



## Materials for Metallic Gaskets

### Corrosion

When specifying the material for a metallic gasket it is important to analyze the metal or alloy properties and its reactions under stress and temperature. Special attention must be given to:

- **Stress Corrosion:** stainless steel 18-8 can exhibit stress corrosion when around certain fluids.
- **Intergranular Corrosion:** some chemical products can penetrate carbides where the crystalline grain formations in metal meet when in temperatures between 790°F (420°C) and 1490°F (810°C). This occurrence is called Intergranular Corrosion.
- **Fluid Compatibility:** The material used must be resistant to the fluid you are sealing and cannot contaminate said fluid.

The following are the most common alloys used in manufacturing metallic gaskets, their characteristics, temperature limits and approximate Brinell hardness (HB).

### Carbon Steel

Commonly used in jacketed gaskets and ring joints. Carbon Steel has a low corrosion resistance and should not be used in water, diluted acids or saline solutions. Carbon Steel can however be used in alkalis and concentrated acids. Temperature limits: 900°F (500°C). Hardness: 90 to 120 HB.

### Stainless Steel AISI 304

An alloy that contains 18% Cr (Chromium) and 8% Ni (Nickel) and is one of the most common in the manufacturing of metallic gaskets because of its excellent resistance to corrosion, its low cost and is readily available. Its maximum operating temperature is 1400°F (760°C). Because of stress and intergranular corrosion, the continuous service temperature is limited to 790°F (420°C). Hardness: 160 HB.





## Materials for Metallic Gaskets (continued)

### **Stainless Steel AISI 304L**

It has the same corrosion resistance as AISI 304. Its Carbon content is limited to 0.03%, has less Intergranular Carbon precipitation and therefore less Intergranular Corrosion. Its operational limit for continuous service is 1400°F (760°C). AISI 304L is susceptible to Stress Corrosion. Hardness: 160 HB.

### **Stainless Steel AISI 316**

This alloy contains 18% Ni (Nickel), 13% Cr (Chromium), 2% Mo (Molybdenum) and offers excellent resistance to corrosion. It can have carbonate precipitation at temperatures between 860°F (460°C) and 1650°F (900°C), under severe corrosion conditions. Max continuous service temperature is 1400°F (760°C). Hardness: 160 HB

### **Stainless Steel AISI 316L**

Has the same chemical composition as the AISI 316 but has a carbon content limited to 0.03% , inhibiting Intergranular Carbon precipitation, and by extension limiting Intergranular Corrosion. Maximum Service Temperature is 1400°F (760°C). Hardness: 160 HB.

### **Stainless Steel AISI 321**

This alloy contains 18% Cr and 10% Ni stabilized with Ti (Titanium), which reduces Intergranular Carbon precipitation. Can be used in temperatures up to 1500°F (815°C). Hardness: 160 HB.

### **Stainless Steel AISI 347**

An alloy similar to AISI 304 but is stabilized with Nb (Niobium) and Ta (Tantalum) to reduce carbonate precipitation. This alloy is also susceptible to Stress Corrosion. Has good performance in high temperature corrosive service. Maximum temperature: 1550°F (815°C). Hardness: 160 HB.





## Materials for Metallic Gaskets (continued)

### **Monel**

An alloy with 67% Ni and 30% Cu (Copper) that offers great resistance to most acids and alkalis with the exception of extremely oxidant acids. This metal is subject to stress corrosion and therefore it should not be used in applications involving fluorine-silicon acid and Mercury. When used in conjunction with PTFE, it is used frequently in Spiral Wound gaskets for highly corrosive service. Maximum operating temperature: 1500°F (815°C). Hardness: 95 HB

### **Nickle 200**

An alloy with 99% Ni and offers great resistance to caustic applications although it does not have the same kind of chemical resistance as Monel. It is also used in Spiral Wound and jacketed gaskets for special applications. Maximum operating temperature: 1400°F (760°C). Hardness: 110 HB.

### **Copper**

This material is often used in small dimension gaskets, where the seating pressure is limited. Maximum operating temperature: 500°F (260°C). Hardness: 80HB

### **Aluminum**

Because it has great corrosion resistance and is easy to handle, aluminum is frequently used to make gaskets. Maximum service temperature: 860°F (460°C). Hardness: 35 HB.

### **Inconel**

This alloy contains 70% Ni, 15% Cr and 7% Fe (Iron). Inconel has excellent corrosion resistance from cryogenic to high temperature. Temperature limit: 2000°F (1100°C) Hardness: 150 HB.

### **Titanium**

This metal has excellent corrosion resistances in high temperatures, oxidant service, Nitric acid and caustic solutions. Temperature limit: 2000°F (1100°C). Hardness: 215 HB.

