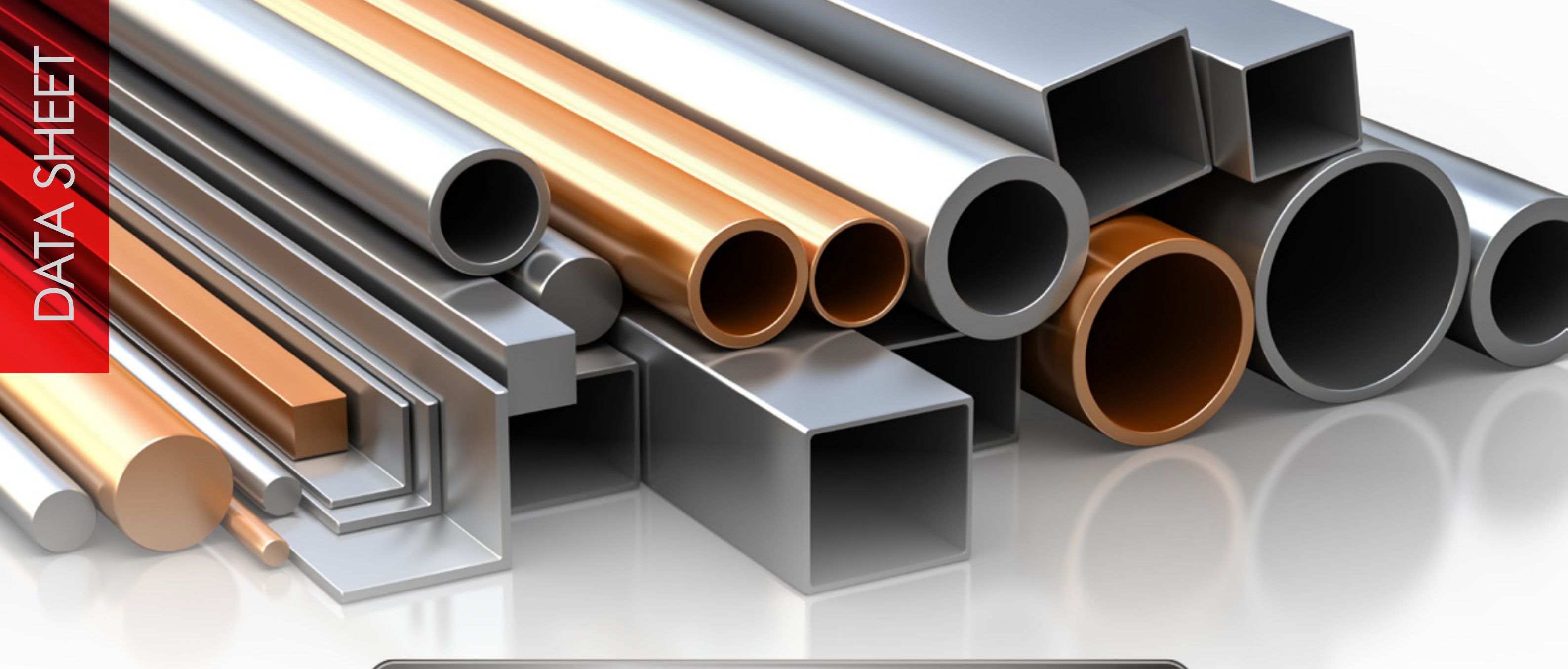
DATA SHEET



INCONEL® 718

UNS No - N07718

Other common names: Alloy 718, Haynes® 718, Nicrofer® 5219, Allvac® 718, Altemp® 718

Inconel 718 is a nickel-chromium-molybdenum alloy intended to resist an extensive variety of serious corrosive situations, pitting and crevice corrosion. This nickel steel alloy additionally shows incredibly high return, tensile, and creep-break properties at high temperatures. These nickel alloys is utilized from cryogenic temperatures up to long term service at 1200° F. One of the recognizing elements of Inconel 718's composition is the expansion of niobium to allow age hardening which permits annealing and welding without unconstrained hardening during heating and cooling. The expansion of niobium acts with the molybdenum to stiffen the alloy matrix and give high strength without a reinforcing heat treatment. Other well known nickel-chromium alloys are age hardened through the expansion of aluminium and titanium. This nickel steel alloy is promptly fabricated and might be welded in either the annealed or precipitation (age) hardened condition. This super alloy is utilized as a part of an assortment of commercial ventures, for example, aerospace, marine engineering, chemical processing, pollution-control equipment and nuclear reactors.

Applications

- Chemical processing
- Aerospace
- Liquid fuel rocket motor components
- Pollution-control equipment
- Nuclear reactors
- Cryogenic storage tanks
- Valves, fasteners, springs, mandrels, tubing hangers
- Well head completion equipment and blow out preventers (BOP´s)
- Gas turbine engine parts

Characteristics

- Good mechanical properties - tensile, fatigue and creep-rupture
- Yield tensile strength, creep, and rupture strength properties are exceedingly high
- Highly resistant to chloride and sulphide stress corrosion cracking
- Resistant to aqueous corrosion and chloride ion stress corrosion cracking
- High temperature resistant
- Age-hardenable with a unique property of slow aging response that permits heating and cooling during annealing without the danger of cracking
- Excellent welding characteristics, resistant to post weldage cracking

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Corrosion Resistance

Alloy 718 has phenomenal corrosion resistance to numerous media. This resistance, which is like that of other nickel-chromium alloys, is a component of its creation. Nickel adds to corrosion resistance in numerous inorganic and natural, other than firmly oxidizing, mixes all through wide scopes of acidity and alkalinity. It additionally is valuable in combating chloride-ion stress-corrosion breaking. Chromium imparts a capacity to withstand attack by oxidizing media and sulfur mixes. Molybdenum is known to contribute to resistance to pitting in numerous media.

Machining

Standard machining methods utilized for iron based alloys might be utilized. This alloy works harden during machining and has higher strength and "gumminess" not typical of steels. Heavy duty machining equipment as well as tooling should be utilized to minimize chatter or work-hardening of the alloy in front of the cutting. Most any business coolant might be utilized as a part of the machining operations. Water-base coolants are favored for high speed operations, for example, turning, grinding or milling. Heavy lubricants work best for tapping, drilling, broaching or boring. Turning: Carbide tool is recommended for turning with a nonstop cut. High speed steel tooling should be utilized for interfering with slices and for smooth completing to close resilience. Tools should have a positive rake angle. Cutting speeds and feeds are in the accompanying reaches. Drilling: Steady feed rates must be utilized to maintain a strategic distance from work hardening because of harping of the drill on the metal. Rigid setups are crucial with as short a stub drill as practical. Heavy duty, high speed steel drills with heavy web is recommended. Feeds fluctuate from 0.0007 inches for each rev. for holes of less than 1/16" measurement, 0.003 inches for each rev. for 1/4" dia., to 0.010 inches for each rev. for holes of 7/8"diameter. Slow surface speed, as 8-10 feet/ minute, are best for drilling. Processing: To acquire great exactness and a smooth completion, it is fundamental to have unbending machines and fixtures and sharp cutting devices. High speed steel cutters, for example, M-2 or M-10 work best with cutting speeds of 5 to 15 feet per minute and feed of 0.001"- 0.004" per cutting tooth. Grinding: The alloy should be wet ground and aluminium oxide wheels or belts are favored.

Forming

This alloy has good ductility and might be promptly formed by every standard technique. Since the alloy is more powerful than consistent steel it need more power to perform forming. Heavy-duty lubricants should be utilized during cold forming. It is crucial to altogether clean the part of all traces of lubricant to shaping as embrittlement of the alloy might occur at high temperatures if lubricant is left on.

Welding

The usually utilized welding strategies work well with this alloy. The coordinating alloy filler metal should be utilized. In the event that coordinating alloy is not available, then the closest alloy richer in the essential chemistry (Ni, Co, Cr and Mo) should be utilized. All welds dots should be marginally curved. It is not important to utilize preheating. Surfaces to be welded must be perfect and free from oil, paint or crayon marking. The cleaned area should stretch out no less than 2" past either side of a welded joint. Gas-Tungsten Arc Welding: DC straight polarity (electrode negative) is recommended. Keep as short an arc length as could be expected under the circumstances and use consideration to keep the hot end of filler metal dependably inside of the protected environment. Shielded Metal-Arc Welding: Electrodes should be kept in dry storage and if dampness has been grabbing the electrodes should be prepared at 600 F for one hour to safeguard dryness. Current settings shift from 60 amps for material (0.062" thick) up to 140 amps for material of 1/2" and thicker. It is best to weave the electrode marginally as this alloy weld metal does not tend to spread.

Cleaning of slag is finished with a wire brush (hand or powered). Complete evacuation of all slag is essential before progressive weld passes furthermore after final welding. Gas Metal-Arc Welding: Reverse-polarity DC should be utilized and best results are acquired with the welding weapon at 90 degrees to the joint. For Short-Circuiting-Transfer GMAW a typical voltage is 20-23 with a current of 110-130 amps and a wire feed of 250-275 inches per minute. For Spray-Transfer GMAW voltage of 26 to 33 and current in the scope of 175-300 amps with wire feed rate of 200-350 inches per minute, relying on filler wire diameter. Submerged-Arc Welding: Matching filler metal, the same concerning GMAW, should be utilized. DC current with either turn around or straight polarity might be utilized. Convex weld globules are favored.

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Heat Treatment

The alloy is age-hardenable (see under "Aging") and can be annealed at 1900 F took after via air cooling.

Forging

Forging is done in the scope of 2050 F to 1700 F. Last decreases of 20% for open die work and 10% for close die are craved to keep up maintain grain structure and completing temperatures should be in the 1750 F - 1700 F range.

Hot Working

Hot working might be done in the temperature scope of 2050 F to 1650 F. It is imperative to reheat the alloy if hot working temperatures fall underneath 1650 F.

Cold Working

Cold forming might be done utilizing standard tooling albeit plain carbon tool steels are not recommended for shaping as they tend to produce galling. Soft die materials (bronze, zinc alloy, and so forth.) minimize galling and deliver great completions, yet the die life is to some degree short. For long production runs the alloy tool steels (D-2, D-3) and high speed steels (T-1, M-2, M-10) give great results particularly if hard chromium plated to decrease galling. Tooling should be, for example, to take into consideration liberal clearances and radii. Heavy duty lubricants should be utilized to minimize galling in all forming operations. Twisting of sheet or plate through 180 degrees is for the most part constrained to a twist sweep of 1 T for material up to 1/8" thick and 2 T for material thicker than 1/8".

Annealing

Annealing might be done at 1900 F took after by fast air cooling.

Aging

Two marginally distinctive aging heat treatments are available. 1. 1800 F anneal and age at 1325 F for 8 hours, then furnace cool to 1150 F and hold at that temperature for 10 hours, then air cool. This is the ideal treatment for the most noteworthy room temperature strength and the best rupture properties. 2. 1925 F anneal and age at 1400 F, furnace cool to 1200 F and hold there for 10 hours, furnace cool to 1200 F and hold for 10 hours, then air cool. This treatment will give the best transverse flexibility, particularly in heavy areas. Nonetheless, it tends to advance notch brittleness.

Hardening

Cool work will bring about an expansion in both hardness and strength. The alloy might likewise be age-hardened - see "Heat Treat".

Other Mechanical Props

Impact strength values for Charpy V-Notch: At room temperatures: 20.5 ft. lbs. At minus 320 F: 19 ft. lbs.

Chemical Properties

B	C	Al	Si	P	S	Ti	Cr	Mn	Fe	Co	Ni	Cu	Mo	Cb (Nb+Ta)
0.006 max	0.08 max	0.20-0.80	0.35 max	0.015 max	0.015 max	0.65-1.15	17.00-21.00	0.35 max	Remainder	1.0 max	50.00 - 55.00	0.30 max	2.80 - 3.30	4.75 - 5.50

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Mechanical Properties

Tensile Strength (ksi)	0.2% Yield Strength (ksi)	Elongation% in 2 inches
180	150	12

Physical Properties

Properties	Units	Temperature in °C
Density	8.19 g/cm³	Room
Specific Heat	0.104 Kcal/kg.C	21°
Melting Range	1260 - 1366 °C	-
Modulus of Elasticity	199.9 KN/mm²	21°
Electrical Resistivity	125 μΩ.cm	Room
Coefficient of Expansion	13.0 μm/m °C	20 - 100°
Thermal Conductivity	11.1 W/m -°K	21°

ASTM Specifications

Sheet / Plate	Bar
B 670	B 637

Availability

MANUFACTURING
Fasteners
Custom Machining
Custom Fabrication
Stamped Parts
Flanges

RAW MATERIALS
Bars
Sheets
Plates
-
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