

Alloy 718

N07718 / AMS5662 / API6A718



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Alloy 718 is a precipitation hardening nickel-chromium alloy with an excellent combination of high strength and corrosion resistance together with an ease of fabrication and an excellent weldability. The alloy's enhanced properties are achieved via additions of niobium, molybdenum, aluminium, titanium and iron. The unique blend of properties on offer enables its usage for components in the marine, aerospace, chemical, nuclear, offshore and petrochemical industries.



Columbia Metals stocks Alloy 718 in the solution treated condition as per AMS 5662 and to the API 6A specification. AMS5662 is most suitable for heavy machining, forming or welding as it is in its most malleable state, whereas API 6A provides high strength while meeting the maximum hardness requirements of the NACE MR0175, MR0103 and ISO 15156-3 specifications for use in oil tools in corrosive environments.

Alloy 718 can be solution treated and age hardened at a number of different temperatures to fulfil the requirements of individual specifications. Each heat treatment can provide the user with a different set of mechanical and physical properties suitable for different applications.

The AMS 5662 specification stipulates that the material should be supplied in the solution treated condition (i.e. heat treated within the range 941-1010°C). The subsequent age hardening process giving Alloy 718 the best combination of rupture life, notch rupture and rupture ductility. The increased properties are achieved due to the development of a fine grain structure that also provides its highest tensile and yield strengths through a wide range of temperatures from -253°C to 705°C.

- EXCELLENT STRENGTH LEVELS
- OUTSTANDING CORROSION RESISTANCE
- SUPERB HIGH TEMPERATURE STRENGTH
- OXIDATION RESISTANCE UP TO 982°C
- GOOD FORMING / FABRICATION PROPERTIES
- VERY HIGH RESISTANCE TO CREEP
- EASILY JOINED / WELDED
- HIGH RESISTANCE TO STRESS RUPTURE
- RESISTANCE TO STRESS CORROSION
- EXCELLENT PITTING RESISTANCE

Alloy 718 also offers outstanding corrosion resistance in a variety of media. It excels in many different environments including organic acids, inorganic acids (not strongly oxidising), hydrogen sulphide and sour gases. It is also especially resistant to chloride stress-corrosion cracking. The chromium content present in the material results in an excellent resistance to oxidation and sulphur compounds up to temperatures of around 980°C. The molybdenum content aids in the overall pitting resistance of the material.

Alloy 718 can be readily machined in the solution treated condition but the material's high strength and work-hardening characteristics should be taken into account. The material can be hot worked between 985-1150°C or cold worked whilst in the solution treated condition due to its high elongation. However, inter stage annealing (between 925 to 1010°C) may be needed for more complex forming operations. Any hot or cold working should be followed by annealing and quenching to restore the best balance of properties. This material can also be readily welded by the gas tungsten arc (TIG) process and it is especially resistant to post weld cracking.

This combination of properties results in a material that truly can be described as a "Superalloy". Specific applications include fasteners, valves, choke stems, down-hole tooling, cryogenic storage tanks, gas turbines, jet engines, pump bodies and nuclear reactor parts. It is also suitable for shear blades and extrusion dies where conventional tool steels do not offer the required high temperature strength.

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Alloy 718

Technical Data



Nominal Composition (%)

Ni	Cr	Fe	Nb	Mo	Ti	Al
53	19	18	5	3	0.9	0.5

Typical Mechanical Properties

	As Delivered Solution Treated	Age Hardened Room Temperature (Longitudinal) <127mm dia
Hardness (HB)	277	-
Ultimate Tensile Strength (N/mm ²)	-	1276
0.2% Proof Strength (N/mm ²)	-	1034
Elongation (%)	-	12
Reduction of Area (%)	-	15

Typical Physical Properties

	Age Hardened
Density (g/cm ³)	8.22
Melting Range (°C)	1260 - 1335
Young's Modulus (GPa)	204
Thermal conductivity (0-200°C; W/m°K)	14.2
Coeff. Thermal Exp. (m/m°K x 10 ⁻⁶)	13.5
Magnetic Permeability	1.0011

Round Bar Weight and Stock Sizes

Diameter		Weight		Diameter		Weight		Diameter		Weight	
ins	kg/ft	kg/m	ins	kg/ft	kg/m	ins	kg/ft	kg/m	ins	kg/ft	kg/m
10mm	0.19	0.63	1"	1.27	4.15	3"	11.39	37.36			
1/2"	0.32	1.04	1.1/4"	1.98	6.49	4"	20.31	66.64			
5/8"	0.49	1.62	1.1/2"	2.85	9.34	5"	31.74	104.13			
3/4"	0.71	2.34	2"	5.06	16.61	6"	45.70	145.94			

NB Weight data for guidance only