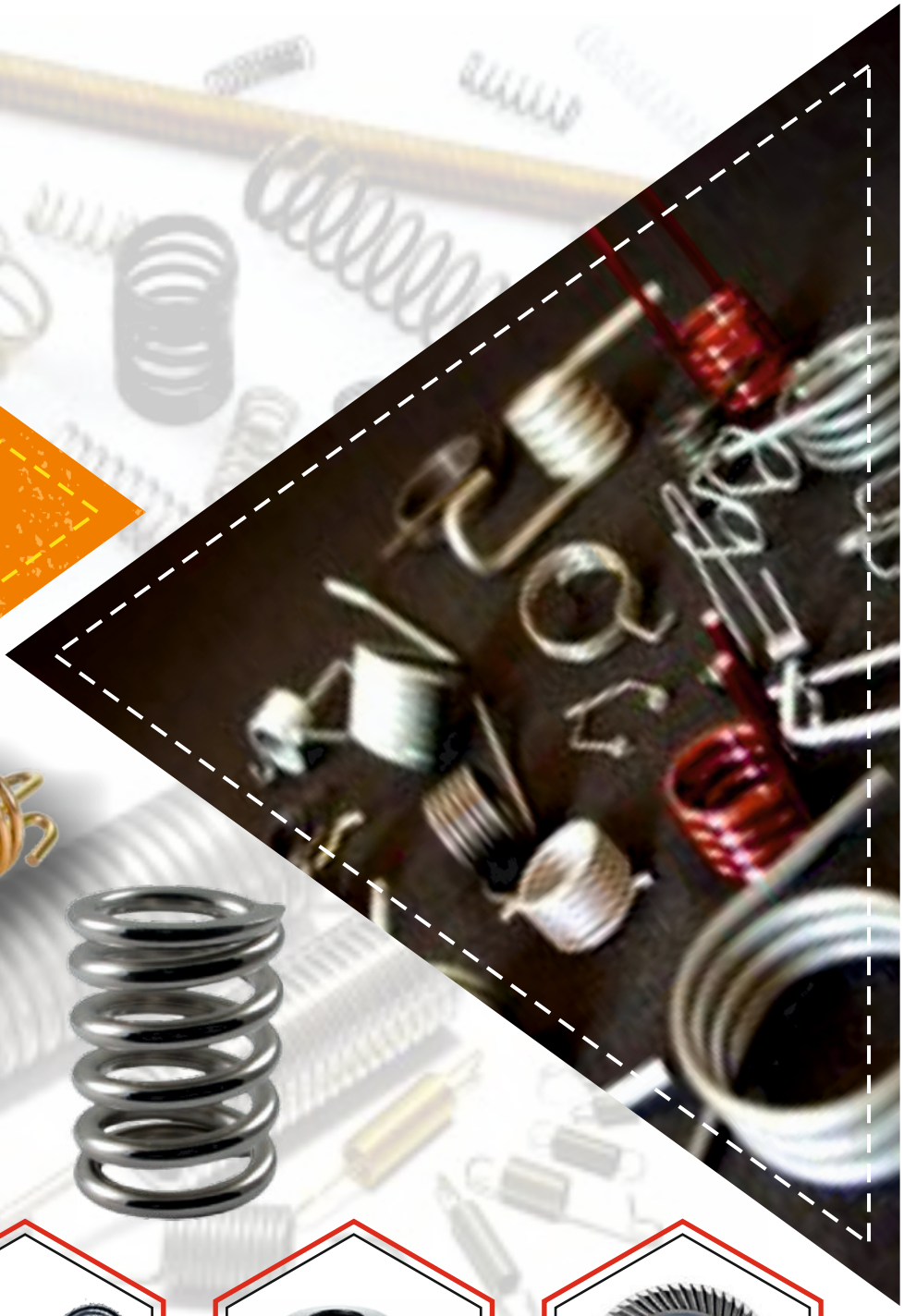
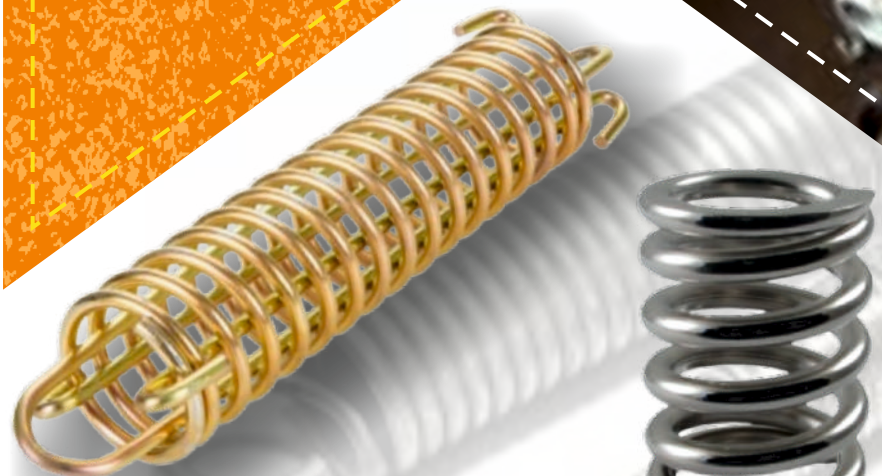
NISHI INDUSTRIES

ISO 9001:2015 CERTIFIED COMPANY

We Never Compromise in Quality...





COIL SPRING

TORSION SPRING

DISC SPRING

SERRATED WASHER

About us...

Specialised in Industrial Springs like **Coil Spring, Disc Spring, Sheet Metal Component.**

Quality Policy

We are committed with our Duties and Responsibilities to provide the product that meet Customer Requirement. Customer Satisfaction is our Goal. We also strive for Continual and Constant Improvement with the help of effective Quality Management System in all areas.

Objective

1. Constant Improvements in Product Quality by using latest Testing and Manufacturing Equipment
2. Improvement in Delivery Performance
3. To emphasize on Cost Reduction by adopting several advance methods.
4. Individual attention

We Specialize In Springs :-

Helical Springs, Roll Springs, Coil Springs, Disc Springs, Compression Springs, Sheet Metal, Wire Forming, Spiral Springs, Torsion Springs, Taper Springs in different grade of material Spring Steel, Stainless Steel 301/302/304/316/316L, Inconel X750/718.

We have a well-equipped manufacturing unit situated at Asangaon, Thane to cater the demands of the ever growing industry. Our products are manufactured according to the Standard Specification as well as designs provided by the customers keeping in mind the stringent quality control.

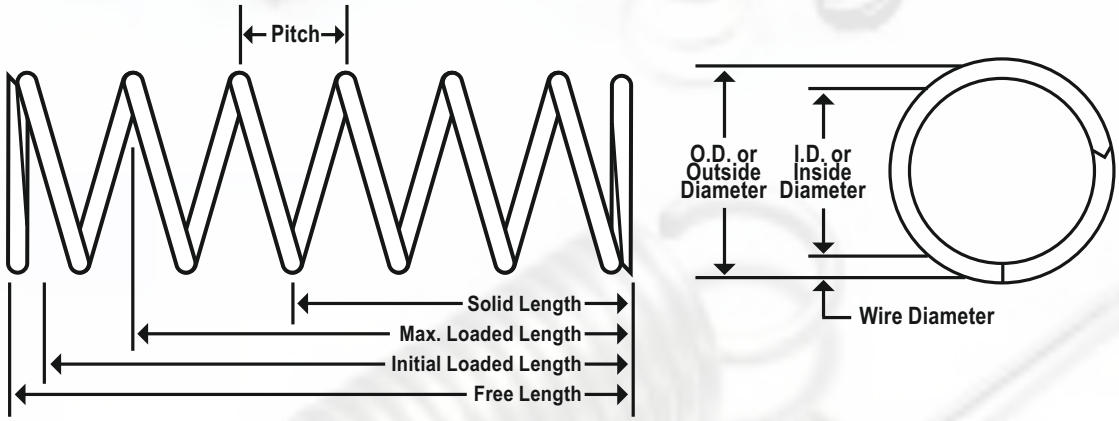
We also cater OEM Spares as per Customer's Requirement.

We would like to introduce ourselves as a team of experienced Professional and Technical people involved in Manufacturing of Copper & Non-Ferrous Components.

INDEX

Compression Springs DIN 2095 & IS 7906

Compression Spring offers resistance to the Axial Compressive Force.
It is an Open-Coil (Pitch) Helical Spring.
They are generally Coiled as Constant Diameter Cylinder.



Common Forms :

Conical, Concave (Barrel), Convex (Hourglass) and various combinations of above. The space allotted will decide the allowable Solid Height, Inner Diameter and Outer Diameter of Compression Springs. Along with the Load and Deflection, the Dimensional Limits will decide the Stress Level. Therefore, to avoid any Design Changes, sufficient care should be taken to decide allotted space.

Spring Materials :

Common Spring materials include Stainless Steel, Alloy Steels, Carbon Steels and some Non-Ferrous materials. NISHI also produces spring from Exotic material like Inconel X-750, Inconel 718, Nimonic 90, Monel, Nimonic, Hastelloy, Beryllium copper etc.
Our Speciality is in Inconel Materials

Spring Design :

Selection of material is one of the important steps in Spring Design. Types of material available, Mechanical and Electrical Properties, Operating Conditions are few points of prime importance for material selection. In case of Heavy Stress Cycles, a Tight Control is required in material quality. Scratches, seams and other such flaws affect fatigue life considerably. Carbon Steel and Alloy Steel give optimum Service and Heavy Stress Cycles

Stress Relieving :

Coiling operation produces Stress so Springs must be Stress Relieved. To relieve the harmful residual stresses, Stress Relieving of Springs is done. Depending upon the type of Spring Material - Furnace Temperature & Soaking Time will vary accordingly. Stress Relieving causes dimensional distortion so manufacturer should predict the change to achieve required dimensions. Forming should immediately follow stress relieving. We have in-house heat-treatment furnaces for large diameter springs. We also do shot penning on springs to introduce compressive stresses on the springs which help to increase the fatigue life of the springs.

Capacity :

We manufacture Compression Springs of any Size, Length and Dimension as per Customer Specifications / Dimensions / Drawings /Samples.

Surface Coating :

We offer a variety of Coating on Springs like Mechanical Zinc plating, Zinc Electro plating, Nickel Plating, Electroless Nickel plating, Geomet, Dacromet Coating, Cadmium Plating, Powder Coating, Epoxy painting etc.

Tension Springs

Tension Springs also known as Extension Springs are Helical Wound Coil Springs usually designed with Hooks, Loops or End Coils. The main use of a Tension Spring is to absorb or store Energy along with creating a resistance to the Pulling Force, the Spring gets Stretched as the Load is applied to it.

Spring Materials :

Common Spring materials include Stainless Steel, Alloy Steels, Carbon Steels and some Non-Ferrous materials. **NISHI** also produces spring from Exotic material like Inconel X-750, Inconel 718, Nimonic 90, Monel, Nimonic, Hastelloy, Beryllium copper etc.

Our Speciality is in Inconel Materials

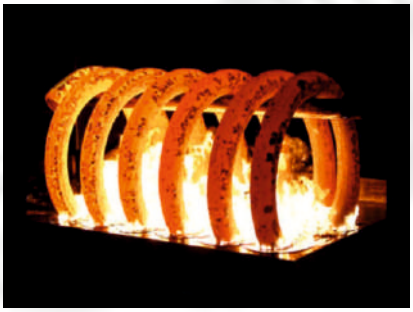
Capacity :

We manufacture Compression Springs of any Size, Length and Dimension as per Customer Specifications / Dimensions / Drawings /Samples.

Surface Coating :

We offer a variety of Coating on Springs like Mechanical Zinc plating, Zinc Electro plating, Nickel Plating, Electrolesss Nickel plating, Geomet, Dacromet Coating, Cadmium Plating, Powder Coating, Epoxy painting etc.

Hot Coiled Springs



Hot Coiled Springs are generally used in Elevated Temperatures, High Load applications or in a Corrosive environment. The Transportation Industry, Agriculture Equipment manufacturers and Construction Equipment manufacturers are some of the Largest users of the Hot Coiled Springs.

Generally Springs with Bar Diameter greater than 12.7mm (0.5 in.) are Hot Coiled. Bars of Carbon or Alloy Steel are generally used for Hot Coiled Springs. For most Hot Coiled Springs, finished Hardness requirement is in the range of Rockwell C 44-53.

Torsion Springs

Torsion Springs resist external Torque with angularly deflecting ends. Contrary to its name, the Wire is subjected to Bending Stress and Not Torsional Stress. These are Close Wound Springs. After deflection, the Body Length increases and Coil Diameter reduces.

Installation :

Spring load and deflection largely depend on the type of end and installation. Every torsion spring will have two points of contact at the end and one at the arbor. While designing, the position of the contact points and their relative position should be made clear.

Types of Ends :

A great care must be taken while deciding spring ends as different types of ends and special end forming result in higher cost and frequent tool change.

Spring Materials :

Common Spring materials include Stainless Steel, Alloy Steels, Carbon Steels and some Non-Ferrous materials. **NISHI** also produces spring from Exotic material like Inconel X-750, Inconel 718, Nimonic 90, Monel, Nimonic, Hastelloy, Beryllium copper etc.

Our Speciality is in Inconel Materials

Capacity :

We manufacture Compression Springs of any Size, Length and Dimension as per Customer Specifications / Dimensions / Drawings /Samples.

Surface Coating :

We offer a variety of Coating on Springs like Mechanical Zinc plating, Zinc Electro plating, Nickel Plating, Electrolesss Nickel plating, Geomet, Dacromet Coating, Cadmium Plating, Powder Coating, Epoxy painting etc.

Torsion springs are manufactured to DIN 2194 & EN13906

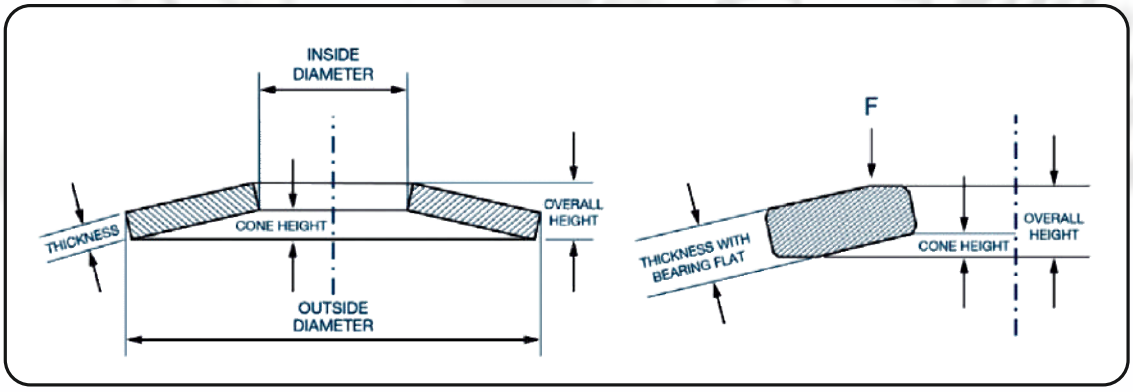
Garter Springs :

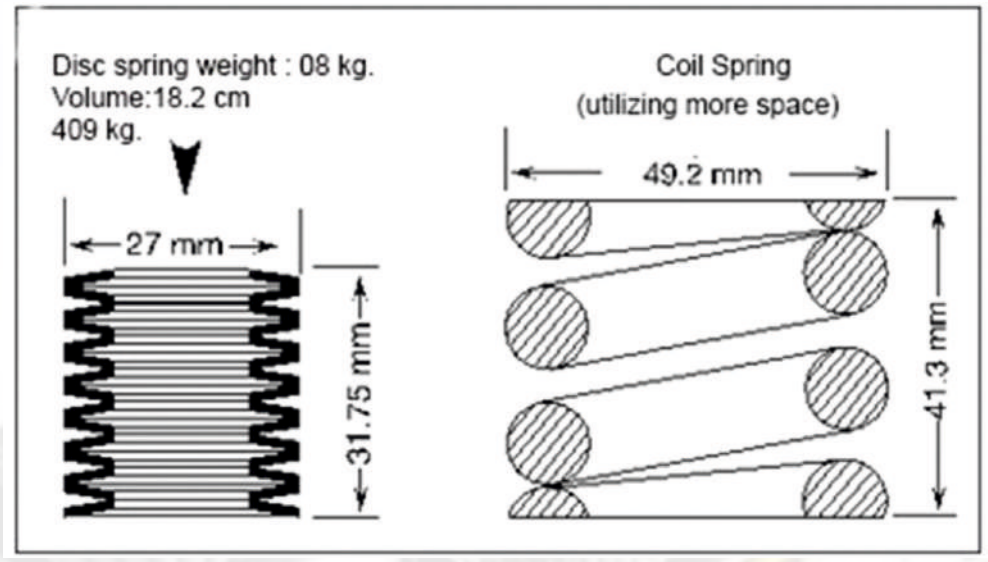
Garter Springs are Helical Coil Springs whose ends are connected together to form a Circular Shape to provide a Strong Radial Force. Compression Garter Springs exert Outward Radial Forces, while Extension
Garter Springs exert Inward Radial Forces.

Most of these Springs are used in Oil Seals, Shaft Seals, Belt Driven Motors and Electrical Connectors, etc.

They can easily handle Pressure, Viscosity and Temperature changes and prevent contamination from Water, Dust, Dirt, Lubrication and Chemicals. They can be supplied pre-assembled into loops, or in lengths – this is particularly useful for standard weights or diameters, as it allows you to cut and assemble your garter springs as needed.

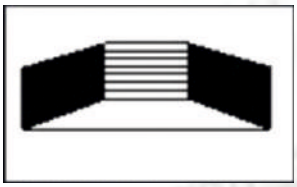
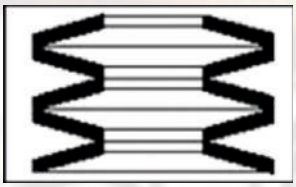
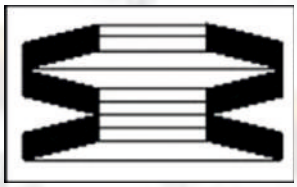
Disc Spring DIN 2093





Disc Springs are conically formed angular discs, which are loaded in the axial direction. Disc Springs have a unique combination of high force in small space with customized deflection combinations.

NISHI offer a well-developed solution to many engineering problems. Disc Springs can be used as Single Disc or arranged in Stacks. A Disc Spring 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 as per DIN 2093 and designed as per DIN 2092. We have custom design program to assist our customers for their specific applications Springs.

		
Stacked in parallel Total Deflection=Deflection of 1 disc Total Load= Load on 1 disc X no.of discs.	**In Series** Total Deflection= Deflection of 1 disc X no. of discs in stack Total Load = Load on 1 disc	**Parallel Series COMBINATIONS** It Can be designed to accommodate virtually any load or deflection and to obtain progressive characteristics

Advantages of Disc Springs :

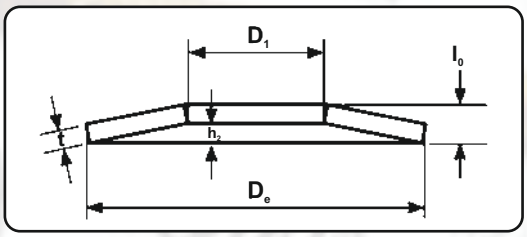
1. No Deformation or Fatigue under normal loads.
2. High Energy Storage Capacity.
3. Long Service Life.
4. Stock keeping is minimized as the individual spring sizes can be combined universally.
5. Space Saving.
6. Largely Self-damping, giving good shock absorption and energy dissipation.
7. Efficient 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

Disc Springs acre classified in 3 Groups as below :	
Group	**Thickness of Single Disc in mm**
1	Less than 1.25mm Thickness
2	From 1.25 to 6mm Thickness
3	Over 6 up to 14mm Thickness

Symbols and Units

Designations of a disc spring

D_e = Outer diameter
D_1 = Inner diameter
t = Thickness
h_2 = Cone height of an unloaded disc spring
l_0 = Height of an unloaded disc spring



Tolerances :

As cost is a major consideration, springs must be produced in the most economical manner. Specified tolerances, therefore, should be generous enough to permit the fabrication of acceptable springs by ordinary production methods. Also, it is wise to apply tolerances only to functional requirements and dimensions. This practice gives the spring maker an opportunity to make adjustments to make compensate for the allowable variations present in the size and mechanical properties of all spring materials. Another recommendation for the product designers: If the standard drawing forms have tolerance boxes for machined dimensions, they are almost sure to be impractical for springs. Delete them and apply realistic tolerances to the mandatory spring requirements.

The following maximum deviations are laid down in DIN 2093. They are valid for all Disc Springs as per the DIN and our works standards. In general IIS also applies these tolerances to special sizes, however, if they deviate greatly from the DIN, wider tolerances must be specified. This applies to our ball-bearing Disc Springs. If closer tolerances are required than those tolerances in DIN 2093, please consult us.

Thickness Tolerances :-

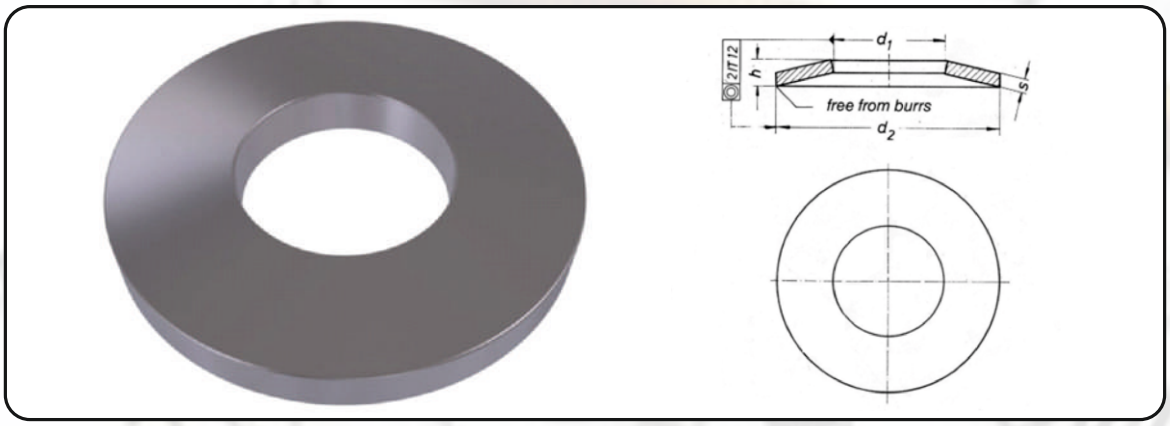
Group	t or t'(mm
1	0.2 to 0.6
2	>0.6 to <1.25 1.25 to 3.8
3	>3.8 to 6.0 >6.0 to 14.0

Note :

***Sizes as per DIN 2093 available**

***Please send us Enquiry of Call us for required Sizes**

Belleville Washer as Per DIN 6796



NISHI manufactures Belleville washer in Imperial as well as Metric Sizes. Belleville washers also called Conical Spring Washers and are manufactured as per **DIN 6796 & DIN 6908.** NISHI Belleville Washers are designed specifically for Heavy Duty Bolted section such as Bus Bars, Transformers, Rectifiers, Heat Exchangers, Transmission etc.

Material : 50CrV4 or Spring Steel CK75

Technical Specifications :

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
2.0	5.0	2.2	0.40	0.60	0.50	920	-
2.5	6.0	2.7	0.50	0.72	0.61	1540	-
3.0	7.0	3.2	0.60	0.85	0.72	2350	-
3.5	8.0	3.7	0.80	1.06	0.92	3160	-
4.0	9.0	4.3	1.00	1.30	1.12	4050	1400
5.0	11.0	5.3	1.20	1.55	1.35	6700	2300
6.0	14.0	6.4	1.50	2.00	1.70	9400	4200
7.0	17.0	7.4	1.75	2.30	2.00	13700	6200
8.0	18.0	8.4	2.00	2.60	2.24	17200	7700
10.0	23.0	10.5	2.50	3.20	2.80	27500	12400
12.0	29.0	13.0	3.00	3.95	3.43	40000	18000
14.0	35.0	15.0	3.50	4.65	4.04	55000	25000
16.0	39.0	17.0	4.00	5.25	4.58	75000	34000
18.0	42.0	19.0	4.50	5.80	5.08	95000	57000
20.0	45.0	21.0	5.00	6.40	5.60	122000	73000
22.0	49.0	23.0	5.50	7.05	6.15	152000	91000
24.0	56.0	25.0	6.00	7.75	6.77	175000	122000
27.0	60.0	28.0	6.50	8.35	7.30	230000	161000
30.0	70.0	31.0	7.00	9.20	8.00	280000	196000

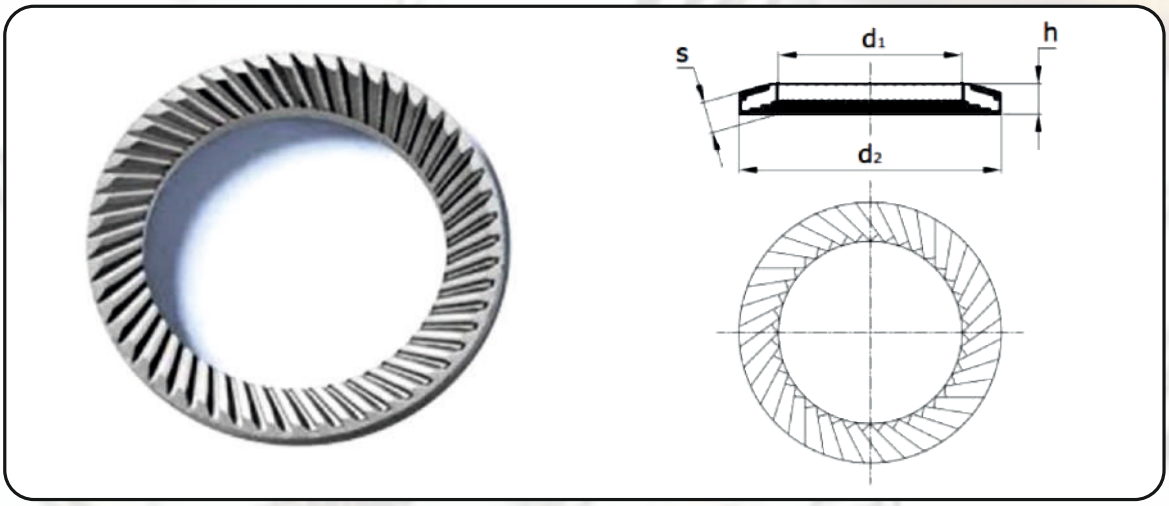
Disc Spring For Preloaded Ball Bearing Plain

NISHI manufactures all types of Ball Bearing Disc Springs used as Preloading Ball Bearing. 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 & 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.

If preload is primarily to protect the bearing from vibration damage when stationary, then greater preload is required.

Note : *Please send us Enquiry of Call us for required Sizes

Serrated Washers



Serrated Washers are Disc Springs with Trapezoidal Cross Section on both sides for gripping. NISHI 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 faces and prevents the screw from loosening up due to vibration. Also, the disc shape holds the necessary 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 head diameter of screw head. This allows using screw and bolt including recessed heads, except countersunk screw.

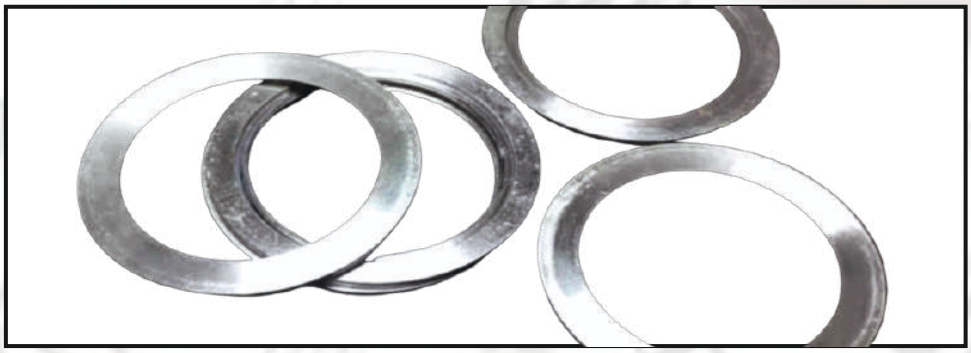
Advantages :

- Used for high vibration resistance due to positive rib contact.
- Excellent pre tensioning.
- Through proper radius selection, no splitting/cracking occurs during tightening.
- The concentric force of the washer eliminates the chances of bending the fastener .
- Extensive application and flexibility, minimizes stocks .

Technical Specifications :

Nominal Bolt Size (mm)	d1 H14 [mm]	d2 H14 [mm]	Thickness s (mm)	h max. [mm]	h min. [mm]
1.60	1.70	3.20	0.35	0.60	0.38
2.00	2.20	4.00	0.35	0.60	0.39
2.50	2.70	4.80	0.45	0.90	0.49
3.00	3.20	5.50	0.45	0.90	0.51
3.50	3.70	6.00	0.45	0.90	0.52
4.00	4.30	7.00	0.50	1.00	0.59
5.00	5.30	9.00	0.60	1.10	0.73
6.00	6.40	10.00	0.70	1.20	0.82
6.35	6.70	9.50	0.70	1.20	0.79
7.00	7.40	12.00	0.70	1.30	0.89
8.00	8.40	13.00	0.80	1.40	0.98
10.00	10.50	16.00	1.00	1.60	1.21
11.10	11.60	15.90	1.00	1.60	1.18
12.00	13.00	18.00	1.10	1.70	1.31
12.70	13.70	19.00	1.10	1.80	1.33
14.00	15.00	22.00	1.20	2.00	1.52
16.00	17.00	24.00	1.30	2.10	1.63
18.00	19.00	27.00	1.50	2.30	1.85
19.00	20.00	30.00	1.50	2.50	1.98
24.00	21.00	30.00	1.50	2.50	1.94
25.40	23.00	33.00	1.50	2.70	2.08
27.00	25.60	36.00	1.80	2.90	2.32
30.00	27.00	38.00	2.00	3.10	2.52
36.00	28.60	39.00	2.00	3.10	2.52

Shim & Support Rings DIN 988



Shim rings are developed to avoid machine components dynamic axially. The commonly application of shim ring to adjust the clearance or space between two parts.

Support rings are used to ensure that do not deform when part to extreme dynamic axial load.

Material :

Shim ring - Mild Steel Support ring - Spring Steel

Surface Finish :

Shim ring - Oiled Support ring - Oiled or Phosphated

Hardness :

Support ring - 440 -500 HV10

E-Clip DIN 6799

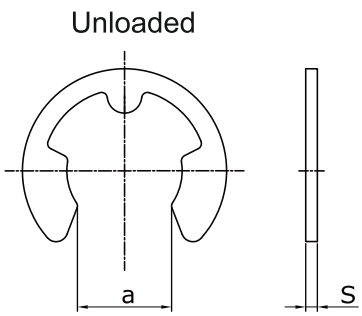


Figure 1.

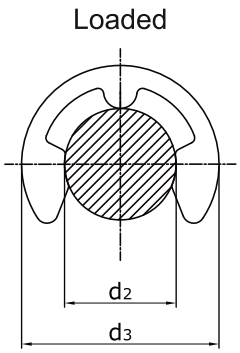


Figure 2.

NISHI Manufactures E-Clips with high end quality metals and precision machine. Quality such as high strength, perfect finish, excellent durability owing attributes durability. These are easily available at leading market prices. The most common Application is of radially fitted Circlips for shafts with grooves which provide a large shoulder on a relatively small shaft diameter.

Material :

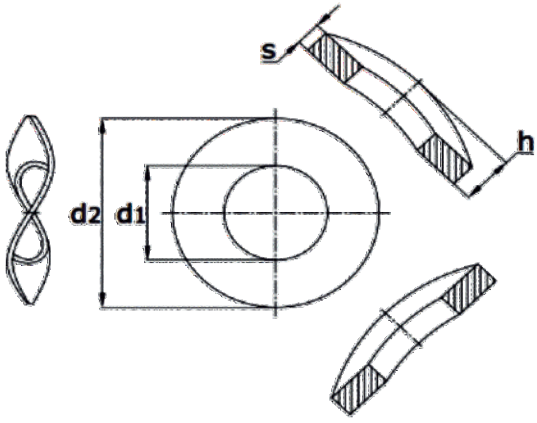
Carbon Spring Steel (DIN17222 / EN10132-4)
Carbon Spring steel Hardened and Tempered
Stainless Steel 301 / 304
Inconel X 750 and X718

Surface Finish :

* Phosphate
* Electro Zinc Plating
* Mechanical Zinc Plating (ASTM B695)
* Natural Finish
* Polish Finish for Stainless Steel

WAVE WASHER

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.

Technical Specifications :

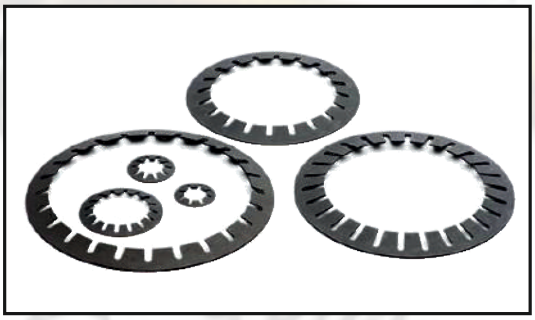
Nominal Size	d_1 1) H14	d_1 1) js16	s		h	
			Nominal Size	Limit deviations	min.	max.
3.0	3.2	8	0.5	- +0.05	0.5	1.6
3.5	3.7	8	0.5	- +0.05	0.5	1.8
4.0	4.3	9	0.5	- +0.05	0.5	2.0
5.0	5.3	11	0.5	- +0.05	0.5	2.2
6.0	6.4	12	0.5	- +0.05	0.5	2.6
7.0	7.4	14	0.8	- +0.06	0.8	3.0
8.0	8.4	15	0.8	- +0.06	0.8	3.0
10.0	10.5	21	1.0	- +0.07	1.0	4.2
12.0	13.0	24	1.2	- +0.07	1.2	5.0
14.0	15.0	28	1.6	- +0.08	1.6	6.0
16.0	17.0	30	1.6	- +0.08	1.6	6.4
18.0	19.0	34	1.6	- +0.08	1.6	6.6
20.0	21.0	36	1.6	- +0.08	1.6	7.4
22.0	23.0	40	1.8	- +0.10	1.8	7.8
24.0	25.0	44	1.8	- +0.10	1.8	8.2
27.0	28.0	50	2.0	- +0.10	2.0	9.4
30.0	31.0	56	2.2	- +0.10	2.2	10.0
33.0	34.0	60	2.2	- +0.10	2.2	10.6
36.0	37.0	68	2.5	- +0.15	2.5	11.6

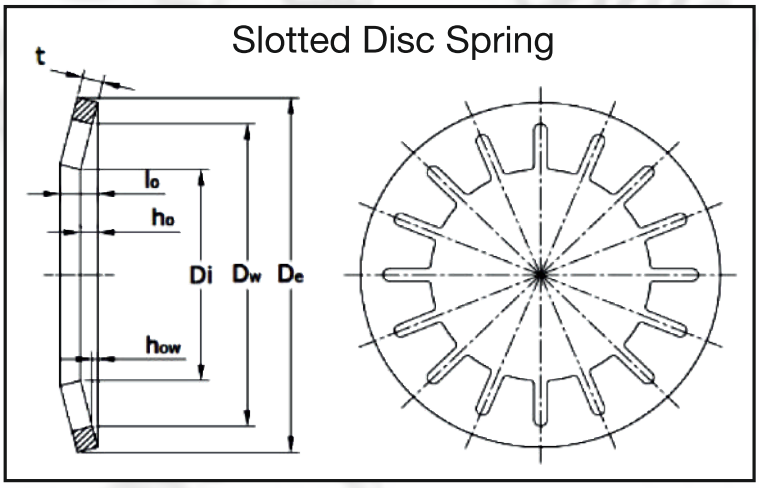
1) The diameter tolerance specified apply to spring washers when pressed flat. The tolerance on coaxiality between d, and d2 (related to d2) shall be ½ IT 14.

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.

BALL BEARING DISC SPRING - SLOTTED & PLAIN

Nishi 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.

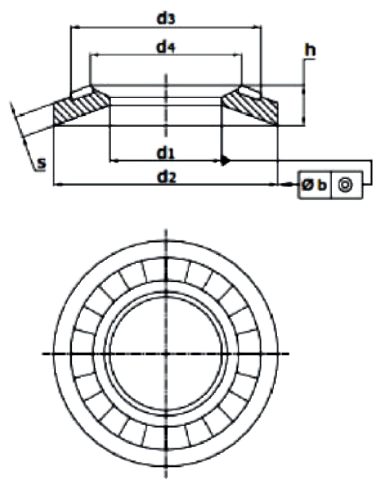
SERRATED CONICAL SPRING WASHER (NFE25-511)

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.

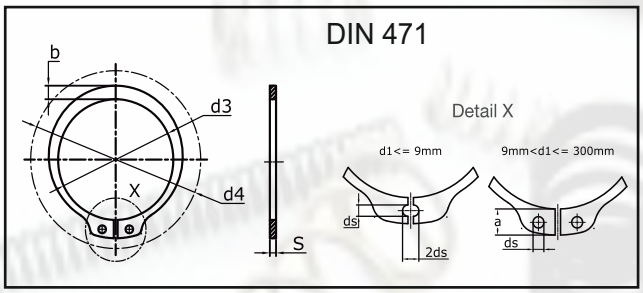
These Washers can be successfully used with Bolts and Screws of Classes 6.8,8.8 and 10.9 they are well suited in several fields of application where High Elastic and Fastening Performances are required.

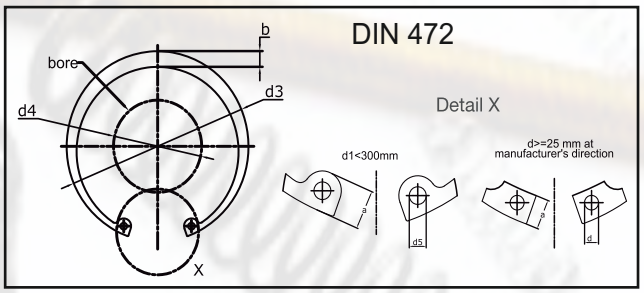


Serrated Conical Spring Washer (NFE 25-511)

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)		
M3	3.10	3.35	6	+/- 0.24	0.5	0.70	0.90	0.24	28
			8	+/- 0.29	0.6	0.80	1.00	0.30	
			10	+/- 0.29	0.6	0.95	1.20	0.30	
M4	4.10	4.40	8	+/- 0.29	0.8	1.00	1.20	0.30	32
			10	+/- 0.29	0.9	1.15	1.40	0.30	
			14	+/- 0.35	1.0	1.40	1.80	0.36	
M5	5.10	5.40	10	+/- 0.29	1.0	1.25	1.50	0.30	36
			12	+/- 0.35	1.1	1.45	1.80	0.36	
			16	+/- 0.35	1.2	1.70	2.10	0.36	
M6	6.10	6.40	12	+/- 0.35	1.2	1.55	1.85	0.36	45
			14	+/- 0.35	1.3	1.75	2.10	0.36	
			18	+/- 0.35	1.4	2.10	2.50	0.36	
M8	8.20	8.56	16	+/- 0.35	1.4	1.80	2.20	0.36	
			18	+/- 0.35	1.4	1.90	2.35	0.36	
			22	+/- 0.42	1.6	2.20	2.70	0.42	
M10	10.20	10.56	20	+/- 0.42	1.6	2.10	2.60	0.42	
			22	+/- 0.42	1.6	2.25	2.75	0.42	
			27	+/- 0.42	1.8	2.60	3.10	0.42	
M12	12.40	12.83	24	+/- 0.42	1.8	2.40	2.90	0.42	
			27	+/- 0.42	1.8	2.60	3.10	0.42	
			32	+/- 0.50	2.0	3.10	3.60	0.50	
M14	14.40	14.83	30	+/- 0.42	2.4	3.20	3.70	0.42	
M16	16.40	16.83	32	+/- 0.50	2.8	3.60	4.10	0.50	60
M20	20.50	21.02	40	+/- 0.50	3.2	4.30	4.90	0.50	

CIRCLIP AS PER DIN 471 & 472





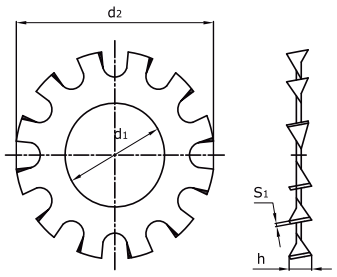
SERRATED LOCK WASHER & TOOTH LOCK WASHER

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.

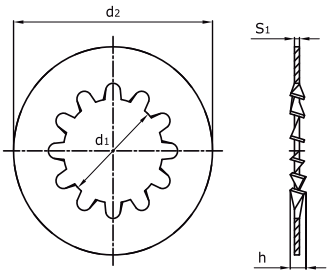
Tooth Lock Washer 6797 Type A external

Toothed lock washers DIN 6797

Type A, With external teeth

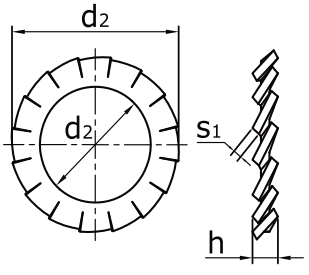


Type J, With internal teeth

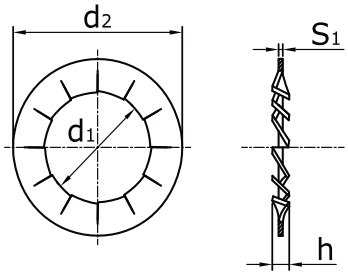


Serrated lock washers DIN 6798

Type A, with external teeth



Type J, with internal teeth



$h = 3S_1$

Serrated Lock Washer 6798 J Type Internal

Note :

***Please send us Enquiry of Call us for required Sizes**

We Can also cater beolow items (as per requirements)

We Can also cater beolow items (as per requirements)

NISHI INDUSTRIES

ISO 9001:2015 CERTIFIED COMPANY

Registered Office & Factory Address :

A14, Rukma Industrial Premises Co-op. Soc. Ltd.,
Near Agrawal Petrol Pump, Asangaon, Tal. Shahapur, Dist. Thane, Maharashtra - 421 601.

: 0091 - 9689983000 / 5000 / 2000

response@nishiindustries.com / nishiindustries45@gmail.com / exports@nishiindustries.com

www.nishiindustries.com