Technical Data Sheet

ATI X-751™ Alloy

INTRODUCTION

ATI X-751™ Alloy is a high-aluminum version of ATI X-750™ Alloy. It is a high-strength, precipitation hardenable, nickel-chromium alloy that employs nickel and titanium as the hardening elements. The alloy has good creep-rupture strength up to 1,500° F (816° C), and excellent oxidation and corrosion resistance up to 1,800° F (982° C). Its primary application is for automotive exhaust valves, although the alloy could be used in most applications for ATI X-750 alloy. The alloy is produced by vacuum induction melting (VIM) followed by electroslag remelting (ESR). It is available in billet and bar form.

SPECIFICATIONS

• Eaton EMS 215

PHYSICAL PROPERTIES

Melting Range:
2,450 – 2,600° F (1,390 – 1,430° C)

Density:
0.298 lbs/in^3 (8.25 gm/cc)

HEAT TREATMENT

There are several ways to heat treat ATI X-751 alloy, depending upon what properties are to be maximized. For optimum creep-rupture strength, solution treating can be done at 2,100° F (1,149° C) for 2-4 hours, then air-cooled. Aging can be done at 1,550° F (843° C) for 24 hours, with an air cool, followed by 20 hours at 1,300° F (704° C), air cool. For optimum room and elevated temperature tensile properties, the alloy can be solution treated at 1,800° F (982° C) for 1 hour, air cooled, followed by aging at 1,350° F (732° C) for 8 hours, slow cooling at 100 F° (56 C°) per hour to 1,150° F (621° C), holding at 1,150° F (621° C) for 8 hours, and air cooled. For service below 1,100° F (593° C), the alloy may be hardened by omitting the solution heat treatment and directly aging at 1,300° F (704° C) after hot or cold working, or by stress relief annealing at 1,625° F (885° C) for 24 hours followed by air cooling prior to the 20 hour age at 1,300° F (704° C).

HARDNESS

The hardness in the aged condition is between Rockwell C 32 and 40.

OXIDATION AND CORROSION RESISTANCE

ATI X-751 alloy has good oxidation resistance up to 1,800° F (982° C) and good general corrosion resistance over a wide range of temperatures. It has excellent resistance to chloride ion stress corrosion cracking in the fully aged condition. The alloy shows good resistance to the products of combustion of high-sulfur diesel fuel at high temperatures.

FORGEABILITY

ATI X-751 alloy has excellent forgeability from 1,800 to 2,200° F (982 to 1,204° C). The alloy has increasingly hot shortness below 1,800° F, so hot working temperatures between 1,200 and 1,600° F (649 and 871° C) should be avoided.

Allegheny Technologies Incorporated
1000 Six PPG Place
Pittsburgh, PA 15222-5479 U.S.A.
www.ATImetals.com

MACHINABILITY

ATI X-751 alloy has machinability similar to most nickel-based superalloys. Rigid machines and tooling, and low feeds and speeds should be used for the best results. Although the alloy may be machined in any condition, it is usually rough machined in the solution annealed condition.

WELDABILITY

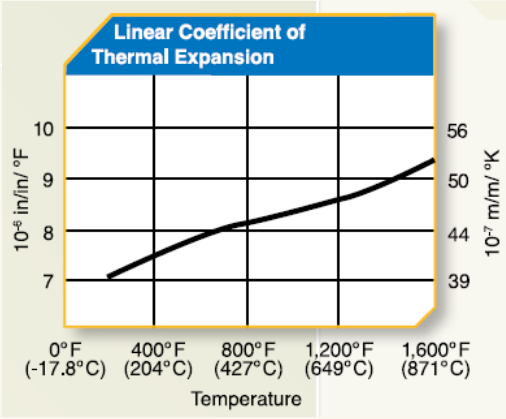
ATI X-751 alloy may be welded by gas-tungsten-arc (GTA) resistance, electron beam, and inertia welding processes. For the best weldability, the alloy should be in the solution-annealed condition. After the welding process, the weldments should be re-solution annealed and fully aged.

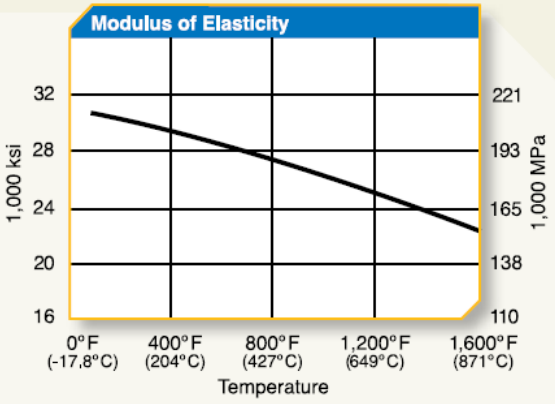
SPECIAL PRECAUTIONS

All lubricants and coolants, particularly those containing sulfur, should be removed prior to heat treating and welding. Heat-treating should be done in a sulfur-free atmosphere.

Chemical Composition

	C	Cr	Fe	Ti	Al	Nb + Ta	B	V	Ni
% w/w, min.	0.03	14.0	6.0	2.0	1.10	0.7	0.0015	-	Bal.
% w/w, max.	0.1	17.0	9.0	2.6	1.35	1.2	0.009	0.15	Bal.





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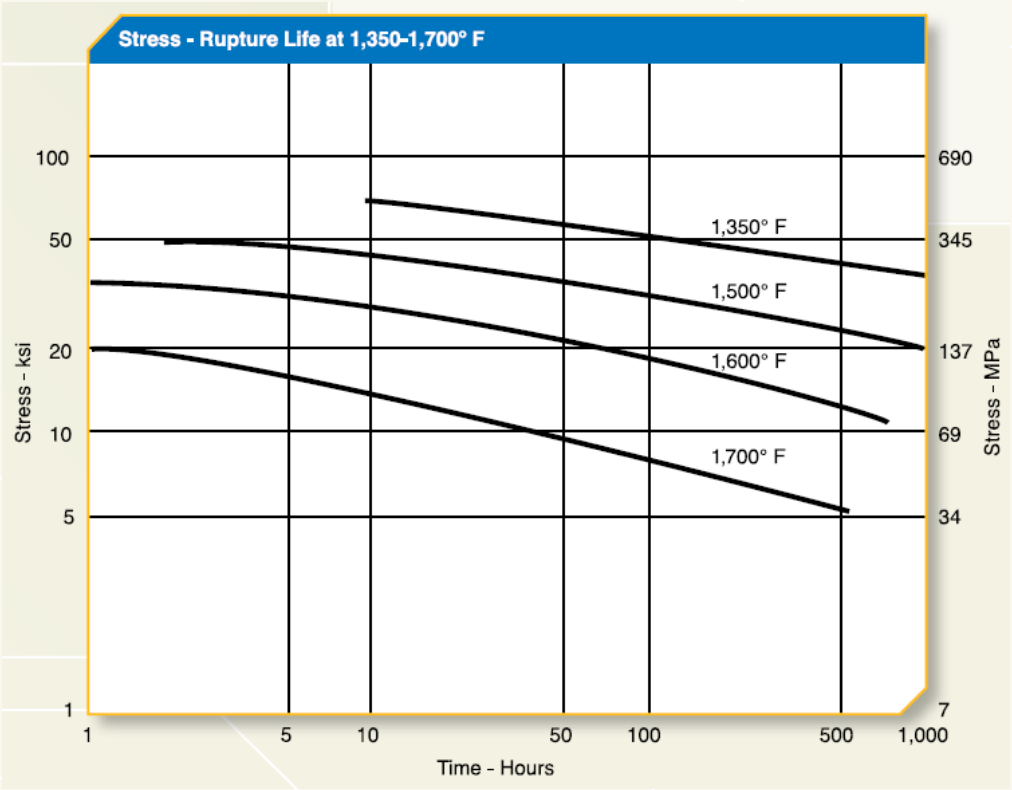

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