

Properties of Metals

Stainless steel, Type 316

This is the standard tubing material for chromatography, suitable for a wide variety of applications. It is cold drawn seamless, not welded, with close tolerances held on both ID and OD. We neither recommend nor offer Type 304 stainless steel for analytical applications.

Austenitic stainless steels may be used for most chromatographic applications. Type 316 is most commonly used for HPLC because of its superior chloride ion resistance.

Stainless steel, Type 303

Recommended for GC use and general purpose connections, combining excellent machining characteristics with good resistance to corrosion and high temperature oxidation. Susceptible to attack by chlorides, iodides, and bromides.

Stainless steel, gold-plated

Improved inertness and high-integrity sealing for applications such as ultra pure gas analysis.

Electroformed nickel (EFNI)

We electroplate pure nickel over a diamond drawn mandrel in a continuous process, then carefully separate and remove the mandrel from the tubing. The result is an extremely inert and smooth interior surface (1–2 microinch finish). It is widely used for transfer lines, since it minimizes the potential for carryover or cross contamination often found with mill-drawn Nickel 200, due to its rough interior surface. Unlike glass- or silica-lined stainless, EFNI can easily accept tight bends and cutting without heating, and does not release damaging glass fragments or silica particles. Electroformed nickel has more in common with fused silica than drawn nickel tubing in terms of surface inertness and smoothness.

Hastelloy C® series

This is the material most often recommended for corrosion resistance – it works when nothing else will. This versatile nickel-chromium molybdenum alloy has excellent resistance to most acids, including strong oxidizers such as ferric and cupric chlorides; nitric, formic and acetic acids; wet chlorine; sea water and brine solutions; and mixtures containing nitric acid or oxidizing acids with chloride ions. VICI uses only HC-22 for fittings and valve stators, rather than the older and less corrosion resistant HC-276.

The best choice for most special applications where HPLC grade stainless cannot be used, Hastelloy C has excellent resistance to pitting, stress corrosion cracking, and oxidizing atmospheres up to temperatures well beyond any other standard components of the chromatographic system.

Inconel 600

One of the few metals which can be used with hot, strong solutions of magnesium chloride. Good for most severely corrosive environments at elevated temperatures. Resistant to sulfuric and hydrofluoric acid, and to all concentrations of phosphoric acid at room temperature. Poor resistance to nitric acid.

Monel 400

High resistance to hydrochloric, hydrofluoric, and sulfuric acid under reducing conditions. Attacked by oxidizing acid salts and hypochlorites. High resistance to chlorinated solvents and nearly all alkalis.

Nickel 200

Excellent resistance to caustics, high temperature halogens and hydrogen halides, and salts other than oxidizing halides. Good resistance to caustic soda and other alkalis except ammonium hydroxide.

The industry standard nickel alloy tubing, containing trace amounts of copper, carbon, silicon, and other elements which impart certain mechanical characteristics. Like our 316 stainless, this tubing is cold drawn to close ID and OD specifications, and is suitable for many applications where a relatively inert and low cost nickel is required. While more inert than 316 SS in most applications, it is still absorptive and has a relatively rough interior. Use electroformed nickel tubing for applications requiring a high level of inertness or finish.

Nitronic 50

Good resistance to chlorides, sulfuric acid, and sea water. Resistant to sulfur gases such as hydrogen sulfide and sulfur dioxide.

Nitronic 60

Chemical resistance is similar to Type 316 stainless, but its resistance to galling and oxidation make it superior to Type 316 or 303 in the majority of applications. This is the standard material in Valco and Cheminert metal valve lines.