



ALLVAC 718-OP®

GENERAL

Allvac® 718-OP (UNS N07718) is an extremely versatile precipitation-hardening, Ni-base alloy with excellent strength, ductility, and corrosion resistance up to 1300° F (704° C). These characteristics, combined with good weldability, good formability, and excellent cryogenic properties account for the popularity of this alloy. The main hardening constituent is a niobium containing γ'' , Ni₃ (Nb,Al,Ti). The unique welding characteristics of this alloy are attributed to the kinetics of the precipitation reaction. It is produced by vacuum induction melting followed by consumable remelting (vacuum arc or electroslag).

Because of its good resistance to corrosion and oxidation in a variety of media, Allvac 718-OP is used in a variety of applications in the oil patch and chemical process industries. Some of the applications are valves, packers, fasteners, hangers, blow-out preventers, and well logging casing

SPECIFICATIONS - AMS

- ASTM B 637 (chemistry) - Bar and Forgings
- NACE MR0175 - Bar
- MIL-N-24468

PHYSICAL PROPERTIES

Melting Range: 2300-2450° F; (1260 - 1343° C)

Density: 0.296 lbs/in³; 8.19 gm/cm³

Specific Heat @ 70° F (21° C): 0.100 BTU/lb - °F (444 J/kg - °K)

Magnetic Permeability @ 70° F (21° C): 1.001 (H=200 oersteds=16kA/m)

HEAT TREATMENT

The heat treatment consists of solution treating followed by a single aging treatment.

Solution treat at 1850 - 1900° F (1010 - 1038° C) for 1 hour. Rapid cool.

Age at 1425 - 1475° F (774 - 802° C) for 6 -8 hours. Air cool.

HARDNESS

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

FORGEABILITY

Allvac 718-OP displays good hotworking characteristics. Recommended forging furnace temperatures for initial forgings are 2050° F (1121° C) maximum for initial forging and 1775-1800° F (968 - 982° C) minimum 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.

FORMABILITY

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

MACHINABILITY

Allvac 718-OP is 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, Allvac 718-OP 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.



Allvac

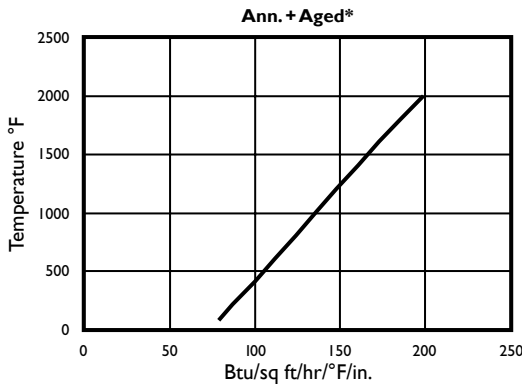
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TECHNICAL DATA SHEET

ALLVAC 718-OP®

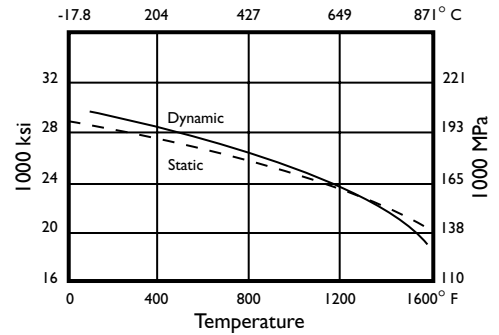
Chemistry	C	Mn	Si	S	P	Cr	Ni	Co	Fe	Mo	Ti	Al	B	Cb+Ta
% w/w, min.	-	-	-	-	-	17.0	50.0	-	Bal.	2.8	0.65	0.20	-	5.0
% w/w, max.	0.08	0.35	0.35	0.015	0.015	21.0	55.0	1.0	-	3.3	1.15	0.8	0.006	5.5

Thermal Conductivity

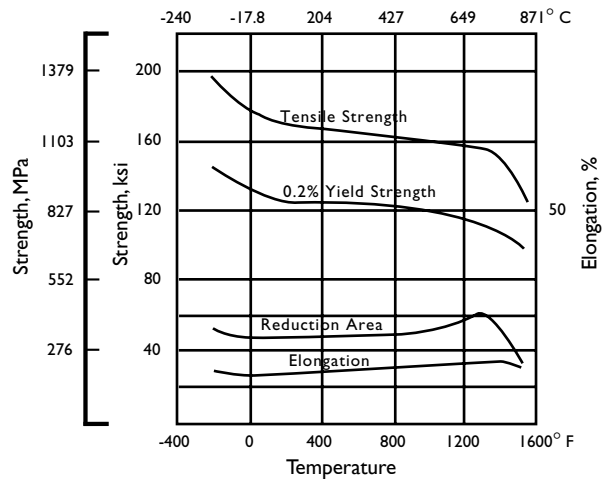


* Annealed 1800° 1hr.AC at 1325° F. Hold 8 hr.AC

Modulus of Elasticity

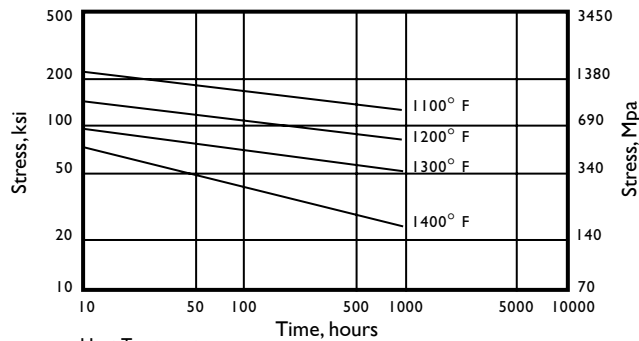


Typical Tensile Properties at Cryogenic, Room, and Elevated Temperatures



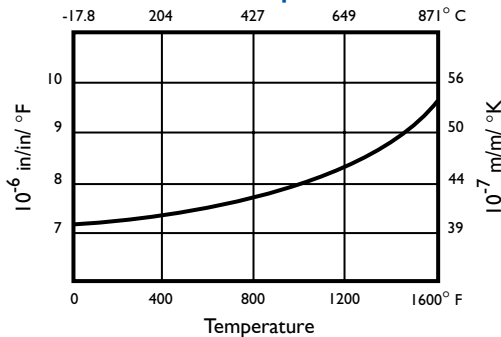
Heat Treatment
Solution Treat: 1875° F for 1 Hour. Water quench.
Age: 1450° F for 6-8 hours. Air cool.

Stress - Rupture Life at 1100-1400° F



Heat Treatment
1800° F - 1 Hr. air cool
1325° F - 8 Hrs. FCE cool at 100° F per hr. to 1150° F
1150° F - 8 Hrs. air cool

Linear Coefficient of Thermal Expansion



C-Ring Tests in NACE Solution*

Alloy	Material Condition	0.2% Yield Strength		Hardness Rc	Duration Days	Sulfide Stress Cracking
		ksi	MPa			
625	Cold Worked	125.0	862	30.5	42	No
718	Age Hardened	139.0	958	38	42	No
725	Age Hardened	132.9	916	36	42	No
925	Age Hardened	114.0	786	38	42	No

* Room temperature tests at 100% of yield strength in 5% NaCl plus 0.5% acetic acid saturated with H₂S. All specimens were coupled to carbon steel.