



## Common Name: Alloy 218

Nitronic 60 Stainless Steel is all purpose metal. This completely austenitic alloy was originally designed as a temperature alloy and subsequently has very good high temperature properties for temperatures around 1800°F. This grade is best known for its wear and galling resistance. The oxidation resistance of Nitronic 60 Stainless Steel is similar to Type 309 and far better than Type 304. The increases of Silicon and Manganese have given this alloy a matrix to inhibit wear, galling and fretting even in the annealed condition. Higher strengths are feasible through cold working the material and are still completely austenitic after severe cold-working. This working does not improve the anti-galling properties, as are ordinary for carbon steels and some stainless steels. The advantage of the cold or hot work put into the material is included strength and hardness, and the wear resistance does not decrease noticeably. Chromium and Nickel additions give it similar corrosion to 304 and 316 stainless steels, while having around double the yield strength. The high mechanical strength in annealed parts grants utilization of decreased cross sections for weight and cost reductions using thinner stock.

## Applications

- Automotive valves - can withstand gas temperatures of upto 1500°F for a minimum of 50,000 miles.
- Fastener galling - capable of frequent assembly and disassembly, allowing more use of the fastener before the threads are torn up, also helps to eliminate corroded or frozen fasteners.
- Pins - Used in roller prosthetics & chains to ensure a better fit of parts (closer tolerance, non-lubricated) and longer lasting.
- Marine shafts - better corrosion than types 304 and 316, with double the yield strength.
- Pin and hanger expansion joints for bridges - better corrosion, galling-resistance, low temperature toughness, & high charpy values at sub-zero temps compared to the A36 and A588 carbon steels commonly used.

## Characteristics

- Wear and galling resistant alloy

## Machining

Slow speeds, positive feeds and abundant resulfurized lubricant is significant to success in machining this alloy. Speeds and feeds are comparable to those employed with 316 or 317 stainless steels are appropriate here. Each and every unique machining practice can be utilized in this material. Chips will be tough and stringy and it is recommended these curlers or breakers are used.

## Welding

With this material pre-heating is not required and all regular welding techniques including gas tungsten arc, gas metal arc and submerged arc are obtained. Filler metal selection should be of comparable chemistry for maximum strength and resistance to intergranular attack.

## Forging

Heat to 2000 F, soak to equalize, then heat to 2150 and equalize prior to forging.

## Forming

With this alloy all common forming methods can be utilized. Spring back will be more prominent than with standard austenitic and should be taken into consideration when choosing the appropriate forming forces. Process annealing is recommended to remove stresses resulting from this alloys' high work hardening rate. Heat to 1950 F (1065 C) for intermediate anneals.

## Annealing

Soak at 1900-2050 F, quench rapidly in air or water.

## Hardening

Hardening this alloy requires cold working. It won't harden with exposure to thermal treatment.

## Chemical Properties

C	Mn	P	S	Si	Cr	Ni	N
0.010	7.0 - 9.0	0.060	0.030	3.5 - 4.5	16.0 - 18.0	8.0 - 9.0	0.08 - 0.18

## Mechanical Properties

Tensile Strength (ksi)	0.2% Yield Strength (ksi)	Elongation% in 2 inches
105	55	35

## Physical Properties

Properties	Units	Temperature in °C
Density	7.62 g/cm <sup>3</sup>	Room
Specific Heat	0.11 Kcal/kg.C	22°
Melting Point	1375 °C	-
Modulus of Elasticity	180 KN/mm <sup>2</sup>	20°
Electrical Resistivity	589 μΩ.cm	Room
Coefficient of Expansion	15.8 μm/m °C	20-100°

## ASTM Specifications

Sheet / Plate	Bar / Forging	Fitting
A 240	A 193, A 194, A 276, A 479	A 182

## Availability

### MANUFACTURING

Fasteners

Custom Machining

Custom Fabrication

Stamped Parts

Flanges

### RAW MATERIALS

Bars

Sheets

Plates

### Disclaimer

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