About Stainless Steel

Stainless steel is a family of iron-based alloys that must contain at least 10.5% chromium. The presence of chromium creates an invisible surface film that resists oxidation and makes the material "passive" or corrosion resistant. Other elements, such as nickel or molybdenum are added to increase corrosion resistance, strength or heat resistance. Stainless steels can be simply and logically divided into three classes on the basis of their microstructure; austenitic, mart-

ensitic or ferritic. Each of these classes has specific properties and basic grade or "type." Also, further alloy modifications can be made to alter the chemical composition to meet the needs of different corrosion conditions, temperature ranges, strength requirements, or to improve weldability, machinability, work hardening and formability.

Austenitic stainless steels contain higher amounts of chromium and nickel than the other types. They are not hardenable by heat treatment and offer a high degree of corrosion resistance. Primarily, they are nonmagnetic; however, some parts may become slightly magnetic after cold working. The tensile strength of austenitic stainless steel varies from 75,000 to 105,000 psi.

18-8 Stainless steel is a type of austenitic stainless steel that contains approximately 18% chromium and 8% nickel. Grades of stainless steel in the **18-8** series include, but not limited to; **302, 303, 304** and **XM7**.

Common austenitic stainless steel grades:

• **302**: General purpose stainless retains untarnished surface finish under most atmospheric conditions and offers high strength at reasonably elevated temperatures. Commonly used for wire products such as springs, screens, cables; common material for flat washers.

• **302HQ**: Extra copper reduces work hardening during cold forming. Commonly used for machine screws, metal screws and small nuts

• 303: Contains small amounts of sulfur for improved machinability and is often used for custom-made nuts and bolts.

• **304**: Is a low carbon-higher chromium stainless steel with improved corrosion resistance when compared to 302. 304 is the most popular stainless for hex head cap screws. It is used for cold heading and often for hot heading of large diameter or long bolts.

• **304L**: Is a lower carbon content version of **304**, and therefore contains slightly lower strength characteristics. The low carbon content also increases the **304L** corrosion resistance and welding capacity.

• **309 & 310**: Are higher in both nickel and chromium content than the lower alloys, and are recommended for use in high temperature applications. The **310** contains extra corrosion resistance to salt and other aggressive environments.

• **316 & 317**: Have significantly improved corrosion resistance especially when exposed to seawater and many types of chemicals. They contain molybdenum, which gives the steel better resistance to surface pitting. These steels have higher tensile and creep strengths at elevated temperatures than other austenitic alloys.

Austenitic stainless steel limitations:

• They are suitable only for low concentrations of reducing acids.

• In crevices and shielded areas, there might not be enough oxygen to maintain the passive oxide film and crevice corrosion might occur.

• Very high levels of halide ions, especially the chloride ion can also break down the passive surface film. Common martensitic stainless steel grades:

• **410**: A straight chromium alloy containing no nickel. General-purpose corrosion and heat resisting, hardenable chromium steel. It can be easily headed and has fair machining properties. Due to their increased hardness, are commonly used for self-drilling and tapping screws. These are considered very inferior in corrosion resistance when compared with some of the **300**.