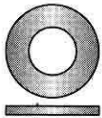
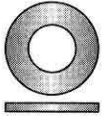


**A washer is a stamped round piece of metal used to provide increased bearing surface, spacing, and to prevent galling of a nut and/or the head of a bolt or screw. Washers are available in different types and materials.**

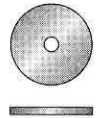
## WASHERS



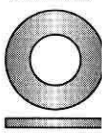
1. **Fine Washers** (SAE), or machine washers, have proportions that are related to the dimensions of bolt heads and nuts principally to minimize embedding and to aid in torquing.



2. **Coarse Washers** (USS) have proportions designed to fulfill the customary purpose of distributing the load over larger areas of lower strength materials.



3. **Fender Washers** have a larger outside diameter than a regular flat washer and is used where a larger bearing surface is necessary.



4. **Hardened Washers**, such as Grade 8 washers, are thoroughly hardened and made from carbon alloy steel with 0.3% to 0.6% carbon that has been quenched and tempered. Grade 8 washers should be used with Grade 8 bolts and nuts due to the higher torques available with these stronger fasteners.



5. **Split Lock Washers** (Helical Spring Lock washers) are lock washers which have the function of :

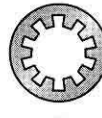
- providing greater bolt tension per unit of applied torque for tighter assemblies
- providing hardened bearing surfaces to create more uniform torque control
- providing protection against looseness resulting from vibration and corrosion.

Split Lock washers are available in standard and Hi-collar. Hi-collar Split Lock washers have a smaller than standard O.D. and are designed for use with Socket Head Cap screws.

Split Lock washers are also available in special materials such as Grade 8, Stainless Steel and Silicon-Bronze.

Split Lock washers are coiled so that the free height (the height of a coil when no compression force is applied also called the rest position) is approximately equivalent to twice the thickness of the washer material.

The gap and the relationship of the severed ends shall be such as to prevent washer tangling and ensure that the washer will compress flat. Split Lock washers are heat treated so that when compressed to flat and released, the free height of the washer will be at least 2/3 of the original free height.



6. **Tooth Lock Washers** can have internal teeth or external teeth. Tooth Lock Washers serve to lock fasteners, such as bolts and nuts, to the component parts of an assembly, or, increase the friction between the fasteners and the assembly. External Lock washers are often used in electrical grounding contact applications to cut through painted or corroded surfaces and make a positive grounding contact with the metal. Tooth Lock washers can sometimes be found as a permanent part of a screw or nut such as a SEMS screw or a Keps nut.



7. **Wave Lock Washers** are spring type lock washers. This type of lock washer is made by taking a stamped, round piece of heat treated spring steel and creating a wavy surface that is at least twice the thickness of the washer material. These lock washers have the function of providing greater bolt tension per unit of applied torque while providing a hardened bearing surface to create more uniform torque control.



8. **Specialty Washers** come in many shapes and materials for many specialized needs. A few of these types are:

A. **Finishing Washers** (Cup washers) - used to recess a flat (countersunk) headed screw where a greater bearing surface is required, and on material that is not thick enough to be countersunk.

B. **Machine Bushings**- can be washers of non-standard or unique sizes used for special applications due to space or special torque requirements.

C. **Special Materials** are used to accommodate special needs and requirements for moisture, anti-corrosion, conductivity, or absence of conductivity.

- Aluminum
- Stainless Steel
- Brass
- Bronze
- Nylon
- Rubber
- Fiber
- Leather
- Mylar
- Bonded (metal bonded to rubber)