

ATI 718-HS™ & 718-DA™ Alloys

GENERAL

ATI 718-HS & 718-DA alloys (UNS N07718) are a family of thermo-mechanically processed materials that give higher mechanical properties to this already versatile alloy. To achieve these higher property levels, very tight controls must be observed over all processing parameters. Although double melt practices (VIM/VAR) are appropriate for many applications, improved cleanliness is achieved in the most critical applications by triple melting (VIM/ESR/VAR). Typical applications are highly stressed components in the compressor and turbine sections of jet engines.

SPECIFICATIONS

- GE C50TF81
- GE C50TF103
- GE C50TF104
- PWA 1085

PHYSICAL PROPERTIES

Melting Range: 2,300-2,450° F; (1,260 - 1,343° C)
Density: 0.296 lbs/in³; 8.19 gm/cm³

HEAT TREATMENT

For high strength processed material (718-HS)

Solution treat at 1,725 - 1,875° F (941 - 1,024° C) for 1-2 hours. Rapid cool.

Age at 1,325° F (718° C) for 8 hours. Furnace cool to 1,150 F (621° C).

For direct age processed material (718-DA)

Age at 1,325° F (718° C) for 8 hours. Furnace cool to 1,150° F (621° C). Hold 8 hours. Air cool. Rapid cool after final hot working operations.

No solution treating is required.

HARDNESS

The hardness in the solution treated condition is about 20-25 HRc which increases upon aging to about 40-47 HRc max.

FORGEABILITY

ATI 718-HS & DA alloys display good hotworking characteristics. Recommended forging furnace temperatures for initial forgings are 1,875° F (1,024° C) maximum for initial forging and 1,775-1,850° F (968 - 982° C) for finish forging. A reduction of 25% minimum during final forging, together with a low finishing temperature, is required to avoid a duplex grain structure and to establish proper mechanical properties. Time at temperature must be controlled to minimize delta phase precipitation.

FORMABILITY

This alloy is readily formable in the solution treated condition because of its good ductility.

MACHINABILITY

ATI 718-HS & DA alloys are readily machinable in both the solution treated and age-hardened conditions.

WELDABILITY

Satisfactory welds can be produced in both the solution treated and fully-aged conditions using inert gas-shielded arc, plasma arc, electron beam, and resistance welding techniques. Because of the sluggish aging response, ATI 718-HS & DA alloys can be welded without hardening during the heating and cooling cycles, and the aged alloy can be repair welded several times without cracking even in complex weldments.

SPECIAL PRECAUTIONS

All lubricants, or coolants, particularly sulfur-bearing, should be removed prior to heat treating and welding.

ATI 718-HS™ & 718-DA™ Alloys

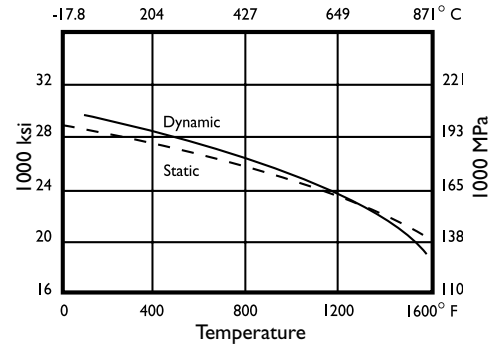
Chemistry	C	Mn	Si	S	P	Cr	Ni	Co	Fe	Mo	Ti	Al	B	Cb+Ta
% w/w, min.	-	-	-	-	-	17.0	50.0	-	Bal.	2.8	0.65	0.20	-	5.0
% w/w, max.	0.08	0.35	0.35	0.015	0.015	21.0	55.0	1.0	-	3.3	1.15	0.8	0.006	5.5

Thermal Conductivity

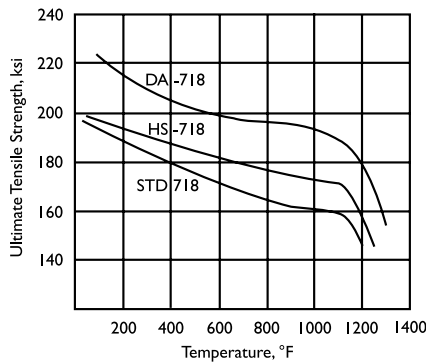


* Annealed 1800° 1hr.AC at 1325° F. Hold 8 hr.AC

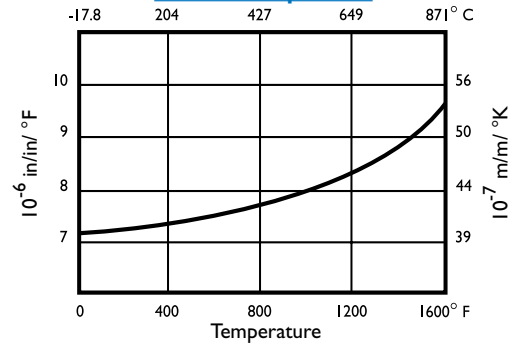
Modulus of Elasticity



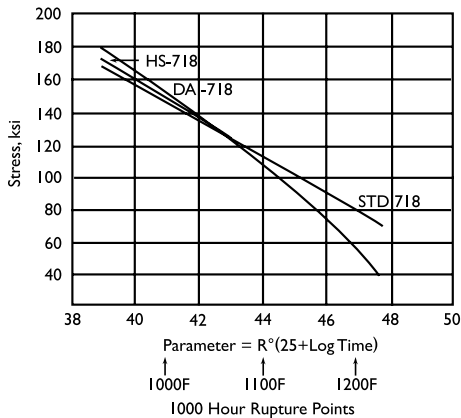
Ultimate Tensile Strength**



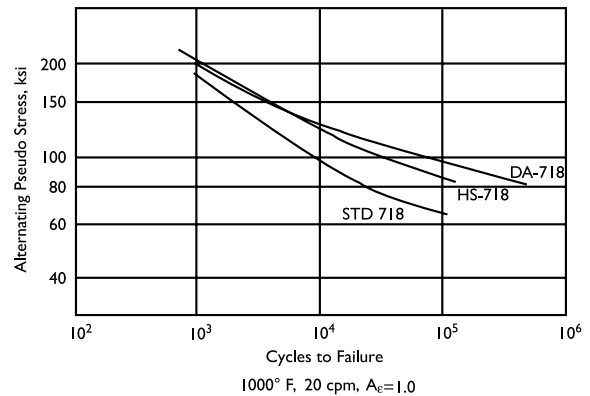
Linear Coefficient of Thermal Expansion



Stress Rupture ¹



1000° F Low Cycle Fatigue ¹



1. Krueger, D.D., "The Development of Direct Age 718 for Gas Turbine Engine Disk Applications", GE Aircraft Engines, Cincinnati OH, (TMS, 1989)