

## Properties

**Stainless Steels:** The main alloying element is Chromium in quantity over 10.5%. According to the chemical composition and the structure that can be achieved with heat treatments, several categories of stainless steels are distinguished depending on their crystalline structure: austenitic, ferritic, martensitic, precipitation hardenable, and duplex alloys.

Ferrite is the structure of steel at room temperature (body centered cube).

Austenite is the structure of high-temperature steel (face-centered cube).

Martensite is a distorted body-centered cube structure produced by quenching of steel.

In the steel formulation, alloying elements are added that stabilize one or another crystalline form (Cr, Si stabilize ferrite while Ni, Mn, C stabilize austenite).

### Austenitic

They are the most commonly used (A-304, A-316). The 300 series corresponds to iron-chromium-nickel steels, which, due to their high chromium and nickel content, are among the most resistant to corrosion in general and have good mechanical properties. They are not magnetic. They cannot be hardened by heat treatment but do harden by mechanical cold work.

Most common qualities: They contain a maximum of 0.08% carbon without a minimum value. It is enough that the material satisfies the required mechanical properties.

Low carbon content (L qualities): They contain a maximum of 0.03% carbon (which decreases mechanical resistance) and this serves to prevent the precipitation of chromium carbides by heating during welding. The loss of chromium causes the stainless property to be lost in that area, leading to intergranular corrosion.

H qualities: They contain a minimum of 0.04% and a maximum of 0.10% of carbon, to improve their mechanical resistance at high temperatures. They are stainless for high temperature applications.

### Martensitic

Martensitic steels were developed to provide steels that were resistant to corrosion but hardenable by heat treatment.

The hardness is achieved by formation of a phase called "Martensite", of great hardness, which precipitates in the process of sudden cooling.

These steels only contain chromium, they do not contain nickel as an alloy metal.

They are magnetic and hardenable by heat treatment. They are used in applications where hardness, mechanical strength, and erosion resistance are important. They are within the 400 series along with ferritic steels.

### Ferritic

It is a group of steels developed to resist corrosion and oxidation, being particularly resistant to stress corrosion cracking.

They are magnetic steels that cannot be hardened or increase their resistance by heat treatments. They can be cold worked and softened by annealing. As a group they are more resistant to corrosion than the martensitic steels, but less resistant to corrosion than the austenitic steels.

Like the martensitic, they are steels with only chromium, without nickel.

The chromium content is higher and the carbon content is lower than the martensitic.

They are used in decoration, dishwashers, automobiles, exhaust pipes. They are in the 400 series along with martensitic steels.

In 430 the 16-18% chromium content is higher and the 0.12% carbon content is lower than in the 410 martensitic.

