH	44.80	53.70	0.50	3.60	4.0	1.55	260.00	6006	-	-	-	-
WB61.3X51.2X0.4PH	51.20	60.30	0.40	3.60	4.0	1.60	90.00	6305	6206	16007	-	-
WB60.7X50.6X0.5PH	50.60	60.70	0.50	3.70	5.0	1.60	430.00	6007	6403	-	-	-
WB60.55X50.55X0.6PH	50.55	60.55	0.60	3.70	5.0	1.55	700.00	6007	6206	6305	6403	16007
WB66.8X57.5X0.4PH	57.50	66.80	0.40	3.40	5.0	1.50	150.00	16008	-	-	-	-
WB66.8X57.5X0.5PH	57.50	66.80	0.50	3.50	5.0	1.50	300.00	6008	-	-	-	-
WB70.5X60.9X0.4PH	60.90	70.50	0.40	3.50	5.0	1.55	150.00	6207+6404	-	-	-	-
WB70.8X60.7X0.5PH	60.70	70.80	0.50	3.40	5.0	1.45	260.00	6207+6404	-	-	-	-
WB71.2X60.9X0.6PH	60.90	71.20	0.60	3.50	5.0	1.45	480.00	6207	6306	6404	-	-
WB73.8X63.8X0.4PH	63.80	73.80	0.40	3.40	5.0	1.45	100.00	8009	-	-	-	-
WB73.5X63.5X0.5PH	63.50	73.50	0.50	3.60	5.0	1.55	300.00	8009	-	-	-	-
WB78.7X70.8X0.5PH	70.80	78.70	0.50	3.80	5.0	1.65	180.00	6010	6405	6208	6307	16010
WB78.5X70.5X0.6PH	70.50	78.50	0.60	3.60	6.0	1.50	540.00	6010	6405	-	-	-
WB83.9X73.9X0.5PH	73.90	83.90	0.50	3.50	5.0	1.50	178.00	6209	-	-	-	-
WB83.9X73.9X0.6PH	73.90	83.90	0.60	3.50	6.0	1.45	650.00	6209	-	-	-	-
WB88.2X78.3X0.5PH	78.30	88.20	0.50	3.70	6.0	1.60	300.00	6011	6210	6308	6406	16011
WB88X78.3X0.6X42JPH	78.30	88.00	0.60	3.90	6.0	1.65	600.00	6011	6210	6308	6406	16011
WB92.9X83.3X0.5PH	83.30	92.90	0.50	3.60	6.0	1.55	200.00	6012+16012	-	-	-	-
WB93.1X84X0.6XC75PH	84.00	93.10	0.60	3.60	6.0	1.55	420.00	6012+16012	-	-	-	-
WB97.8X88.4X0.5PH	88.40	97.80	0.50	4.00	6.0	1.75	210.00	6013	6211	6309	6407	16013
WB97.8X88.4X0.6PH	88.40	97.80	0.60	4.10	6.0	1.75	400.00	6013	6211	6309	6407	16013
WB107X97X0.5XC75PH	97.00	107.00	0.50	4.20	7.0	1.85	380.00	6014	6212	6310	6408	16014
WB107.3X97.4X0.6PH	97.40	107.30	0.60	4.40	7.0	1.90	690.00	6014	6212	6310	6406	16014
WB112X102X0.5XC75PH	102.00	112.00	0.50	4.40	7.0	1.95	350.00	6015	16015	-	-	-
WB112X102X0.6XC75PH	102.00	112.00	0.60	4.70	7.0	2.05	520.00	6015	16015	-	-	-
WB117X107X0.5XC75PH	107.00	117.00	0.50	4.40	7.0	2.00	280.00	6213	6311	6409	-	-
WB117X107X0.6X42JPH	107.00	117.00	0.60	4.70	7.0	2.05	520.00	6213	6311	6409	-	-
WB121.7X111.7X0.5PH	111.70	121.70	0.50	4.70	7.0	2.10	250.00	6016	6214	16016	-	-
WB121.7X111.7X0.6PH	111.70	121.70	0.60	4.80	7.0	2.10	460.00	6016	6214	16016	-	-
WB127.5X117.5X0.5PH	117.50	127.50	0.50	4.40	7.0	1.95	225.00	6017	6215	6312	6410	16017
WB127.5X117.5X0.6PH	117.50	127.50	0.60	4.60	7.0	2.00	400.00	6017	6215	6312	6410	16017
WB136.5X126.8X0.5PH	126.80	136.50	0.50	4.20	8.0	1.85	300.00	6018	6216	6313	6411	16018
WB136.5X126.8X0.6PH	126.80	136.50	0.60	4.40	8.0	1.90	550.00	6018	6216	6316	6411	16018



## 6. Ball Bearing Disc Spring - Slotted & Plain

IIS manufactures Ball Bearing Disc Springs (Plain and Slotted) used in maintaining positioning accuracy of bearings with no end play. Ball-Bearing Disc Springs are used with radial Ball bearings to minimize vibration and shaft deflection. Proper preloading will increase bearing rigidity and eliminate excessive wear and tear and running noise. Application of Preloaded Bearing Washers in Electric Motors helps to reduce operating noise. The preload force remains practically constant even when there is axial displacement of the bearing as a result of thermal expansion. The recommended preload is achieved when the Disc Springs are deflected to 75% of the free height.



Advantages of Ball Bearing Disc Springs (Preloading Washers):

1. The Spring load remains nearly constant for a large deflection range
2. Backlash Compensation & Regressive Curves help reduce preload variations
3. Very low force characteristics with very large deflection range
4. Multiplication of force by stacking of two or more in parallel
5. Available in sizes to accommodate all Bearing Sizes
6. Round shape ensures equal distribution of load around the bearing ring



Slotted Disc Springs have relatively low forces and are used with small size ball bearings. Disc Spring with slots have a strong digressive characteristic which helps in constant spring force over a large deflection range. We are able to achieve flatness through our special heat treatment process and full contact area helps in uniform preload.

# Product - Ball Bearing Disc Springs

## Ball Bearing Disc Springs arranged by Dimensions

SAP Code	Ball bearing IIS disc spring for ball bearing type			Dimension				F (0.50 h <sub>0</sub> )		F (0.75 h <sub>0</sub> )	
				D <sub>e</sub> * [mm]	D <sub>i</sub> * [mm]	t [mm]	l <sub>0</sub> [mm]	S [mm]	F [N]	S [mm]	F [N]
BS9.8X6.2X0.15XC75PH	-	623	-	9.8	6.2	0.15	0.60	0.23	9	0.35	13
BP9.8X6.2X0.2XC75PH	-	623	-	9.8	6.2	0.20	0.40	0.10	19	0.15	24
BS12.8X7.2X0.2XC75PH	-	624	-	12.8	7.2	0.20	0.65	0.23	16	0.35	18
BP12.8X7.2X0.25PH	-	624	-	12.8	7.2	0.25	0.50	0.12	24	0.19	29
BS15.8X8.2X0.25PH	-	625	634	15.8	8.2	0.25	0.75	0.25	17	0.40	20
BP15.8X8.2X0.25PH	-	625	634	15.8	8.2	0.25	0.55	0.15	20	0.22	23
BS18.8X9.2X0.25PH	-	626	635	18.8	9.2	0.25	1.00	0.38	17	0.55	20
BP18.8X9.2X0.3XC75PH	-	626	635	18.8	9.2	0.30	0.65	0.17	26	0.26	31
BS18.8X10.2X0.25PH	-	607	-	18.8	10.2	0.25	1.05	0.40	19	0.60	24
BP18.8X10.2X0.35PH	-	607	-	18.8	10.2	0.35	0.70	0.17	40	0.26	51
BS21.8X12.3X0.25PH	-	608	627	21.8	12.3	0.25	1.25	0.50	19	0.75	24
BP21.8X12.3X0.35PH	-	608	627	21.8	12.3	0.35	0.75	0.20	38	0.30	46
BS23.7X14.3X0.3PH	-	609	-	23.7	14.3	0.30	1.30	0.50	21	0.75	25
BP23.7X14.3X0.4PH	-	609	-	23.7	14.3	0.40	0.90	0.25	69	0.37	80
BS25.7X14.3X0.3PH	6000	-	629	25.7	14.3	0.30	1.40	0.55	24	0.80	28
BP25.7X14.3X0.4PH	6000	-	629	25.7	14.3	0.40	0.90	0.25	54	0.37	64
BS27.7X17.3X0.35PH	6001	-	-	27.7	17.3	0.35	1.45	0.55	25	0.80	31
BP27.7X17.3X0.4PH	6001	-	-	27.7	17.3	0.40	1.00	0.30	73	0.45	80
BS29.7S17.3X0.35PH	-	6200	-	29.7	17.3	0.35	1.55	0.60	26	0.90	32
BP29.7X17.3X0.4PH	-	6200	-	29.7	17.3	0.40	1.10	0.35	80	0.52	82
BS31.7X20.4X0.35PH	6002	6201	-	31.7	20.4	0.35	1.55	0.60	27	0.90	33
BP31.7X20.4X0.4PH	6002	6201	-	31.7	20.4	0.40	1.10	0.35	79	0.52	81
BS34.6X20.4X0.4PH	-	-	6300	34.6	20.4	0.40	1.65	0.65	27	1.00	32
BP34.6X20.4X0.4PH	-	-	6300	34.6	20.4	0.40	1.10	0.35	60	0.52	61
BS34.6X22.4X0.35PH	6003	6202	-	34.6	22.4	0.35	1.55	0.60	27	0.90	32
BP34.6X22.4X0.5PH	6003	6202	-	34.6	22.4	0.50	1.20	0.35	106	0.52	119
BS36.6X20.4X0.4PH	-	-	6301	36.6	20.4	0.40	1.90	0.75	31	1.10	35
BP36.6X20.4X0.5PH	-	-	6301	36.6	20.4	0.50	1.30	0.40	103	0.60	111
BS39.6X25.5X0.4PH	-	6203	-	39.6	25.5	0.40	1.90	0.75	33	1.10	37
BP39.6X25.5X0.5PH	-	6203	-	39.6	25.5	0.50	1.30	0.40	103	0.60	111
BS41.6X25.5X0.45PH	6004	-	6302	41.6	25.5	0.45	2.05	0.80	34	1.20	39
BP41.6X25.5X0.5PH	6004	-	6302	41.6	25.5	0.50	1.40	0.45	113	0.67	114
BS46.5X30.5X0.45PH	6005	6204	6303	46.5	30.5	0.45	2.05	0.80	39	1.20	44
BP46.5X30.5X0.6PH	6005	6205	6303	46.5	30.5	0.60	1.50	0.45	140	0.67	155
BS51.5X35.5X0.45PH	-	6205	6304	51.5	35.5	0.45	2.10	0.85	42	1.25	47
BP51.5X35.5X0.6PH	-	6205	6304	51.5	35.5	0.60	1.50	0.45	124	0.67	135
BS54.5X40.5X0.45PH	6006	-	-	54.5	40.5	0.45	2.15	0.85	48	1.30	53
BP54.5X40.5X0.6PH	6006	-	-	54.5	40.5	0.60	1.50	0.45	127	0.67	140
BS61.5X40.5X0.55PH	6007	6206	6305	61.5	40.5	0.55	2.55	1.00	49	1.50	54
BP61.5X40.5X0.7PH	6007	6206	6305	61.5	40.5	0.70	1.80	0.55	164	0.82	186
BS67.5X50.5X0.55PH	6008	-	-	67.5	50.5	0.50	2.60	1.05	76	1.60	78
BP67.5X50.5X0.7PH	6008	-	-	67.5	50.5	0.70	1.70	0.50	143	0.75	160
BS71.5X45.5X0.6PH	-	-	6306	71.5	45.5	0.60	2.90	1.15	71	1.70	74
BP71.5X45.5X0.7PH	-	-	6306	71.5	45.5	0.70	2.10	0.70	190	1.05	185
BS71.5X50.5X0.6PH	-	6207	-	71.5	50.5	0.60	2.90	1.15	127	1.70	127
BP71.5X50.5X0.7PH	-	6207	-	71.5	50.5	0.70	2.10	0.70	223	1.05	217
BS74.5X55.5X0.6PH	6009	-	-	74.5	55.5	0.60	2.90	1.15	88	1.70	91
BP74.5X55.5X0.8PH	6009	-	-	74.5	55.5	0.80	1.90	0.55	186	0.82	212
BS79.5X50.5X0.7PH	-	-	6307	79.5	50.5	0.70	3.10	1.20	78	1.80	83

# Product - Ball Bearing Disc Springs

## Ball Bearing Disc Springs arranged by Dimensions

SAP Code	Ball bearing IIS disc spring for ball bearing type			Dimension				F (0.50 h <sub>0</sub> )		F (0.75 h <sub>0</sub> )	
				D <sub>e</sub> * [mm]	D <sub>i</sub> * [mm]	t [mm]	l <sub>0</sub> [mm]	S [mm]	F [N]	S [mm]	F [N]
BP79.5X50.5X0.8PH	-	-	6307	79.5	50.5	0.80	2.30	0.75	228	1.12	228
BS79.5X55.5X0.7PH	6010	6208	-	79.5	55.5	0.70	2.90	1.10	127	1.65	127
BP79.5X55.5X0.8PH	6010	6208	-	79.5	55.5	0.80	2.30	0.75	264	1.12	264
BS84.5X60.5X0.75PH	-	6209	-	84.5	60.5	0.75	3.15	1.20	66	1.80	78
BP84.5X60.5X0.9PH	-	6209	-	84.5	60.5	0.90	2.50	0.80	352	1.20	357
BS89.5X60.5X0.8PH	-	-	6308	89.5	60.5	0.80	3.30	1.25	90	1.90	104
BP89.5X60.5X0.9PH	-	-	6308	89.5	60.5	0.90	2.50	0.80	284	1.20	288
BS89.5X65.5X0.8PH	6011	6210	-	89.5	65.5	0.80	3.40	1.30	180	1.95	189
BP89.5X65.5X0.9PH	6011	6210	-	89.5	65.5	0.90	2.50	0.80	330	1.20	333
BS94.5X75.5X0.8PH	6012	-	-	94.5	75.5	0.80	3.45	1.35	191	2.00	206
BP94.5X75.5X1XC75PH	6012	-	-	94.5	75.5	1.00	2.20	0.60	272	0.90	325
BP99X65.5X1XC75PH	-	-	6309	99.0	65.5	1.00	2.60	0.80	274	1.20	293
BP99X70.5X1XC75PH	6013	6211	-	99.0	70.5	1.00	2.60	0.80	312	1.20	333
BP109X70.5X1.25PH	-	-	6310	109.0	70.5	1.25	2.70	0.73	294	1.09	356
BP109X75.5X1.25PH	6014	6212	-	109.0	75.5	1.25	2.70	0.73	327	1.09	394
BP114X90.5X1.25PH	6015	-	-	114.0	90.5	1.25	2.45	0.60	311	0.90	396
BP119X75.5X1.25PH	-	-	6311	119.0	75.5	1.25	2.80	0.78	270	1.16	319
BP119X85.5X1.25PH	-	6213	-	119.0	85.5	1.25	2.80	0.78	331	1.16	391
BP124X90.5X1.25PH	6016	6214	-	124.0	90.5	1.25	3.00	0.88	392	1.31	441
BP129X85.5X1.25PH	-	-	6312	129.0	85.5	1.25	3.20	0.98	375	1.46	402
BP129X95.5X1.25PH	6017	6215	-	129.0	95.5	1.25	3.20	0.98	462	1.46	500
BP139X90.5X1.25PH	-	-	6313	139.0	90.5	1.25	3.25	1.00	329	1.50	353
BP139X101X1.25XC75PH	6018	6216	-	139.0	101.0	1.25	3.25	1.00	398	1.50	427
BP149X95.5X1.5XC75PH	-	-	6314	149.0	95.5	1.50	3.20	0.85	312	1.28	380
BP149X106X1.5XC75PH	6020	6217	-	149.0	106.0	1.50	3.20	0.85	368	1.28	448
BP159X101X1.5XC75PH	-	-	6315	159.0	101.0	1.50	3.50	1.00	356	1.50	409
BP159X111X1.5XC75PH	6021	6218	-	159.0	111.0	1.50	3.50	1.00	415	1.50	477
BP169X111X1.5XC75PH	-	-	6316	169.0	111.0	1.50	3.80	1.15	432	1.73	472
BP169X121X1.5XC75PH	6022	6219	-	169.0	121.0	1.50	3.80	1.15	497	1.73	542
BP179X121X2X51CPH	-	-	6317	179.0	121.0	2.00	4.20	1.10	702	1.65	861
BP179X126X2X51CPH	6024	6220	-	179.0	126.0	2.00	4.20	1.10	761	1.65	934
BP189X121X2XC75PH	-	-	6318	189.0	121.0	2.00	4.30	1.15	628	1.73	760
BP189X131X2X51CPH	-	6221	-	189.0	131.0	2.00	4.30	1.15	702	1.73	849
BP198X131X2X51CPH	-	-	6319	198.0	131.0	2.00	4.50	1.25	691	1.88	813
BP198X141X2XC75PH	6026	6222	-	198.0	141.0	2.00	4.50	1.25	779	1.88	917
BP213X151X2.25X51CPH	-	6224	6320	213.0	151.0	2.25	4.50	1.12	746	1.69	941
BP223X161X2.25X50CPH	6030	-	6321	223.0	161.0	2.25	4.60	1.17	747	1.76	933
BP228X161X2.25X51CPH	-	6226	-	228.0	161.0	2.25	4.95	1.35	864	2.02	1030
BP238X161X2.25X50CPH	6032	-	6322	238.0	161.0	2.25	5.25	1.50	886	2.25	1020
BP248X171X2.5X51CPH	-	6228	-	248.0	171.0	2.50	5.00	1.25	795	1.88	1000
BP258X171X2.5X51CPH	6034	-	6324	258.0	171.0	2.50	5.50	1.50	928	2.25	1108
BP268X181X2.5X50CPH	-	6230	-	268.0	181.0	2.50	5.70	1.60	990	2.40	1160
BP278X181X2.5X51CPH	6036	-	6326	278.0	181.0	2.50	6.00	1.75	1020	2.63	1160
BP288X191X2.75X51CPH	6038	6232	-	288.0	191.0	2.75	5.75	1.50	931	2.25	1150
BP298X191X2.75X51CPH	-	-	6328	298.0	191.0	2.75	6.35	1.80	1130	2.70	1310
BP308X202X3X51CPH	6040	6234	-	308.0	202.0	3.00	6.10	1.55	1050	2.33	1300
BP318X212X3X51CPH	-	6236	6330	318.0	212.0	3.00	6.20	1.60	1060	2.40	1300
BP338X232X3X51CPH	6044	6238	6332	338.0	232.0	3.00	6.60	1.80	1180	2.70	1410
BP358X242X3X51CPH	6048	6240	6334	358.0	242.0	3.00	7.00	2.10	1350	3.15	1530

## 7. Coil Springs



Heat Treatment of Coil Springs

At IIS, we are actively producing Coil Springs for a variety of application like Valves, Switchgear, Transformer, Actuator, Oil Engines, Earth Moving Equipments, Crushers, Windmills, etc. We Manufacture Compression, Tension, Torsion, Extension, Conical, Garter, Spiral, Volute Springs, etc. conforming to various International & Indian Standards like IS 7906, DIN 2095, DIN 2098, DIN 2194. Our Engineering Team has the expertise to design custom Coil Springs to suit the most critical applications. We are able to supply small quantities as well as large quantities in Short periods. Our Wide Production Range and capabilities allow us to serve your diverse needs.



Actuator Springs



Inconel Coil Springs



Tension Spring





Conical Spring



Double Torsion Spring

We have a wide range of material like Inconel, Nimonic, Beryllium Copper, Hastelloy, Stainless Steel in stock. IIS has capability to manufacture Coil Springs from Wire Diameter 0.2 mm & OD 1.7mm upto Wire Diameter 70mm & OD 500mm. IIS make Springs upto Length of 1560mm. We are producing Springs using High Tensile material bought directly from mills like TATA, Usha Martin etc.



Extension Spring Assembly



Garter Spring



Stainless Steel Tension Spring



Powder Coated Spring

## 8. Other Products

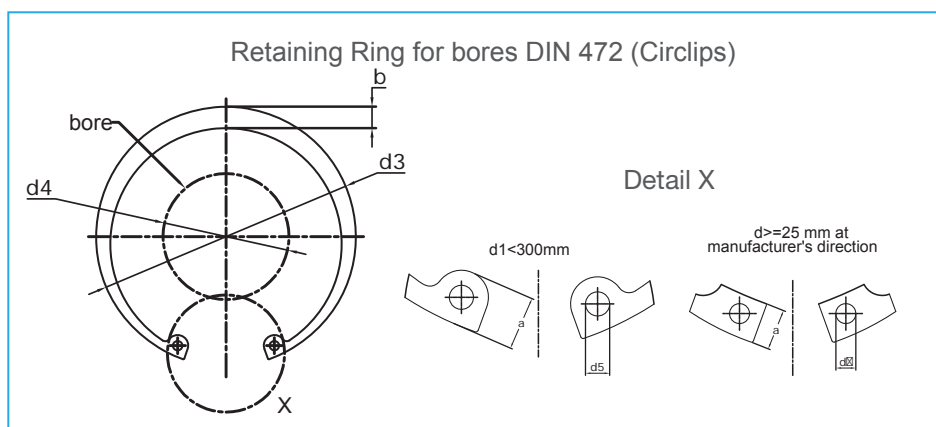
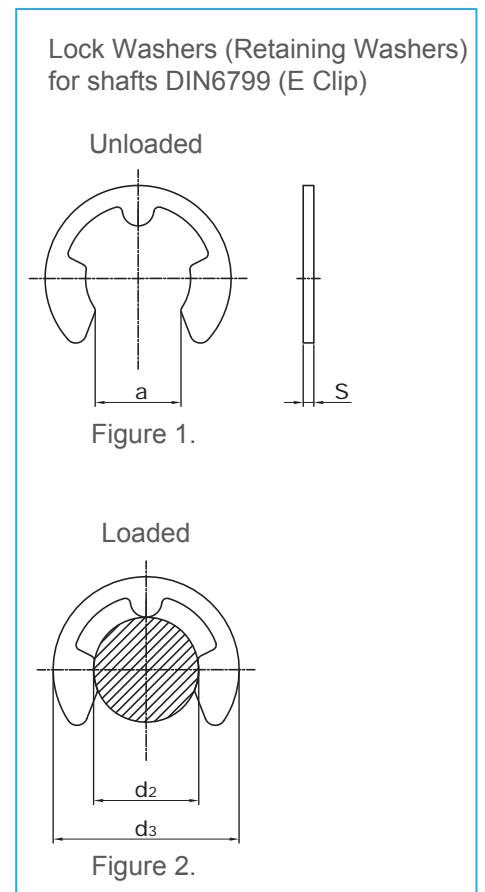
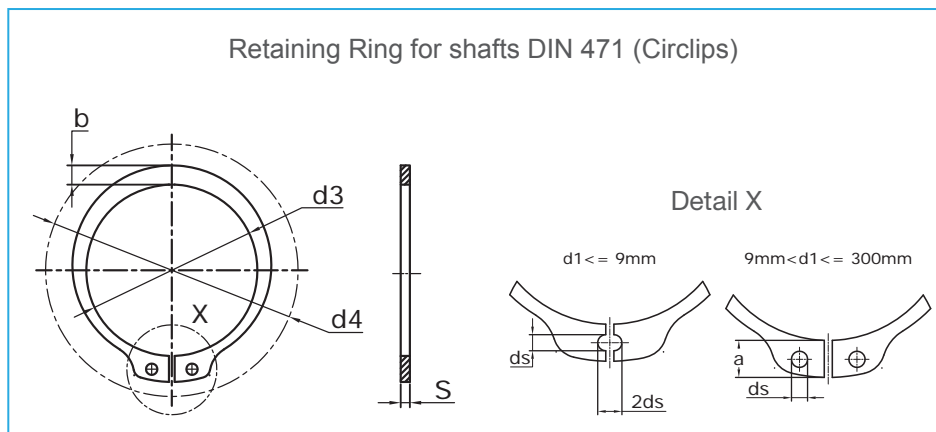
### Circlips & E-Clips

Circlips are used in application where a part needs to be pivot, spin or turn usually along with the bearing. Circlips are commonly used in Motors, Turbines, Pistons & Assemblies where they are subjected to strong centrifugal forces. Circlips fits in to a groove on the inside of a bore or outside a shaft.



Circlips & E-Clips - internal and external circlips

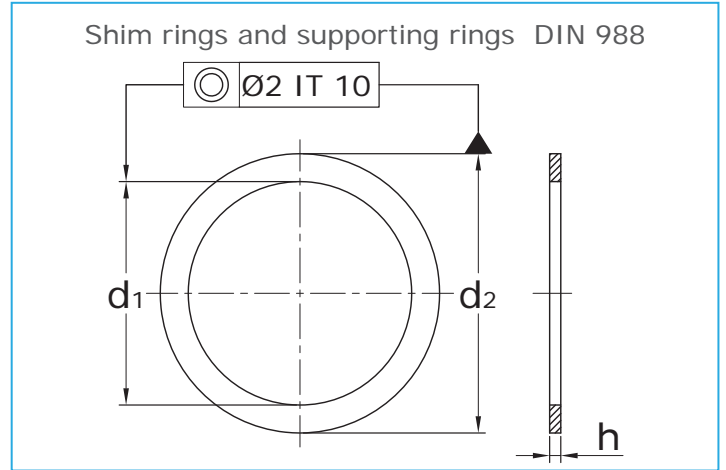
IIS Manufactures Circlips, E-Clips, Snap Rings, Retaining Rings as per DIN 471, DIN 472, DIN 6799, IS 3075, DIN 7993 in Carbon Steel with phosphate finish. Varieties of other materials are available on request. IIS also manufactures Custom Size for shafts & bores requiring a smaller radial mounting height.



## Shim Washer & Supporting Rings

Shim Washer (DIN 988) are generally manufacture from Spring Steel material (EN10132-4) in Plain Oiled Finish. They are available in incremental of 0.1mm thickness. Shim Washers provide a cost effective solution for compensating axial play resulting from manufacturing tolerances.

Supporting Rings are used with Circlips or Lock Washers to ensure that they do not deform when subjected to excessive axial forces.



## Serrated Lock Washer & Tooth Lock Washer

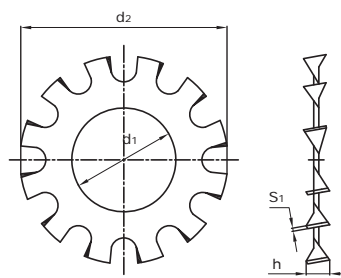
Serrated Lock Washer (DIN 6798) help locking bolts & screws which are subject to vibrations. They also help in maintaining uniform tightening torque in electrical or electronic applications. The outer teeth allow continuous contact when used in Electrical circuits. Tooth Lock Washer (DIN 6797) with form J are normally used when the Surface of the fastener is irregular. IIS manufactures Serrated Lock Washer in Spring Steel (EN10132-4) as well as Stainless Steel.

Tooth Lock Washer 6797 Type A external

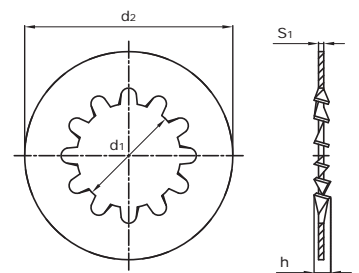


Toothed lock washers DIN 6797

Type A, With external teeth

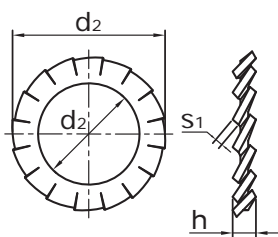


Type J, With internal teeth

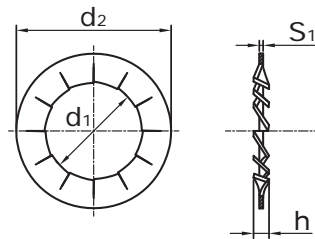


Serrated lock washers DIN 6798

Type A, with external teeth



Type J, with internal teeth



$$h = 3S_1$$

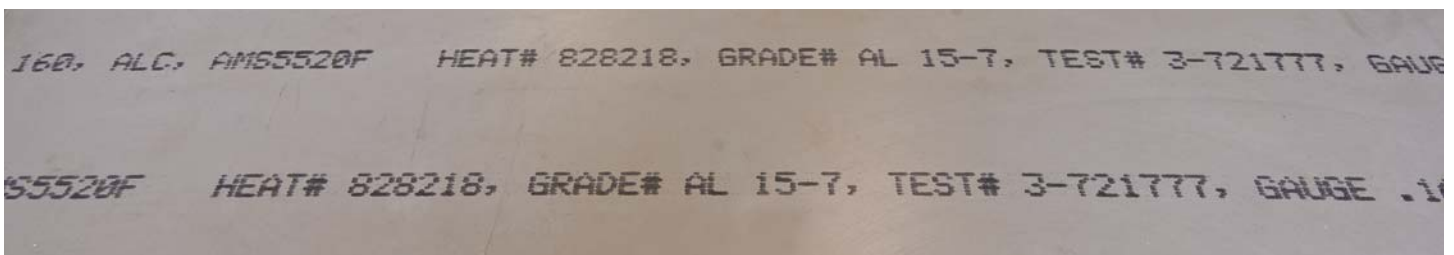
Serrated Lock Washer 6798 J Type Internal



# Material & Surface Finish

## Raw Materials

Description	Material Grade	Material No.	Working Temperature
Spring Steel & Alloy Strips DIN EN 10132-4 & Spring Wire			
High Carbon Steel	C67S	1.1231	-20 / +100
	C75S	1.1248	-20 / +100
Chrome Vanadium Steel allowing increase relaxation resistance to the spring	51CrV4	1.8159	-20 / +100
	51CrMoV4	1.7701	-50 / +200
Chrome Silicon Steel (OT or IT wires)	SAE 9254(54SiCr6) or FDSiCr / TDSiCr / VDSiCr as per EN10270-2:2001 or IS4454 Part 2:2001		-20 / +200
High Carbon Spring Steel. Patented & Music Spring wires	Cold Drawn Unalloyed Steel Wire (Wire Garde SL. SM. SH.DM.DH ) As per EN10270-1:2001 or IS4454 Part 1:2001		-80 / +150
Hard draw Stainless Wire (Full Hard)	SS302, SS304, SS316	1.4310, 1.4301, 1.4401	-200/+200
Corrosion Resistance Stainless Steel Strips & Sheets, Chromium-Nickel-Alloyed DIN EN 10151			
Work-Hardenable Stainless Steel 300 Series upto thickness 6 mm	X 10 CrNi 18-8 (SS301)	1.4310	-200 / +200
	X 5 CrNiMo 17-12-2 (SS316)	1.4401	-200 / +200
	X 5 CrNi 18-10 (SS304)	1.4301	-200 / +200
Precipitated age-Hardened Stainless Steel	X 7 CrNiAl 17-7 (17-7 Ph)	1.4568	-90 / +300
Heat Resistant Steel Sheets, Chromium-Molybdenum-Vanadium Steel DIN EN 10269			
High Temperature Spring Steel moderately corrosion resistant	X 22 CrMoV 12-1	1.4923	-50 / +500
	X 39 CrMo 17-1	1.4122	-50 / +400
Nickel and Cobalt Alloys, High Strength & Heat Resistance, Outstanding Fatigue Properties & Corrosion Resistance			
High Strength & Heat Resistance. Outstanding Fatigue Properties. Corrosion Resistance. Non Magnetic & Age Hardenable	NiCr 20 Co 18 Ti (Nimonic® 90)	2.4632 / 2.4969	-200 / +700
	NiCr 15 Fe 7 TiAl (Inconel® X 750)	2.4669	-200 / +600
	NiCr 19 NbMo (Inconel® 718)	2.4668	-200 / +600
	Duratherm 600	-	-200 / +550
Copper Alloys - Good Electric Conductivity			
Favorable Values of Strength & Elasticity for copper based Material	CuSn 8	2.1030	-50 / +100
	CuBe 2	2.1247	-260 / +200
High Temperature work Tool Steel			
High Temperature Tool Steel	X40CrMoV5-1 (H13)	1.2344	-20 / +350
	X30WCrV9 (H21)	1.2581	-20 / +350



Alloy 15-7 Mo Strip

## Details of different types of plating

Sr. No.	Types of coating	Standard/Reference	Salt Spray Test ASTM B117
1	Zinc Phosphating	IS 3618 / DIN EN12476	24 hrs. red rust
2	Mechanical Zinc Plating	ASTM B695	192 hrs. red rust
3	Geomet ® Zinc Flake Coating	ISO 10683	720 hrs. red rust
4	Electro Plating & Nickel Plating	ASTM - B633 & ASTM - B689	96 hrs. red rust
5	Powder coating, CED coating & Enamel Painting	IS - 13871	NA
And variety of other finishes available as per Customer requirement			





"Quality is not an act, it is a habit"

At IIS, we work together to take up newer challenges and responsibilities. We believe in getting remembered for our quality long after price is forgotten.

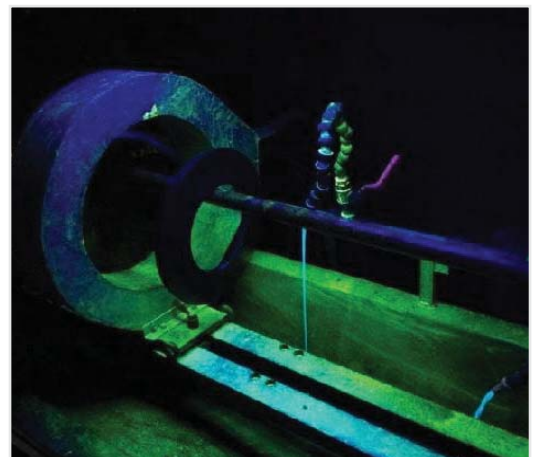
Monitoring, standardizing & innovating all our processes at every stage help us to create value for all our customers.

Our Quality engineers are well equipped with quality tools such as PPAP, CAPA, 8D, SPC etc. Our in plant Testing Capabilities like Salt Spray Testing, Creep Testing, Microstructure, Fatigue Testing and Failure analysis ensure our products are ready for real life applications.

Our quality goal is to supply superior parts with focus on customer's products.

We have fully integrated our SAP system into every area of business starting from CRM & purchasing to production & final quality testing. Using this we can assure our customers complete traceability of each process parameters and their results. We are able to provide test certificates confirming to EN 10204 3.1

IIS is committed to providing excellent products and services that meet all customer requirements by adhering to a quality management system that benefits our customers and employees.





# Let's Spring Forward



Quality is never an accident; IIS believe that Quality is the result of Intention, Efforts & Choice. Skillful execution of these ensures product compliance resulting in Quality Assurance.





# TESTIMONIALS & CERTIFICATIONS



Alexander Paal GmbH – Blumentalstraße 2 – 42859 Romscheid

International Industrial Springs  
Plot No. A/26, Road No. 10  
400604 Thane/Maharashtra  
India

## Supplier assessment 2017

dated 26.02.2018  
Supplier code 78032  
Your contact person

**Subject:** Supplier evaluation for the period 01.01.2017 / 31.12.2017

Ladies and gentlemen,

based on your deliveries and our identical orders found in the period 01.01.2017 until 31.12.2017 following evaluation:

Shipping – quality at 100%  
Quantity – loyalty at 100%  
Dates of loyalty at 72,00%

Complaints 1

Results in a total percentage of **90,66%** = **Note 1**

Note 1 = A – Supplier (Excellent! The more objective must be the Note 1, so 100%)  
Note 2 = B – Supplier (Room for improvement! Take suitable action!)  
Note 3 = C – Supplier (The quality must be necessarily better!)



Flow Control Division

Date: 01-Sep-16

To,

International Industrial Springs,  
Plot No. A26, Road No. 10, Wagle Industrial Estate,  
Thane – 400606, Maharashtra, INDIA  
Phone: 022-25821941 / 2508  
Fax: 022-25824478

Kind Attention: Mr. Sumit

**Subject:** S100 Spring validation test as per Flowserve standards.

We are happy to inform you that S100 spring part codes as appended below has successfully completed 5lacs cycles as per our Load A and Load B requirements of the specification.

Part No: M470010 – Inner Spring  
Part No: M470011 – Middle Spring  
Part No: M470012 – Outer Spring

S 100 Spring Data Before Cycle Test		
Part No	Load at L1 = 66.00mm	Load at L2 = 40.50mm
Spec	32.94 - 51.24	49.41 - 60.39
M470010	34.5	53.6
Spec	Load at L1 = 76mm	Load at L2 = 50.6mm
M470011	65.88 - 80.52	98.2 - 120.78
Spec	73.6	115.6
M470012	Load at L1 = 66.00mm	Load at L2 = 40.50mm
Spec	98.729 - 120.671	148.23 - 181.17
M470012	102.8	171.8

S 100 Spring Data After Cycle test (after 5 lacs)		
Part No	Load at L1 = 66.00mm	Load at L2 = 40.50mm
Spec	32.775 - 36.225	50.92 - 56.28
M470010	35.1	55.2
% of Change	-1.73	-2.98
Spec	Load at L1 = 76mm	Load at L2 = 50.6mm
M470011	69.92 - 77.28	109.82 - 121.38
% of Change	71.6	116.6
M470012	71.6	116.6
% of Change	2.71	0.86
Spec	Load at L1 = 66.00mm	Load at L2 = 40.50mm
M470012	97.66 - 107.94	163.21 - 180.39
% of Change	101	170
M470012	102.8	171.8
% of Change	1.75	1.04



INTERNATIONAL INDUSTRIAL  
PLOT NO A-26, ROAD NO 10,  
THANE

Format No:FUR/00/38  
Issue no:01/ dt.01.01.2017  
Rev No : 100/ dt.01.01.2017

Kind Attention: MR GANESH CHAUDHARI  
Greetings from Force Motors Limited!

Please find tabulated below the performance evaluation of your company for the period APR-JUN/2018

KEY PERFORMANCE INDICATOR'S SCORE CARD							Quarter: APR-JUN/2018
INTERNATIONAL INDUSTRIAL							Vendor Code: V009394G
For Your Supplies To AKURDI Plant							
RATING ELEMENT	UNIT	TARGET	ACTUAL PERFORMANCE	LEVEL OF PERFORMANCE	WEIGHTAGE	SCORE	
<b>FML PLANTS QUALITY PERFORMANCE</b>							
PPM Eq (PPM: 0)	%	100	100	N/A	25%	25.00	
Max. Nos. of lots without defect	%	100	100	N/A	10%	10.00	
<b>FML PLANTS DELIVERY PERFORMANCE</b>							
Schedule Adherence	%	100	95	N/A	25%	23.75	
<b>ARN COMPLIANCE</b>							
ARN Compliance	%	100	100	N/A	10%	10.00	
<b>STU STATUS</b>							
Supplier Audit Score *	%	100	83	N/A	15%	12.45	
Total No. of Items Supplied	Nos		2	N/A			
Total No. of Items under STU Status	Nos		0	N/A			
Complaint in STU Parts	Nos	Zero	0	N/A			
<b>QUALITY SYSTEM CERTIFICATION STATUS</b>							
Certification Status	ISO 9001 - 2008 "We require our supplier partners to be TS certified, please share your road map"						
Validity Date	14.09.2018 Certificate Validity Will Expire By End of This Quarter						
<b>FIELD QUALITY PERFORMANCE</b>							
Warranty(Last 3 Months)	%	100	100	N/A	10%	10.00	
Warranty(Last 12 Months)	%	100	100	N/A	5%	5.00	
						Total	96.20
<b>Rating</b>							
<b>Rating Criteria</b>							
Excellent		Good		Must Improve		Poor	
Scale - 90 to 100		80 to 89		65 to 79		Below 65	
Excellent		Good		Must Improve		Poor	

Your performance in last quarter has been "Excellent", we are confident the same will be sustained.

Regards,

Praveen Karnavat  
Sr. Vice President (Corporate Materials)

Makarand Kanade  
Sr. Vice President (Corporate Quality)

FORCE MOTORS LIMITED  
Regd. office: Mumbai-Pune Road, Akurdi, PUNE-411035, INDIA.  
Tel: (+91)20 27476381. Visit us at: www.forcemotors.com



## INTERNATIONAL INDUSTRIAL SPRINGS

HEAD OFFICE : PLOT NO. A26, ROAD NO. 10, WAGLE INDUSTRIAL ESTATE,  
THANE – 400 604, MAHARASHTRA, INDIA.

This is a multi-site certificate, additional site details are listed in the appendix to this certificate  
Bureau Veritas Certification Holding SAS – UK Branch certifies that the Management System of the above organization has been audited and found to be in accordance with the requirements of the Management System standards detailed below.

Standards

### ISO 9001:2015, ISO 14001:2015 & ISO 45001:2018

Scope of certification

- DESIGN AND MANUFACTURING OF DISC SPRINGS, WASHERS - BELLEVILLE, WAVE, SERRATED, CONICAL, SPRING & LOCK-RITE AND COIL SPRING UP TO 32MM DIAMETER
- MANUFACTURING OF REED VALVES, VALVE PLATES, PRECISION SHEET METAL STAMPING & COMPONENTS, CIR-CLIPS, E-CLIPS, CONTACT WASHER, RINGS, & ASSEMBLIES

Original cycle start date: 01 October 2018  
Expiry date of previous cycle: Not Applicable  
Certification Audit date: 31 August 2018  
Certification cycle start date: 01 October 2018  
Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: 30 September 2021  
Certificate No. IND18.4916U/Q/E/HS Version : 1 Revision date: 04 October 2018

Signed on behalf of BVCH SAS – UK Branch  
Ramesh KOREGAVE  
Director, CERTIFICATION  
South Asia Region



Certification body address: 3th Floor, 66 Prescot Street, London, E1 8HG, United Kingdom.

Local office: Bureau Veritas (India) Private Limited (Certification Business)  
72 Business Park, Midori Industrial Area, MIDC Cross Road "C",  
Andheri (East), Mumbai – 400 083, India.

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organization.  
To check this certificate validity please call +91 22 6274 2006.

Pg 1 of 2



## Bharat Heavy Electricals Limited Heavy Equipment Repair Plant Varanasi

08-October-2018 10:59 AM

Welcome M/S INTERNATIONAL INDUSTRIAL SPRINGS, THANE

Home
Enquiries
Purchase Orders
Material Received
PO Balance Yet to Supply

Vendor Performance Rating : **A 2018-1 (ALL)** GST No ::  
**27AAAFI0815P1ZA**

### Clarification Required from Vendor:

SRV No	Message	Department	
732700696 dt 31.03.2018	BILL REQUIRED (01 ORIGINAL + ...)	FINANCE & ACCOUNTS	Details

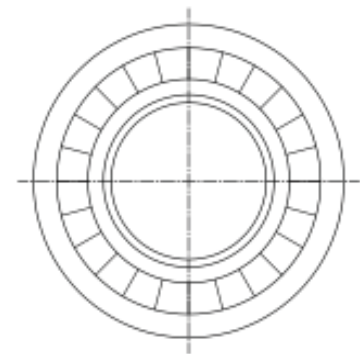
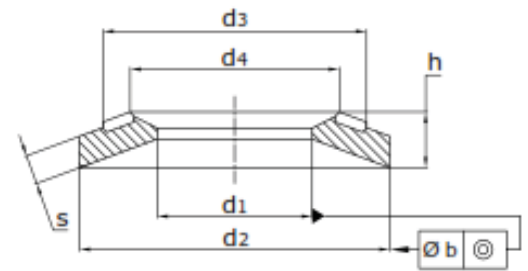
# Product- Serrated Conical Spring Washer (NFE25 - 511)

These Washers have below Functions :

1. When Flattened on Assembly they ensure that the Stresses are distributed in the Best Possible way over the Item to be Tightened.
2. The Serrations prevent the Screw / Nut from Loosening.
3. Because of their Elasticity, the Serrated Conical Washers Tighten up any Slack in the Components of an Assembly with Minimal Loss of Tightness.

These Washers are made of Carbon Steel with a Hardness of 42 - 50 HRC. Can also be made is Stainless Steel, 17 - 7 PH, Nimonic 90, Inconel X750 / 718, etc.

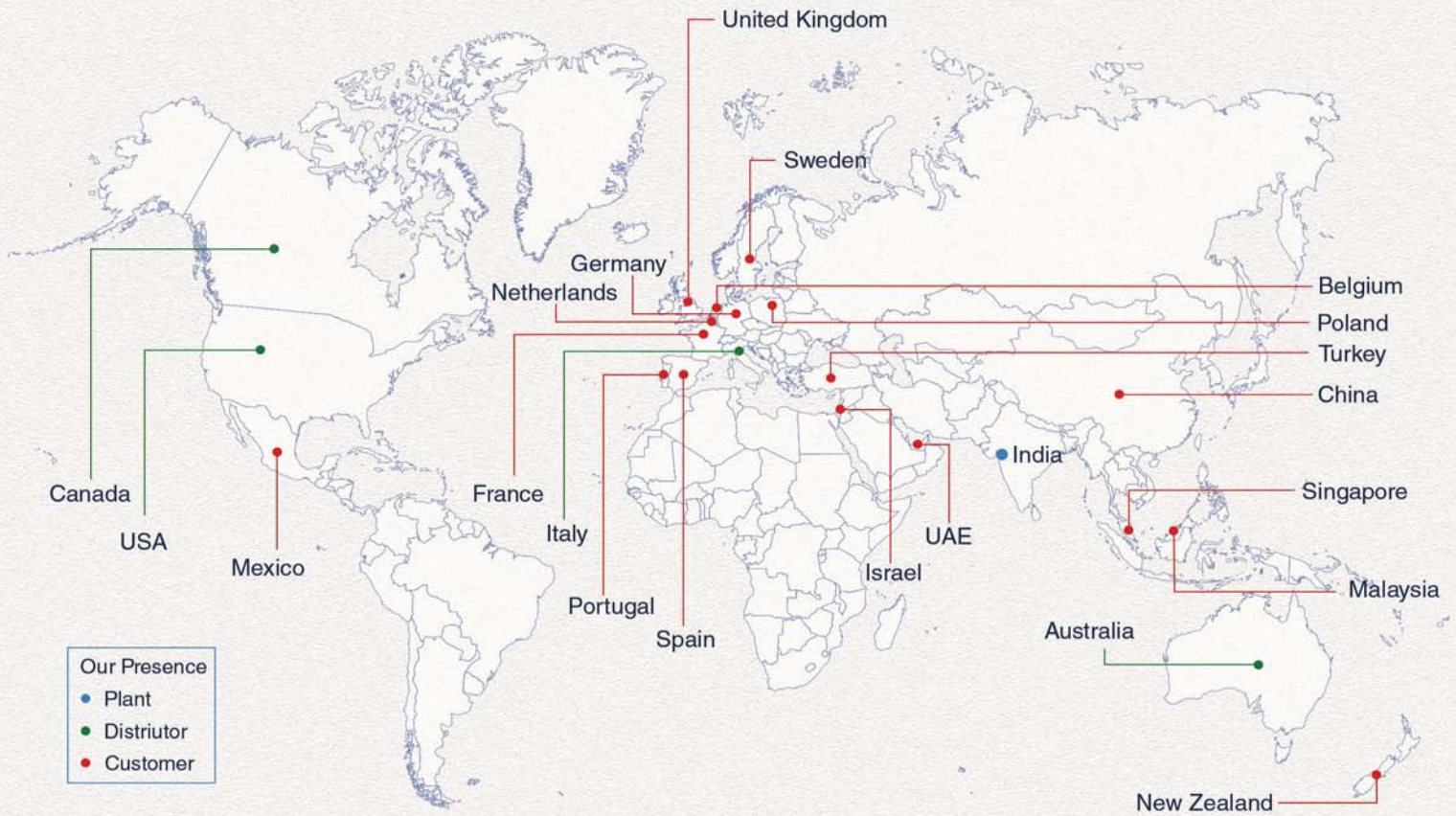
These Washers can be successfully used with Bolts and Screws of Classes 6.8, 8.8 and 10.9 they are well suited in several fields of application where High Elastic and Fastening Performances are required.



Serrated Conical Spring Washer  
(NFE 25-511)

SAP Code	Bolt Size	ID (d1)		OD (d2)		Thk. (s) mm	Height (h)		b 2 IT 12 (1)	No. of Serrations
		Min. (mm)	Max. (mm)	mm	Tol. (mm)		Min. (mm)	Max. (mm)		
SS6X3.1X0.5XC67NF	M3	3.10	3.35	6	+/- 0.24	0.5	0.70	0.90	0.24	28
SS8X3.1X0.6XC67NF				8	+/- 0.29	0.6	0.80	1.00	0.30	
SS10X3.1X0.6XC67NF				10	+/- 0.29	0.6	0.95	1.20	0.30	
SS8X4.1X0.8XC67NF	M4	4.10	4.40	8	+/- 0.29	0.8	1.00	1.20	0.30	32
SS10X4.1X0.9XC75YZ				10	+/- 0.29	0.9	1.15	1.40	0.30	
SS14X4.1X1XC67NF				14	+/- 0.35	1.0	1.40	1.80	0.36	
SS10X5.1X1XC67NF	M5	5.10	5.40	10	+/- 0.29	1.0	1.25	1.50	0.30	36
SS12X5.1X1.1XC75YZ				12	+/- 0.35	1.1	1.45	1.80	0.36	
SS16X5.1X1.2XC67NF				16	+/- 0.35	1.2	1.70	2.10	0.36	
SS12X6.1X1.2XC67NF	M6	6.10	6.40	12	+/- 0.35	1.2	1.55	1.85	0.36	45
SS14X6.1X1.3XC60NF				14	+/- 0.35	1.3	1.75	2.10	0.36	
SS18X6.1X1.4XC67NF				18	+/- 0.35	1.4	2.10	2.50	0.36	
SS16X8.2X1.4XC67NF	M8	8.20	8.56	16	+/- 0.35	1.4	1.80	2.20	0.36	45
SS18X8.2X1.4XC60NF				18	+/- 0.35	1.4	1.90	2.35	0.36	
SS22X8.2X1.6XC67NF				22	+/- 0.42	1.6	2.20	2.70	0.42	
SS20X10.2X1.6XC75NF	M10	10.20	10.56	20	+/- 0.42	1.6	2.10	2.60	0.42	45
SS22X10.2X1.6XC75YZ				22	+/- 0.42	1.6	2.25	2.75	0.42	
SS27X10.2X1.8XC75NF				27	+/- 0.42	1.8	2.60	3.10	0.42	
SS24X12.4X1.8XC67NF	M12	12.40	12.83	24	+/- 0.42	1.8	2.40	2.90	0.42	45
SS27X12.4X1.8XC60NF				27	+/- 0.42	1.8	2.60	3.10	0.42	
SS32X12.4X2XC67NF				32	+/- 0.50	2.0	3.10	3.60	0.50	
SS30X14.4X2.4XC75YZ	M14	14.40	14.83	30	+/- 0.42	2.4	3.20	3.70	0.42	60
SS32X16.4X2.8XC60NF	M16	16.40	16.83	32	+/- 0.50	2.8	3.60	4.10	0.50	
SS40X20.5X3.2XC75YZ	M20	20.50	21.02	40	+/- 0.50	3.2	4.30	4.90	0.50	





sprężyny talerzowe    디스크 봄    Keilsicherungscheibe  
 واشتر چوب گوه، قفل    ék záróalátétet    đĩa mùa xuân    Keilsicherungscheibe  
**Wedge-lock Washers**    Дисковые пружины    Vònđ đêđ Wedge -lock    잠금 와셔 웨지  
 disk yaylar    wedge lāsbricka    القرص سبرينج  
**Disc Springs**    楔形锁紧垫圈    硇形弹簧    썩기 잠금 와셔  
 wig borgring    硇形弹簧    Takoz kilit Yıkayıcılar    diosca Springs  
 硇形弹簧    락크왓셔우େჯ    cuña arandela de seguridad    klín pojistnou podložku  
 Takoz kilit Yıkayıcılar    Podkładki klinowe - lock    硇形弹簧    tallerkenfjærer  
 硇形弹簧    resortes de disco    klin stopornuju šajbu    cuneo rondella di sicurezza    硇形弹簧  
 硇形弹簧    Kil - lāsbrickor    tallriksfjädrar    ressorts de disque  
 硇形弹簧    Tellerfedern    Arandelas de cuña de bloqueo    Кли́н - пружинными шайбами  
 硇形弹簧    Kile- lāseskiver



**INTERNATIONAL INDUSTRIAL SPRINGS**

**Head Office**

Plot No. A-26, Road No. 10, Wagle Industrial Estate, Thane - 400604, Maharashtra, INDIA  
 Tel. : 2582 1941 / 2508 /2581 3416, Fax : 91-22-2582 4478

\* Tel. : 2582 1941 / 2508 / 2581 3416

\* Fax : 91-22-2582 4478

Email : sales@internationalsprings.com



Visit us at  
[www.internationalsprings.com](http://www.internationalsprings.com)