



Damstahl
stainless steel solutions

Magnetism in stainless steel

Why is my Stainless Steel Magnetic?

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More or less automatically, stainless steel is regarded as non-magnetic. For that reason, lots of professionals carry a magnet in their pocket, and if the steel is non-magnetic, it is stainless; if the magnet sticks to the steel, it is not stainless. To many people, this is a verified truth, even though all of us seem to keep our stainless knives on a magnet in the kitchen. How this is possible, nobody seems to wonder.

Different Types of Stainless Steel

The reason for this misconception is the fact that we do not have one but rather five different types of stainless steel:

1. Austenitic
2. Ferritic
3. Duplex (ferritic-austenitic)
4. Martensitic and
5. Precipitation Hardening (martensitic-austenitic, "PH")

Of these, the only non-magnetic one is the austenitic (1). Due to cold working or in welds, even the austenitic steels may be slightly magnetic; however, as a rule the austenites are non-magnetic. The other four types of stainless steel range from moderately magnetic to strongly magnetic.

The martensitic steels (4) can be hardened by rapid cooling and are frequently used for axels or knives. All high-quality butchery knives are made of martensitic stainless steel, and their strongly magnetic properties are easily observed by watching the knife magnet in one's kitchen. The precipitation hardening types (5) are not quite as hard as the martensites and are used for i.e. golf clubs or chains. Neither type is used for the same applications as the austenites, and the risk of "magnetic confusion" is correspondingly small.

The use of the remaining three groups, austenitic (1), ferritic (2) and ferritic-austenitic (duplex, 3), implies a major overlap. The non-magnetic austenites still cover the main share of the market, but this share is getting smaller and smaller, partly due to the development of new steel types, partly due to the high and unstable price of nickel.

In particular, a large part of the non-magnetic 4301 and 4401 classes is expected to be substituted by the ferritic (and thus magnetic) 4509 and 4521, respectively. For even more aggressive environments, duplex 2205 (4462) and duplex 2507 (4410) have become "classics", even though they are magnetic.

To summarize, the fact that a stainless steel is magnetic does not prove that it is not stainless. In contrast, many of the magnetic types are much more corrosion resistant than the conventional austenites, so using a magnet to separate the stainless from the non-stainless steels is, at best, misleading.