ATI 720 *Alloy*

Technical Data Sheet

GENERAL

ATI 720 Alloy is a high-strength, precipitation-hardening, nickel-base alloy that was originally developed as an industrial gas turbine blade alloy. Later, this alloy was used for aircraft engine disks and blades. The alloy is solid solution strengthened by additions of chromium, cobalt, molybdenum and tungsten, while additions of titanium and aluminum provide precipitation strengthening by γ' (Ni_3Ti,Al). The high Υ' solvus temperature allows thermomechanical processing to develop very fine grain sizes that can result in superplastic properties. ATI 720 alloy has good oxidation resistance, as well as excellent resistance to sulfide corrosion. It is manufactured by Vacuum Induction Melting (VIM) followed by Vacuum Arc Remelting (VAR), or by triple melting which includes an Electroslag Remelting (ESR) step between the VIM and VAR operations.

SPECIFICATIONS

- Rolls Royce: MSRR7252
- General Electric: C50TF105

PHYSICAL PROPERTIES

Density: 0.292 lbs/in3 (8.09 gm/cm3)
Υ' Solvus: 2,075°F (1,135°C)

HEAT TREATMENT

Several heat treatments are used for ATI 720 alloy, depending upon the specific requirements for the application. For a typical fine grain disk application, the following heat treatment may be used:

1. Solution heat treat 4 hours at 1,975-2,030°F (1,080-1,100°C), and oil quench.
2. Age 24 hours at 1,200°F (650°C), air cool, followed by 16 hours at 1,400°F (760°C), air cool.

Another heat treatment requires the solution heat treatment with a different age cycle, resulting in a grain size in the ASTM 4 to 8 range. This heat treatment is a 4 hour age at 1,550°F (843°C), air cooling to 1,400°F (760°C) and holding for 16 hours, followed by an air cool.

OXIDATION AND CORROSION RESISTANCE

ATI 720 alloy has good oxidation resistance up to 1,800°F (982°C). It also has good resistance to sulfidation as well as resistance to stress corrosion cracking in sulfate and chloride atmospheres.

FORGEABILITY/ FORMABILITY

ATI 720 alloy is difficult to forge. Forging is normally done below the Υ' solvus temperature to prevent grain growth; however, the forging temperature should not go below 1,900°F. In addition to conventional forging methods, the alloy is often hot die forged, and where the billet is very fine grained, isothermal forging techniques may be used. Isothermal forging temperature ranges should be determined by low strain rate tensile tests.

MACHINABILITY

Alloy 720 is difficult to machine, more so than most other superalloys. Rigid machines and tooling are required. Common cutting tool materials used are CBN, ceramic and coated and uncoated carbides. CBN and ceramic tools are used for rough machining where it is desired to remove large amounts of stock. Carbide tools are used for moderate roughing and finish cut operations.

Machining operations will produce residual stresses along the machined surfaces. This also is true for hand tools used for rework and blending operations. Hand tools should be used in combination with “flap” type soft tooling to eliminate local residual stresses. Shot peening is normally used to convert the residual tensile stresses to compressive stresses.

WELDABILITY

Because of the high volume percentage of gamma prime, the only welding process that is used is inertia welding.

SPECIAL INSTRUCTIONS

All lubricants, particularly those containing sulfur, should be removed prior to heat treating and pickling.

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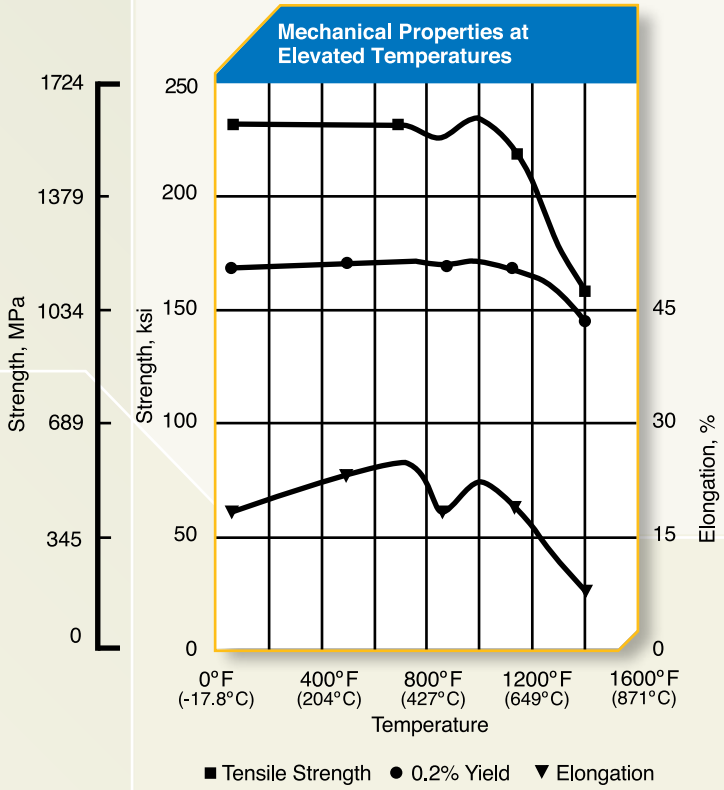
Chemical Composition										
	C	Cr	Co	Mo	W	Ti	Al	Zr	B	Ni
Wt. %, min.	0.006	16.0	14.0	2.75	1.10	4.95	2.45	0.03	0.01	Bal.
Wt. %, max.	0.012	17.0	15.0	3.25	1.40	5.20	2.65	0.05	0.02	Bal.



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