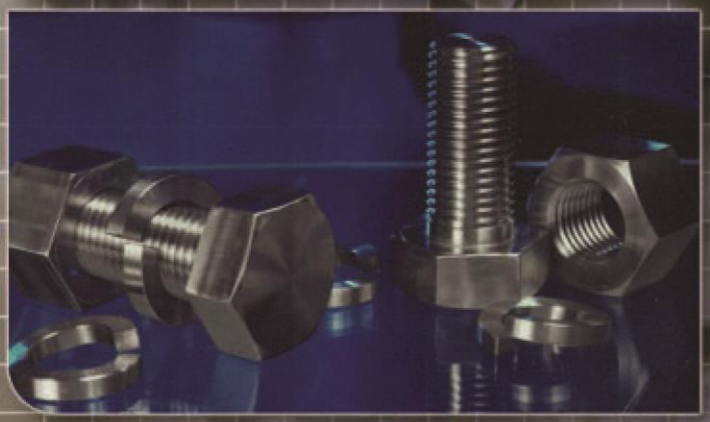
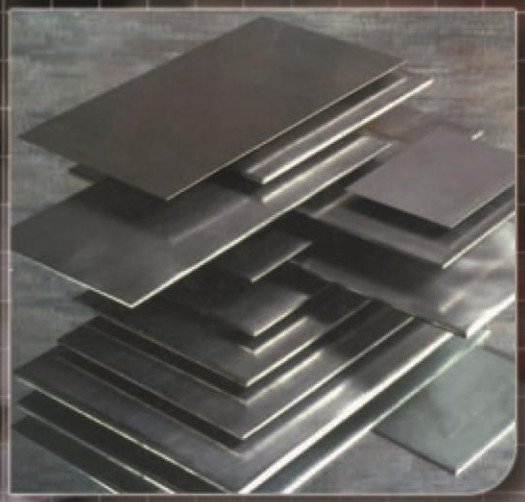
CORROSION, WEAR AND HEAT RESISTANT ALLOYS

HPA ALLOYS

Since 1984





Bar, Wire, Sheet, Plate and Fasteners. These are our specialties, stocking many sizes and grades of special metals. Quick shipments of small and medium quantities are where High Performance Alloys performs best!

High Performance Alloys is here to help you impartially select the most cost effective material for your specific application.

HIGH PERFORMANCE ALLOYS, INC.

The Specialty Producer!

1-877-472-5569

sales@hpalloys.com • www.hpalloys.com

Company Profile

High Performance Alloys, Inc. (HPA) was formed in 1984 to provide customers requiring small quantities of alloy (less than 500 pounds) with fast, dependable delivery. We also offer our services for larger quantities (around 1000 pounds,) and will estimate for deliveries through our large network of mills for even larger needs.

HPA represents several fine mills throughout the world, such as Haynes International, Krupp VDM, Allegheny Ludlum, Special Metals, Carpenter Technology, Bohler, Deutsche Nickel, Foroni, Valbruna, Dunkirk, Universal and Electralloy.

HPA is also a producer of these alloys, as well as a number of other alloys. Most production, from forging to rolling and finishing, is performed at our Tipton facility. Our concentration has been on production or toll processing of alloys that contain a high concentration of Nickel, Cobalt, Molybdenum, Chromium, Tantalum, or Titanium.

In general, we supply NITRONIC®, HASTELLOY®, INCONEL,® and STELLITE in various sizes of bar, wire, sheet, plate, forgings and fasteners.

Metals Service Center

Multiple saw types are available to readily cut bars to multiple lengths (MULTS). A piece can be cut from the sheet or plate using a shear, CNC plasma and waterjet. We also offer processes such as rough machining and light fabricating. Our lead times for machining and grinding are dependent upon how much material is being quoted. Small to medium orders are welcome. Special size or temper required? We have production capabilities in-house to produce bars, plates, sheets and forgings to many tempers and sizes, all on an as-needed basis.

Producer

A GFM 412 Rotary Forge was installed in 1995. A two high rolling mill was installed in 2001, and a 750-ton forge press was installed in 2007. We specialize in making available the sizes and alloys that are not common, not produced yet, or so small in quantity that a larger mill will not produce them.

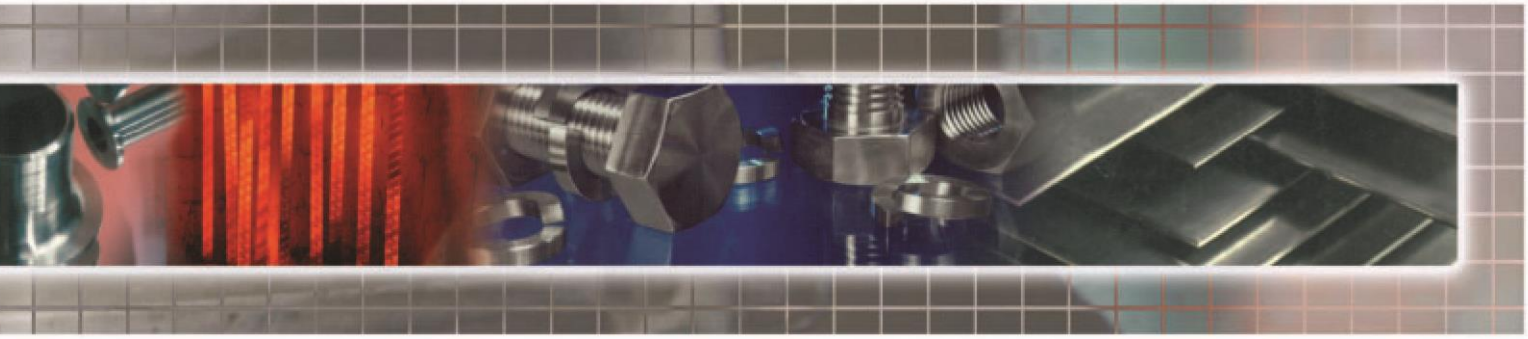
We use our two high rolling mill to produce small bars, hex, narrow flats, and rectangular. These products are primarily cold finished, and hot or warm rolled when necessary. The 750-ton forging press makes squares, rounds, upsets and planished forgings. The working bed is 14 inch x 36 inch wide, allowing many possibilities of products from under 50 lbs. up to 3000 lbs. per piece.

Production of Special Metals

We also specialize in small quantities. By serving this niche market, we help our mills with developmental alloys. We also help our customers by making that size or alloy available in a short amount of time, without having to purchase a heat lot quantity. Many projects only require a small amount to evaluate a material for process/application suitability.

Production cut bars

Radial bar forging area



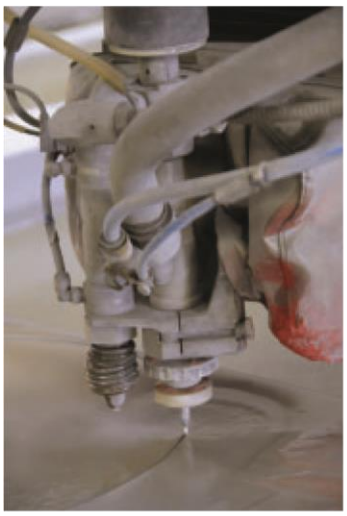
www.hpalloys.com • 1 877 472 5596 • sales@hpalloys.com

Our Services

HPA provides many services in-house to aid our customers in getting exactly what they need, when they want it. Being a distributor, service center, and producer, helps our customers receive timely quotes for specific products, with the special attention that only HPA can give with unbiased facts, information, and guidance. Let our friendly sales staff take care of your needs today!

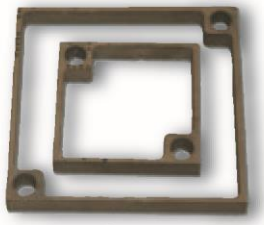
Cutting Requirements

We cut and machine bevels, cut to part multiples, and of course, we can cut in half for easy shipment. Whether it is bar, wire, sheet, plate, tube, or pipe; HPA will serve your needs.



Dynamic Waterjet

Plastics and Water Only Cutting



Metal Cutting

Furnace Capabilities

HPAlloy's gas fired, 12 foot length batch furnace is capable of a 2300°F temperature. We also provide computer controlled programming capabilities for temperature control of annealing to specification. Several lab-size furnaces are available for small parts. These are used for proofing procedures and for heat-treating sample size pieces.

Rapid Delivery

Fast delivery service is particularly important to operating plants in order to avoid costly downtime and lost production. HPA is organized to provide 24-hour delivery service of in-stock material anywhere in North America. Customers may also pick material up from our warehouses.

Normal Order Specifications

Our normal order specifications include packaging, material certifications, and material identification. Packaging includes our standard method of protecting for shipment. Certifications on our materials are mandatory for the majority of our customers and include many standard specifications, as well as any that may be added during the quote process. Material identifications include labeling the product for your purchase order by materials type, heat number, dimensions, weight, and a part number if desired.

Bar Production

Using our 750-ton press, we can start working material as large as 8-10 inch diameter. We can work this material to go directly to our radial forge as well. Our radial/rotary forge can produce materials starting with rough stock at about 3 inch diameter, and through a series of reductions, take the material to around 1/2 inch diameter. The hot, warm and cold working processes are especially good for small quantities, special tempers, and super alloys.

Machining

Machining is also available at our facility. We offer a wide assortment of processes for rough machining our materials down to a particular size and shape. We have dedicated machinists that will do what it takes to help our customers attain the delivery they need.

Experience

Our management and sales division of HPA has over 200+ years combined experience in technology, product development and sales marketing of specialty materials. HPA is qualified to help you in impartially selecting cost effective material for a specific application. You can also talk to our qualified staff about your metallurgical needs.

Mill Quantities

HPA represents several high quality material producers, which enables the customer to receive lower cost and reliable delivery of mill production. We also offer custom stock for just-in-time deliveries. Ask about a stocking plan to fit your needs.

Special Products

Customer designed components can be machined or fabricated. Full machining capabilities are available inhouse, including turning, milling, drilling, boring, tapping, centerless grinding, surface grinding and blanchard grinding. Welding, including TIG and MIG, can be performed on small fabrications and assemblies.

Large diameter pipes are made in nickel and cobalt based material and some stainless. This is offered as a service on our materials, so special (O.D. and wall) pipe and tubing can be offered on a small quantity basis.

Specially Produced Bar

HPA is also a secondary producer of the alloys that we normally stock, as well as a number of other materials.

Hot and cold reduction of bar is available in-house. This is performed with our GFM 412, a rotary forge that can produce from 3 inch to 1/2 inch diameter bar. Furnaces on both ends of the production area assist in reducing heat loss during long hot working sessions. Bars are returned to batch furnace for process/final anneal. This batch furnace is 12 foot long and 40 inches wide, and capable of 2300°F with quick ramping for up to 2000 lb. quantities.

Bar

Stock sizes in bar range from 1/8 inch to 12 inch in stock. Larger sizes and special sizes can be produced according to your needs. Product is centerless ground up through 4 inch diameter, and larger sizes are smooth turned or rough turned. We stock strain hardened and hot worked bars in several grades, as well as their normal annealed tempers.

High Strength 60 Ground Finish

Wire

Spools and cut lengths are available for quick shipment, in close tolerance or product for welding. Sizes range from 0.001 inch to 0.125 inch diameters.

Sheet

Sheets are available ranging in thickness from 0.025 inch thick to 0.125 inch thick. Widths and lengths can vary from alloy to alloy, depending on their thickness and their need for a particular industrial use. Widths of 12 inch, 24 inch, 36 inch, and 48 inch are common. Lengths of sheet product can be 96 inch, 120 inch, 144 inch and special order lengths for product of coil.

Plate

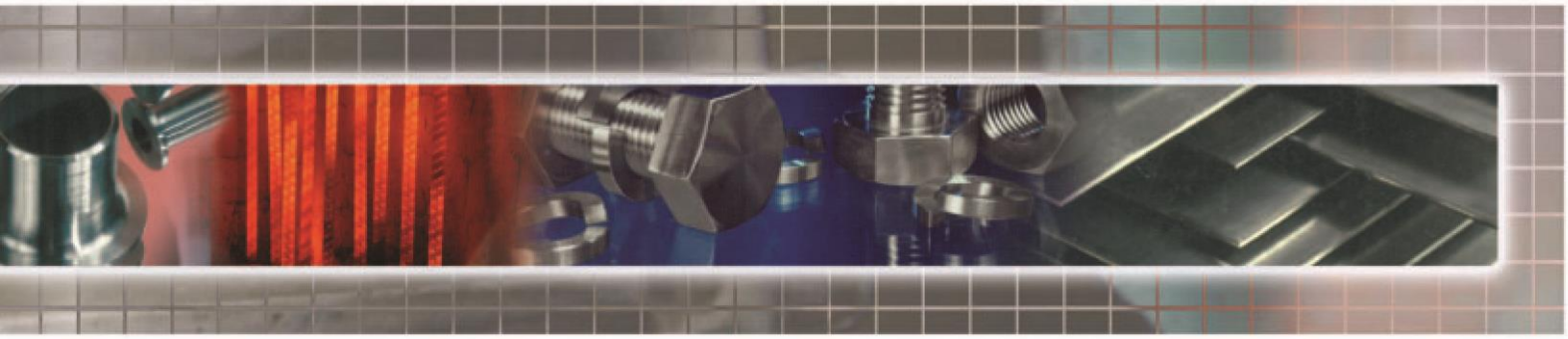
Stock plate thicknesses ranging from 3/16 inch to 2-1/2 inch thick are available for rapid shipment.
Master plates typically come from the mill as a 96 inch x 240 inch R/L. Hot rolling of plate and sheet is accessible for relatively small orders, through our large network of specialists. If you have a special requirement, let us know.

Fasteners

HPA has fasteners in the materials that we stock. If your item is not in stock, we will help make it available.

Forgings

Many of our materials are forged in Tipton. Bars, flats, and upsets are made to order.



750 ton Lake Erie Forge Press

This open die forge press, with three material handling manipulators is located in the center of our Tipton facility.
Forging allows for a wide array of mechanical properties. From annealed, precipitation hardened condition, to cold reduced, and the hot worked-as worked conditions.

Press and 500 pound manipulator

3000 pound manipulator

input Size

10 inch max. diameter. One of three manipulators can start the process. A small 500 lb. capacity Positech can hold pieces as large as 8 inch diameter, and as small as 2 inch diameter. The ability to use small input stock can be utilized to yield the most material possible. The 1000 lb., or the 3000 lb. Long Reach mobile units can be used for products from 10 inch diameter to 2 inch diameter. Bar and billet product is typical as input material. We can also accept extruded bar, and work down to produce better grain structure, and density than the extrusion alone offers. Cast products have also successfully been reduced on our equipment, as we closely monitor the process.

Variable press rates allow adjustment of the process to fit many materials.

Output Size

While the possibilities are endless, it depends on the material, and what we are starting with. Generally with cast product, at least a 50% reduction will be necessary to start achieving wrought product properties. Extrusions and Billet will need a 10 to 20% reduction, sometimes more with large sizes and complex grades. Most product produced will be 7 inch diameter through 3 inch diameter, or squares about 6 inch to 2 inch in cross section.

Forging Specifications

Our Lake Erie press has been updated to include numeric control of cycles, and programs of process cycles. A manual override allows operator to take control of process while changing parameters as needed. Heat can be closely monitored with an optical pyrometer, to assure the working temperature range is kept within limits. Quantities usually less than 2000 lbs. allow us to produce a single bar or piece of the material and size that our customers require.

nqa. ISO 9001 Registered

ANAB ACCREDITED

Advantages include:

- Can process small to medium lots of materials, excellent for prototype, research, and other small quantity requirements.
- We are capable of producing round, square and rectangular bar, as well as performing upsets and planishing of billets.
- HPA can move fast to help customers achieve results, and get their material as quick as possible. We can convert our customers' slow moving inventory items into useful sizes, or lengths. As with most of our equipment, we are open to conversion or toll processing of customers material.

Ask about our Strained Hardened Bars!

List of Alloys

HPA maintains a large stock of material in their warehouse and offers shearing, plasma, laser, abrasive cutting and waterjet.

Corrosion Resistant

HASTELLOY® alloy C-276 (UNS N10276)

Ni 57.0, Mo 16.0, Cr 15.5, Fe 5.5, W 3.8

Outstanding corrosion resistance in reducing and oxidizing environments. Maintains corrosion resistance in welded condition. Excellent resistance to pitting and stress-corrosion cracking (SCC). Widely used in severest environments in chemical processing, pollution control, pulp and paper.

INCONEL® alloy 625 (UNS N06625)

Ni 61.0, Cr 21.5 Mo 9.0, Nb+Ta 3.6

High strength and toughness from cryogenic temperatures to 1800°F (980°C), good oxidation resistance, exceptional fatigue strength, and good corrosion resistance.

Chemical and pollution control equipment, ash pit seals, nuclear reactors, marine equipment, ducting, thrust reverser assemblies, fuel nozzles, afterburners, spray bars.

HPA N60® (Alloy 218) (UNS S21800) Nitronic 60

Fe 63, Cr 17, Mn 8, Ni 8.5, Si 4, N 0.13

High strength fully Austenitic alloy that resists galling and wear. Significantly lower cost to extend part life and lower maintenance. The yield strength is twice that of 304 and 316 stainless steels, in the annealed condition. Tensile strengths can be produced in excess of 200 ksi. Chloride pitting is superior to that of type 316, and the oxidation resistance is similar to type 321 at elevated temperatures, and excellent cryogenic impact strength.

Valves stems, seats, and trim; fastening systems, screening, pins, bushings, roller bearings, pump shafts and rings. Food handling, medical, automotive, aerospace and nuclear.

HASTELLOY® alloy C-22 ® (UNS N06022)

High Performance Alloys stocks and produces this grade in the following forms: Bar, wire, sheet, plate, coil, fasteners and forgings.

HASTELLOY Alloy C-22 is a nickel-chromium-molybdenum alloy with enhanced resistance to pitting, crevice corrosion and stress corrosion cracking. It resists the formation of grain boundary precipitates

HASTELLOY® alloy C-22 ® (UNS N06022) (cont.)

in the weld-heat affected zone making it suitable for use in the as-welded condition. Common in FGD (Flue Gas Desulfurization) scrubbers, in the wet/condensation areas. C-22 has outstanding resistance to both reducing and oxidizing media and because of its resistibility can be used where "upset" conditions are likely to occur. It is proven to possess excellent weldability and high corrosion resistance as
consumable filler wires and electrodes. The alloy has proven results as a filler wire in many applications. As filler wire, use when other corrosion resistant wires have failed.

C-22 can easily be cold-worked because of its ductility and cold-forming is the preferred method of forming. More energy is required for forming as the alloy is generally stiffer than austenitic stainless steels.

HPA N50 (XM-19) (UNS S20910) Nitronic 50

Fe 57, Cr 22, Ni 13, Mn 5, Mo 2, Si 1

High strength Austenitic with superior corrosion resistance to types 316 and 316L, with approximately twice the yield strength in the annealed condition. Also fully Austenitic, this alloy stays nonmagnetic when severely cold reduced. Cryogenic properties are also outstanding as well as elevated temperatures.

Pumps, valves, fittings, fasteners, cables, chains, wire cloth, marine hardware, shafts, and springs.

HPA N30 (UNS N20400) Nitronic 30

Fe Bal, Cr 16, Mn 8, Ni 2.25, N 0.22, C 0.03

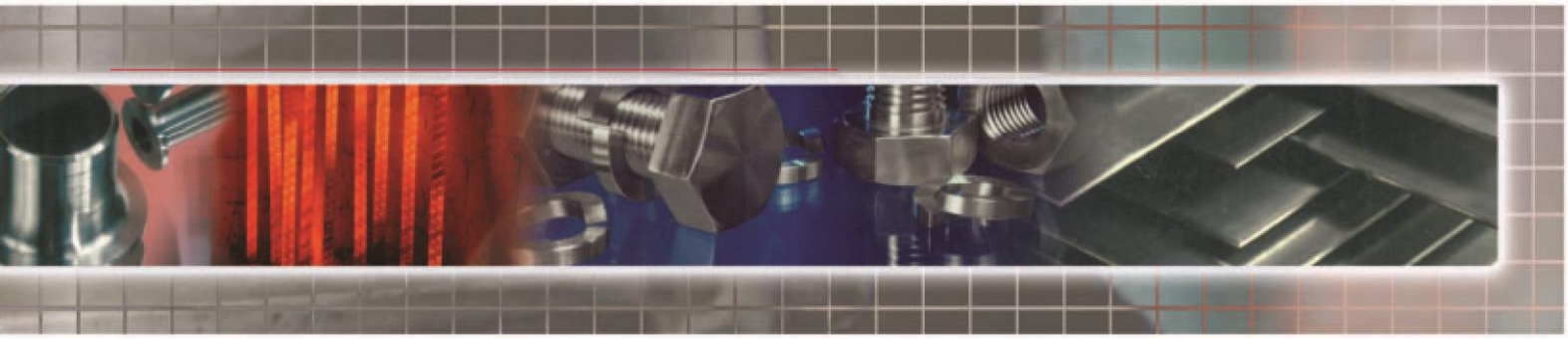
Low alloy version of Nitronic 60, primarily used for abrasion resistance. Corrosion and abrasion resistant. Resists inland atmospheric corrosion. Excellent strength and toughness. Weldable and formable AR material, used in coal and other sliding applications.

Wear Resistant

HPA COBALT alloy 6B (Co-Cr-W) (UNS R30016)

Co 59.0, Cr 30.0, W 3.5, Ni 2.5, Mn 1.4, C 1.0

Excellent hot strength, which is fully returned when cooled to room temperature again. Replacement for castings due to better ductility, and dependability for sealing surfaces. Seizing, galling and nonlubricated wear can be minimized by using this alloy. Metal seizing is when one metal piece building heat against another “weld” together. Galling is when these welded areas break off and forms abrasive debris which creates additional abrasion problems,



HPA COBALT alloy 6B (Co-Cr-W) (UNS R30016) (cont.)
and can lead to other types of corrosion.

Turbine engine nozzle fuel injectors, steam turbine (last vane) to prevent water erosion as the steam condenses. Pump applications such as motor shafts, bushings, sleeves and stems.

HPA N60® (Alloy 218) (UNS S21800) Nitronic 60

Fe 63, Cr 17, Mn 8, Ni 8.5, Si 4, N 0.13

High strength fully Austenitic alloy that resists galling and wear. Significantly lower cost to extend part life and lower maintenance. The yield strength is twice that of 304 and 316 stainless steels, in the annealed condition. Tensile strengths can be produced in excess of 200 ksi. Chloride pitting is superior to that of type 316, and the oxidation resistance is similar to type 321 at elevated temperatures, and excellent cryogenic impact strength.

Valves stems, seats, and trim; fastening systems, screening, pins, bushings, roller bearings, pump shafts and rings. Food handling, medical, automotive, aerospace and nuclear.

High Temperature (heat) Resistant

HASTELLOY® alloy X (HX) (UNS N06002)

Ni 47.5, Cr 21.8, Fe 18.5, Mo 9.0

Excellent high temperature strength and oxidation resistance to 2200°F. Excellent forming and welding characteristics. Resistance to oxidizing, reducing, and neutral atmospheres. Resistant to SCC in petrochemical applications. Good ductility after prolonged service temperatures of 1200ºF through 1600°F for 16,000 hours.

Gas turbine combustion cans and ducting, heat-treating equipment, spray bars, flame holders, furnace rolls, furnace baffles, and flash drier components.

INCONEL® alloy 625 (UNS N06625) & LCF

Ni 61.0, Cr 21.5 Mo 9.0, Nb+Ta 3.6

High strength and toughness from cryogenic temperatures to 1800°F (980°C), good oxidation resistance, exceptional fatigue strength, and good corrosion resistance. Chemical and pollution control equipment, ash pit seals, nuclear reactors, marine equipment, ducting, thrust reverser assemblies, fuel nozzles, afterburners, spray bars.

INCONEL® alloy 718 (UNS N07718)

Ni 52.5, Cr 19.0 Fe 18.5 Mo 3.0 Nb+Ta 3.6

Excellent strength from -423°F to 1300°F (-253°C to 705°C). Age hardenable and may be welded in fully aged condition, excellent oxidation resistance up to 1800°F (980°C).

Jet engines, pump bodies and parts, rocket motors and thrust reversers, nuclear fuel element spacers, hot extrusion tooling.

INCONEL® alloy 601 (UNS N06601)

Ni 61, Fe Bal, Cr 22, Al 1.4

Nickel, higher chromium content for better resistance to oxidizing and reducing environments; for severely corrosive environments at elevated temperatures. Good oxidation resistance to 2200°F. Good formability.

Instrument probes, furnace muffles, electronic components, chemical and food processing equipment, heat treating equipment, nuclear steam generator tubing.

L605 (UNS R30605)

Co 50.0, Cr 20.0, W 15.0, Ni 10.0, Fe 3.0 Mn 1.5

Excellent strength for continues service to 1800°F. Oxidation and carburization resistance to 1900°F. Galling resistant, with resistance to marine environments, acids and body fluids. Non-magnetic, even when severely cold reduced, can reach Rc 50 when cold reduced and aged. Resistant to hydrochloric and nitric acid at certain concentrations and temperatures, and wet chlorine environments at room temperature.

Gas turbine engine components: combustion chambers, and afterburners. Other uses also include: high temperature ball bearing service, springs, and heart valves.

HPA N60® (Alloy 218) (UNS S21800) Nitronic 60

Fe 63, Cr 17, Mn 8, Ni 8.5, Si 4, N 0.13

High strength fully Austenitic alloy that resists galling and wear. Significantly lower cost to extend part life and lower maintenance. The yield strength is twice that of 304 and 316 stainless steels, in the annealed condition. Tensile strengths can be produced in excess of 200 ksi. Chloride pitting is superior to that of type 316, and the oxidation resistance is similar to type 321 at elevated temperatures, and excellent cryogenic impact strength.