Types of Washers

Standard Washers

A standard washer is a thin plate typically round or square with a hole that is normally in the centre. They are used for two main reasons:

1. To minimise souring or scratch damage to material as a result of nut rotation.
2. To increase the effective bearing surface of the bolt and/or nut. That is, to distribute the load of a threaded fastener over a larger area and prevent deformation of the bearing surfaces.
3.

Squirter Washers

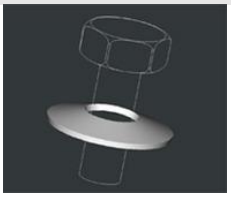
Squirter washers allow you to complete a visual tension inspection in order to save time. Tighten until silicone squirts through the squirter washer; this way, you'll be able to know when the correct tension has been achieved during installation.

Load Indicating Washers (LIWs)

Load indicating washers are used for achieving required tension loads on bolts in countless applications. These include Structural Steel Buildings and Bridges as well as DTI Washers for Studs used in the Petro-Chemical Industry, Anchor Bolts, and SAE Cap Screws for Automotive applications.

Wave washers

A washer with a "wave" in the axial direction, which provides spring pressure when compressed. Wave washers, of comparable size, do not produce as much force as Belleville washers.



Belleville washers
also known as a cupped spring washer or a conical washer

Belleville washers are a washer with a slight conical shape, which provides an axial force when deformed.
A Belleville washer, also known as a coned-disc spring, conical spring washer, disc spring, Belleville spring or cupped spring washer, is a conical shell which can be loaded along its axis either statically or dynamically. A Belleville washer is, then, a type of spring shaped like a washer. It is the frusto-conical shape that gives the washer a spring characteristic.

Types of Washers

Spring Washers

Spring washers are a left hand helix and allow the thread to be tightened in a right hand direction only, i.e. a clockwise direction. When a left hand turning motion is applied, the raised edge bites into the underside of the bolt or nut and the part that it is bolted to, thus resisting turning. Therefore, spring washers are ineffective on left hand threads and hardened surfaces. Also, they are not to be used in conjunction with a flat washer under the spring washer, as this isolates the spring washer from biting into the component that will resist turning. Where a flat washer is required to span a large hole in a component, a nyloc nut (nylon insert) must be used.

Split Washers

A ring split at one point and bent into a helical shape. This causes the washer to exert a spring force between the fastener's head and the substrate, which maintains the washer hard against the substrate and the bolt thread hard against the nut or substrate thread, creating more friction and resistance to rotation.

Two-piece lock washers

Two piece lock washers are designed to prevent bolt assemblies loosening through vibration. They consist of two disks with interposing ramps. Sharp ridges on the upper and lower surfaces of the disks grab the nut and joint surfaces. If the nut backs off a little, it drags its disc along with it. The ramps on it disk climb the ramps on the lower disk. The interaction of these ramp or cam surfaces prevent loss of tension in the bolt.

Lock Washers

A washer with a key to prevent rotation, and is used to lock two nuts in place, without allowing the torque applied to the top nut to cause the bottom nut to also rotate (such as in a threaded headset on a bicycle).

See more extensive below

Types of Washers

Toothed lock washer, serrated washer or star washer

A washer with serrations that extend radially inward or outward to bite into the bearing surface. This type of washer is especially effective as a lock washer when used with a soft substrate, such as aluminium or plastic, and can resist rotation more than a plain washer on hard surfaces, as the tension between washer and the surface is applied over a much smaller area (the teeth). There are four types: internal, external, combination, and countersunk. The internal style has the serrations along the inner edge of the washer, which makes them more aesthetically pleasing. The external style has the serrations around the outer edge, which provides better holding power, because of the greater circumference. The combination style has serrations about both edges, for maximum holding power. The countersunk style is designed to be used with flat-head screws. Tooth lockwashers are also used for ground bonding where a metal lug or object must be electrically bonded to a surface. The teeth of the washer cut through surface oxides, paints or other finishes and provide a gas-tight conductive path. In these applications the washer is not placed under the head of the screw (or under the nut), it is placed between the surfaces to be bonded. In such applications, the tooth washer does not provide any anti-rotation locking features.

Spherical washers

Part of a self-aligning nut; it is a washer with one radiused surface, which is designed to be used in conjunction with a mating nut in order to correct for up to several degrees of misalignment between parts.

Crush washers

Crush washers are commonly found any time a threaded fastener has to seal in a liquid; the most common example is the crush washer under the oil drain plug of most cars.

Curved disc spring

Similar to a Belleville, except the washer is curved in only one direction, therefore there are only four points of contact. Unlike Belleville washers, they exert only light pressures

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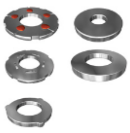
Types of Washers

Insulator Washers

Insulator washers offer solutions in maintaining a reliable electrical infrastructure. They are heat and wear resistant with low moisture absorption. Resistant to corrosion and chemicals.

Retaining Washers

Retaining washers are supplied in natural nylon 6. It helps to lock and seal nuts and bolts. It secures nuts and bolts in position.



Structural Washers

Heavy series **washers** in specifications of ASTM F436 as well as AS1252 **Structural Washers** and Direct Tension Indicators (DTIs).
Product Range: Heavy Series. ASTM F436 Zinc Plated Metric. ASTM F436 Zinc Yellow Passivated Imperial.

Tab washer

A locking washer that works by having a side tab that can be bent into place against a nut. Metallic or non-metallic, the tab washer notch prevents rotation relative to the shaft or fastener. Variations include single, multiple, formed and flat.

Keps nut or K-lock nut

A nut with an integral free spinning washer; assembly is easier because the washer is captive.

Types of Washers

Corrosion Resistance

A number of techniques are used to enhance the corrosion resistant properties of certain washer materials:

Metallic coatings – Typical coatings used to produce corrosion resistant washers are zinc, cadmium, and nickel. Zinc coating acts as a sacrificial surface layer that falls victim to corrosive materials before the washer's material can be harmed. Cadmium produces a high-quality protective surface but is toxic, both biologically and environmentally. Nickel coatings add protection from corrosion only when the finish is dense and non-porous.

Electroplating – This method involves coating the washer by electrolytic deposition using metals such as chromium or silver.

Phosphating – A resilient, but abrasive surface is achieved by incorporating a zinc-phosphate layer and corrosion-protective oil.

Browning or bluing – Exposing the washer (typically steel) to a chemical compound or alkali salt solution causes an oxidizing chemical reaction, which results in the creation of a corrosion-resistant, coloured surface. The integrity of the coating can improved by treating the finished product with a water-displacing oil.

Chemical plating – This technique utilizes a nickel-phosphor alloy that is precipitated onto the washer surface, creating an extremely corrosion- and abrasive-resistant surface.