

Classification of Stainless Steel.

Stainless steel is commonly divided into five groups, depending on the specific amounts of alloying elements, which control the microstructure of the alloy.

Austenitic Stainless Steel.

Austenitic Stainless Steel is the most weldable of the stainless steel grades and can be divided rather loosely into three groups: common chrome-nickel (300 series), manganese-chromium-nickel-nitrogen (200 series) and special alloys. Austenitic is the most popular stainless steel group and is used for numerous industrial and consumer applications, such as in chemical plants, power plants, food processing and dairy equipment.

Ferritic Stainless Steel.

Ferritic Stainless Steel consists of iron-chromium alloys with body-centred cubic crystal structures. They can have good ductility and formability, but high-temperature strengths are relatively poor when compared to austenitic grades. Some ferritic grades (such as type 409 and 405) used, for example, in mufflers, exhaust systems, kitchen counters and sinks, cost less than other stainless steel grades. Other more highly alloyed steels low in C and N (such as types 444 and 261) are more costly but are highly resistant to chlorides.

Martensitic Stainless Steel.

Martensitic Stainless Steel, such as type 403, 410, 410NiMo and 420, are similar in composition to the ferrite group, but contain a balance of C and Ni vs. Cr and Mo; hence austenite at high temperatures transforms to martensite at low temperatures. Like ferrite, they also have a body-centred cubic crystal structure in the hardened condition. The carbon content of these hardenable steels affects forming and welding. To obtain useful properties and prevent cracking, the weldable martensitics usually require preheating and post-weld heat treatment.

Duplex

Primarily used in chemical plants and piping applications, the duplex stainless steels are developing rapidly today and have a microstructure of approximately equal amounts of ferrite and austenite. Duplex stainless steels typically contain about 22-25% Chromium and 5% Nickel with Molybdenum and Nitrogen. Although duplex and some austenitics have similar alloying elements, duplex has higher yield strength and greater stress corrosion cracking resistance to chloride than austenitic stainless steels.

Precipitation Hardening

Precipitation-hardening Stainless Steel is chromium-nickel stainless, that contains alloying additions such as aluminium, copper or titanium which allow them to be hardened by a solution and aging heat treatment. They can be either austenitic or martensitic in the aged condition. Precipitation-hardening stainless steels are grouped into three types: martensitic, semi austenitic and austenitic. The martensitic (such as type 630) and semi austenitic (such as type 631) can provide higher strength than the austenitic (such as type 660, also known as A286) types.