High Performance

Nickel-Chromium-Molybdenum Heat and Corrosion Resistant Alloy

Alloy 718

Alloy 718 Product Description

Gamma Prime strengthened alloy with excellent mechanical properties at elevated temperatures, as well as cryogenic temperatures. Suitable for temperatures upto around 1300°F. Can be readily worked and age hardened.

Excellent strength from -423 degrees F to 1300 degrees F (-253 degrees C to 705 degrees C). Age hardenable and may be welded in fully aged condition, Excellent oxidation resistance up to 1800 degrees F (980 degrees C). Typically sold in the solution annealed temper, but can be ordered aged, cold worked, or cold worked & aged.

Applications

Uses for this alloy tend to be in the field of gas turbine components and cryogenic storage tanks. Jet engines, pump bodies and parts, rocket motors and thrust reversers, nuclear fuel element spacers, hot extrusion tooling. Other popular uses are high strength bolting, and down hole shafting.

Chemistry

Chemical Requirements							
		Fe	Mo	Mn	Si	Cr	C
Max	55.0	Bal	3.30	0.35	0.35	21.0	0.08
Min	50.0		2.80			17.0	

Mechanical Property Requirements			
	Ultimate Tensile	Yield Strength (0.2% OS)	Elong. in 2 in. (50mm) or 4D min, %
Max	202.3 KSi	170.4 KSi	20.3
Min	185 KSi	150 KSi	12

High Performance Alloys can make hot rolled, cold worked, and strain hardened high performance stainless steel bars in-house now.

Ask for our GFM Bulletin for more information about our bar processing capabilities. We have expanded to enhance product availability.

HPA has a full line of high strength nickel based alloys.

Questions? Call (800)HPALLOY

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(800) 472-5569
765-945-8230
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Any questions or comments can also be sent via E-Mail to:
sales@hpalloy.com

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Specifications	
Form	**Standard**
Metal Type	UNS N07718
Bar	ASTM B637 AMS 5662 AMS 5663 AMS 5664 PWA 1009 PWA 1010 GE B50TF15
Wire	AMS 5832
Sheet	ASTM B670 AMS 5596 AMS 5597 PWA 1033 GE B50TF14 ASTM B670 ASTM B637
Plate	ASTM B670 AMS 5596 AMS 5597 PWA 1033 GE B50TF15 ASTM B670 ASTM B637
Tube	AMS 5589 AMS 5590
Pipe	AMS 5589 AMS 5590
Fitting	
Forging	ASTM B637 AMS 5562 AMS 5663 AMS 5664 PWA 1009 PWA 1010 GE B50TF15
Weld Wire	A5.14 ERNiFeCr-2
Weld Electrode	
Din	2.4668

Machinability Ratings

Nickel & cobalt base corrosion, temperature and wear-resistant alloys are classified as moderate to difficult when machining, however, it should be emphasized that these alloys can be machined using conventional production methods at satisfactory rates. During machining these alloys work harden rapidly, generate high heat during cutting, weld to the cutting tool surface and offer high resistance to metal removal because of their high shear strengths. The following are key points which should be considered during machining operations:

CAPACITY - Machine should be rigid and overpowered as much as possible.

RIGIDITY - Work piece and tool should be held rigid. Minimize tool overhang.

TOOL SHARPNESS - Make sure tools are sharp at all times. Change to sharpened tools at regular intervals rather than out of necessity. A 0.015 inch wear land is considered a dull tool.

TOOLS - Use positive rake angle tools for most machining operations. Negative rake angle tools can be considered for intermittent cuts and heavy stock removal. Carbide-tipped tools are suggested for most applications. High speed tools can be used, with lower production rates, and are often recommended for intermittent cuts.

POSITIVE CUTS - Use heavy, constant, feeds to maintain positive cutting action. If feed slows and the tool dwells in the cut, work hardening occurs, tool life deteriorates and close tolerances are impossible.

LUBRICATION - lubricants are desirable, soluble oils are recommended especially when using carbide tooling. Detailed machining parameters are presented on Page 3.

Our alloys can be cut using any conventional plasma arc cutting system. The best arc quality is achieved using a mixture of argon and hydrogen gases. Nitrogen gas can be substituted for hydrogen gases, but the cut quality will deteriorate slightly. Shop air or any oxygen bearing gases should be avoided when plasma cutting these alloys.

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Recommended Tool Types and Machining Conditions	
Operations	**Carbide Tools**
Roughing, with severe interruption	Turning or Facing C-2 and C-3 grade: Negative rake square insert, 45 degree SCEA1, 1/32 in. nose radius. Tool holder: 5 degree neg. back rake, 5 degree neg. side rake. Speed: 30-50 sfm, 0.004-0.008 in. feed, 0.150 in depth of cut. Dry2, oil3, or water-base coolant4.
Normal roughing	Turning or Facing C-2 or C-3 grade: Negative rate square insert, 45 degree SCEA, 1/32 in nose radius. Tool holder: 5 degree neg. back rake, 5 degree neg. side rake. Speed: 90 sfm depending on rigidity of set up, 0.010 in. feed, 0.150 in. depth of cut. Dry, oil, or water-base coolant.
Finishing	Turning or Facing C-2 or C-3 grade: Positive rake square insert, if possible, 45 degree SCEA, 1/32 in. nose radius. Tool holder: 5 degree pos. back rake, 5 degree pos. side rake. Speed: 95-110 sfm, 0.005-0.007 in. feed, 0.040 in. depth of cut. Dry or water-base coolant.
Rough Boring	C-2 or C-3 grade: If insert type boring bar, use standard positive rake tools with largest possible SCEA and 1/16 in. nose radius. If brazed tool bar, grind 0 degree back rake, 10 degree pos. side rake, 1/32 in. nose radius and largest possible SCEA. Speed: 70 sfm depending on the rigidity of setup, 0.005-0.008 in. feed, 1/8 in. depth of cut. Dry, oil or water-base coolant.
Finish Boring	C-2 or C-3 grade: Use standard positive rake tools on insert type bars. Grind brazed tools as for finish turning and facing except back rake may be best at 0 degrees. Speed: 95-110 sfm, 0.002-0.004 in feed. Water-base coolant.
Drilling	C-2 grade not recommended, but tipped drills may be successful on rigid setup if no great depth. The web must thinned to reduce thrust. Use 135 degree included angle on point. Gun drill can be used. Speed: 50 sfm. Oil or water-base coolant. Coolant-feed carbide tipped drills may be economical in some setups.
Reaming	C-2 or C-3 grade: Tipped reamers recommended, solid carbide reamers require vary good setup. Tool geometry same as high speed steel. Speed: 50 sfm. Feed: Same as high speed steel.
Tapping	Not recommended, machine threads, or roll-form them.

Notes:

1. SCEA - Side cutting edge angle or lead angle of the tool.
2. At any point where dry cutting is recommended, an air jet directed on the tool may provide substantial tool life increases. A water-base coolant mist may also be effective.
3. Oil coolant should be premium quality, sulfochlorinated oil with extreme pressure additives. A viscosity at 100 degrees F from 50 to 125 SSU.
4. Water-base coolant should be premium quality, sulfochlorinated water soluble oil or chemical emulsion with extreme pressure additives. Dilute with water to make 15:1 mix. Water-base coolant may cause chipping and rapid failure of carbide tools in interrupted cuts.
5. M-40 series High Speed Steels include M-41 , M-42, M-43, M-44, M-45 and M-46 at the time of writing. Others may be added and should be equally suitable.
6. Oil coolant should be a premium quality, sulfochlorinated oil with extreme pressure additives. A viscosity at 100 degree F from 50 to 125 SSU.
7. Water-base coolant should be premium quality, sulfochlorinated water soluble oil or chemical emulsion with extreme pressure additives. Dilute with water to make 15:1 mix.

About High Performance Alloys

High Performance Alloys is an ISO 9001:2008 Registered Manufacturer & Distributor of Super Alloys

We manufacture custom items, special grades and tempers. Ask our technical department for assistance today. Our forging processes allow manufacturing many difficult to produce alloys. We have put material into naval, aerospace and space applications. In-house open die forging of super alloy, Nickel alloys, and super stainless items. This expands our range of production up through 12" diameter, and 18" wide. Part sizes from 20 lbs. to 3000 lbs. produced in our Tipton facility, allowing greater scheduling flexibility and control for our customers.

Require custom plate or sheet size?
We can help there, as well. We rolled over 50 tons of our own plate and sheet last year. If you're requirement is for a small cold rolled item see information on our Rolling Capability, including cold rolled rounds, squares and flats. Our GFM Rotary Forge capabilities, including round, square and flat configurations for cold or hot working materials.

Introducing Dynamic Waterjet.
Excellent edge quality, tight tolerances, and faster cutting ability than conventional waterjets. Less taper and tighter tolerances combine to make this abrasive cutting process the next standard in semi-finished parts. Your part design can have multiple edge qualities on different areas - as required for application. An edge not critical can be cut faster than a corner that must fit snug. Holes can be cut tighter with virtually no keyhole effect.

One piece to mill quantities, and everything in between.
As a secondary producer as well as a distributor of high performance alloys, HPAlloys can help solve your corrosion, temperature and wear problems. How can we serve you today?

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