Technical Data Sheet

ATI 6-2-4-2™ Alloy

Near-Alpha High Strength Titanium Alloy

(UNS R54620)

INTRODUCTION

ATI 6-2-4-2™ Alloy (UNS R54620) is a near-alpha high strength titanium alloy that shows a good combination of tensile strength, creep strength, and toughness. It shows long term stability at temperatures up to 800°F; (425°C). Silicon up to 0.1% is frequently added to improve the creep resistance of the alloy.

ATI 6-2-4-2™ Alloy is produced by primary melting under vacuum (VAR), electron beam (EB) melting, or plasma arc cold hearth melting (PAM). Primary melting is followed by single or double vacuum arc remelting (VAR). Product forms include forging billet, forged or rolled bar, flat rolled products, extrusions, and wire. ATI 6-2-4-2™ Alloy is used in gas turbine engines for compressor blades, discs, and impellers. It also has applications in afterburner structures as well as for airframe skin applications.

SPECIFICATIONS

• AMS 4975 - Bars and rings (Heat treated)
• AMS 4976 - Forgings (Heat treated)
• AMIL T-9047G - Bar and billet (Heat treated)

PHYSICAL PROPERTIES

Melting Range: 2,890-3,120° F (1,588 - 1,716° C)
Density: 0.164 lbs/cu. in. ; (4.54 gm/cc)
Beta Transus Temperature: 1,825°F (± 25 F°); (995°C (± 15 C°))
Specific Heat: 0.11 Btu/lb.-°F (460 J/kg.)

HEAT TREATMENT

Stress relief annealing is done from 900 - 1,300°F (482 - 704°C) followed by air cool or slow cool. For bars and forgings, material is solution treated from 1,650 - 1,750°F (899 - 954°C) for 1 hour and air cool. This is followed by stabilization at 1,100°F (593°C) for 8 hours and air cool. Small increases in tensile strength may be obtained by solution treating and aging, but this is at the expense of creep strength compared to the annealed and stabilized product.

HARDNESS

Typical hardness in the duplex annealed condition is 32- 36 HRC.

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FORGEABILITY/ FORMABILITY

ATI 6-2-4-2™ Alloy is difficult to form at room temperature. Therefore, severe forming operations such as bending or stretching should be performed on annealed material up to 1,200°F (649°C) without affecting mechanical properties.
Initial forging breakdown may be done above the transus temperature for ease of forging; however, reductions of 50 to 75% are required to obtain an equiaxed alpha structure. Beta forging is done to improve creep and fracture toughness. This is done by heavy beta reductions from 35 to 50 percent followed by reductions of 15 to 25%. Careful control of the entire forging process is required.

MACHINABILITY

ATI 6-2-4-2™ Alloy can be machined using practices for austenitic stainless steels using slow speeds, heavy feeds, rigid tooling, and large amounts of non-chlorinated cutting fluid.

WELDABILITY

ATI 6-2-4-2™ Alloy is easily welded if proper precautions are taken to prevent oxygen, nitrogen, and hydrogen contamination. Fusion welding can be done in inert gas filled chambers or using inert gas shielding of the molten weld metal and the adjacent heated zones using a trailing shield. Spot, seam, and flash welding can be performed without resorting to protective atmospheres.

SPECIAL PRECAUTIONS

ATI 6-2-4-2™ Alloy can be subject to hydrogen contamination during improper pickling and by oxygen, nitrogen, and hydrogen pickup during forging, heat treating, brazing, etc. This contamination results in a deterioration in ductility which adversely affects notch sensitivity and forming characteristics.

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ATI

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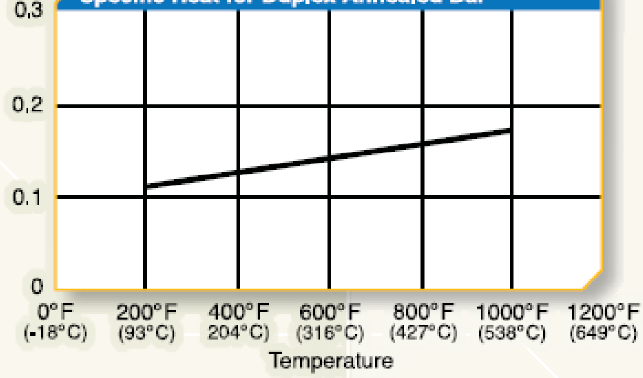
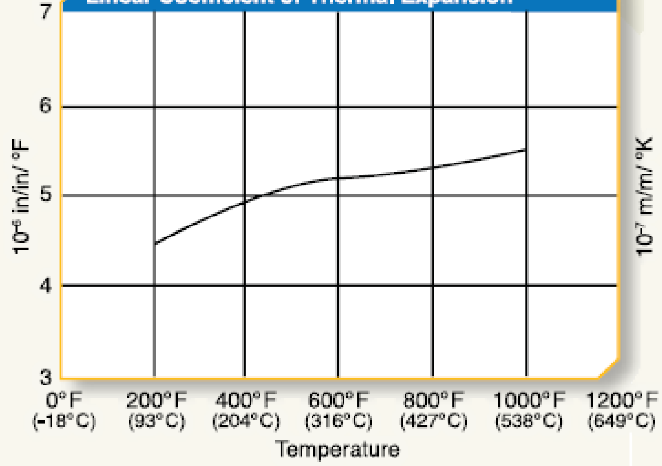
Typical Chemical Composition

	AL	SN	MO	Zr	Fe	O	N	C	H	Si	Ti
% w/w, min.	5.50	1.80	1.80	3.60	-	-	-	-	-	-	Bal.
% w/w, max.	6.50	2.20	2.20	4.40	0.25	0.15	0.05	0.05	0.125	0.1	Bal.

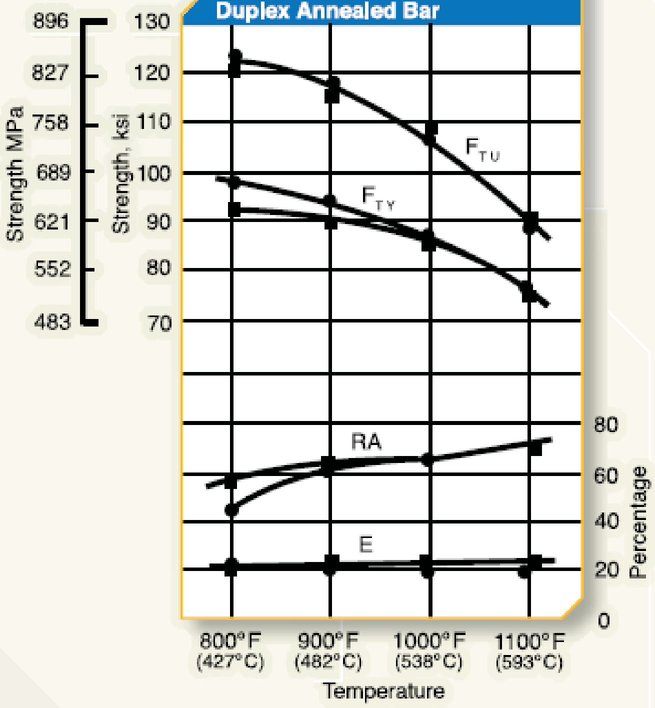
Specific Heat for Duplex Annealed Bar



Linear Coefficient of Thermal Expansion



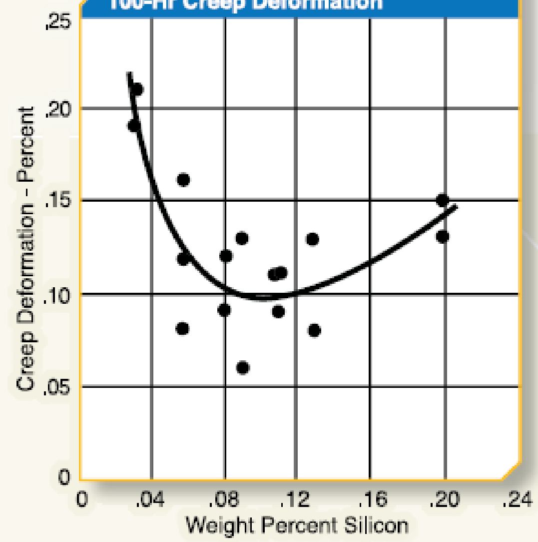
Effect of Test Temperature on Tensile Properties of Duplex Annealed Bar



■ 1,775° F (968° C), 1/2 Hr., Air Cool + 1,100° F (593° C), 8 Hr., Air Cool

● 1,775° F (968° C), 1/2 Hr., Air Cool + 1,100° F (593° C), 8 Hr., Air Cool

Effect of Silicon Content on 100-Hr Creep Deformation



All samples at 950° F (510° C) and 35 Ksi (241 MPa) for Duplex Annealed Bar.

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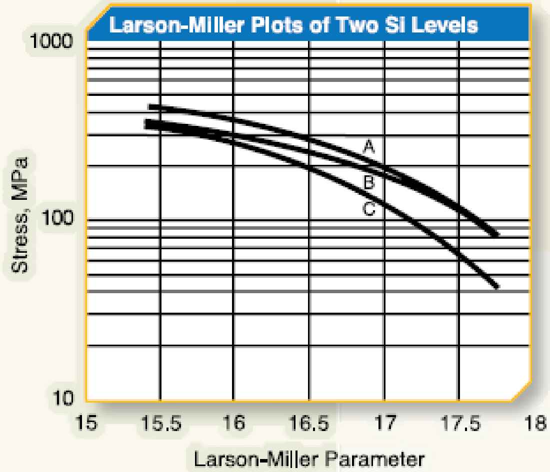
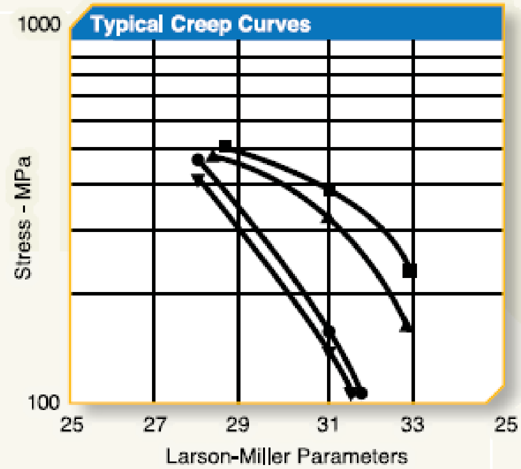


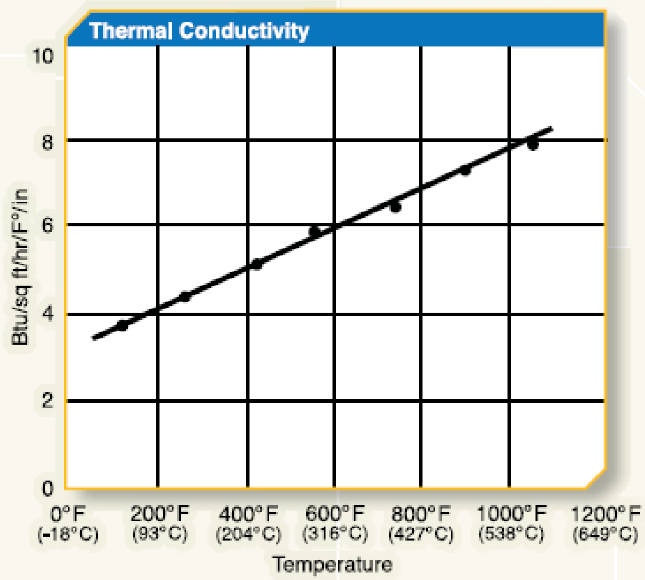
Larson-Miller Parameter = $(T)^{*}(20+\log t) \times 10^{-3}$, where T is temperature in °R and t is time in hours.

A = Ti-6242 +Si(β)
B = Ti-6242 +Si(α+β)
C = Ti-6242



Larson-Miller Parameter = $(T)^{*}(20+\log t) \times 10^{-3}$, where T is temperature in °R and t is time in hours.

■ 0.2% creep, α+β processed
▲ 0.2% creep, β processed
● 0.1% creep, triplex annealed
▼ 0.1% creep, duplex annealed



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