

HAYNES® 718 alloy

CHEMISTRY: Weight %

Ni	Co	Fe	Cr	Cb+Ta	Mo	Ti	Al	Mn	Si	C	B	Cu
52 ^a	1 [*]	19	18	5	3	0.9	0.5	0.35 [*]	0.35 [*]	0.05	0.009	0.1 [*]

^a As Balance

^{*}Maximum

ALLOY DESCRIPTION:

HAYNES alloy 718 is an age-hardenable, nickel-base superalloy with excellent strength at temperatures up to about 1200°F (650°C). It is widely used as a wrought material for forged and fabricated parts in gas turbine, aerospace and industrial applications. Its strength is the highest among the formable and weldable superalloys up to 1200°F (650°C), although lower than that for HAYNES alloy R-41, for example, at higher temperatures. Alloy 718 can be cold-formed in the annealed condition, and may also be hot-formed at temperatures of about 1650°F (900°C) or above. Finish hot working in the temperature range from 1650 to 1850°F (900 to 1010°C) may be necessary to provide optimum properties. The weldability of alloy 718 is generally superior to most other age-hardenable superalloys. The alloy exhibits good resistance to oxidizing combustion gas environments at temperatures up to about 1600°F (870°C).

PHYSICAL PROPERTIES:

	Temp., °F	British Units	Temp., °C	Metric Units
Density	Room	0.297 lb/in ³	Room	8.23 g/cm ³
Melting Range	2300-2435		1260-1335	
Thermal Conductivity	400	100 BTU-in/ft ² -hr-°F	200	14.3 W/m-K
	800	125 BTU-in/ft ² -hr-°F	400	17.6 W/m-K
	1000	137 BTU-in/ft ² -hr-°F	600	20.7 W/m-K
	1200	149 BTU-in/ft ² -hr-°F	700	22.3 W/m-K
	1400	161 BTU-in/ft ² -hr-°F	800	23.9 W/m-K
	1600	174 BTU-in/ft ² -hr-°F	900	25.5 W/m-K
Mean Coefficient of Thermal Expansion	70-800	7.8 μin/in-°F	20-500	14.3 μm/m-°C
	70-1000	8.0 μin/in-°F	20-600	14.8 μm/m-°C
	70-1200	8.4 μin/in-°F	20-700	15.5 μm/m-°C
	70-1400	8.9 μin/in-°F	20-800	16.3 μm/m-°C
	70-1600	9.4 μin/in-°F	20-900	17.1 μm/m-°C
	70-1800	9.8 μin/in-°F	20-1000	17.8 μm/m-°C
Electrical Resistivity	70	47.7 μchm-in	20	121 μohm-cm
	400	49.5 μchm-in	200	126 μohm-cm
	800	50.8 μchm-in	400	129 μohm-cm
	1000	51.7 μchm-in	600	132 μohm-cm
	1200	52.0 μchm-in	700	132 μohm-cm
	1400	52.2 μchm-in	800	132 μohm-cm
	1600	52.3 μchm-in	900	133 μohm-cm

HEAT TREATMENT, SHEET AND STRIP (AMS 5596):

1750°F (955°C)/Bright Anneal + 1325°F (720°C)/8 Hr./FC to 1150°F (620°C)/8 Hr./AC

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DYNAMIC MODULUS OF ELASTICITY:

Temp., °F	10 ⁴ psi	Temp., °C	GPa	Temp., °F	10 ⁴ psi	Temp., °C	GPa
70	29.0	20	200	1200	23.7	700	159
400	27.6	200	191	1400	22.3	800	149
800	25.8	400	179	1600	20.2	900	134
1000	24.8	600	167	1800	17.4	1000	117

TYPICAL TENSILE PROPERTIES, SHEET (AMS 5596):

Test Temperature		Ultimate Tensile Strength		0.2% Yield Strength		Elongation in 2 in (51mm)
°F	°C	Ksi	MPa	Ksi	MPa	%
ROOM	ROOM	202.3	1395	170.4	1175	22.3
1000	540	164.1	1130	144.0	995	24.4
1200	650	167.6	1155	144.8	1000	19.9
1400	760	124.1	855	108.6	750	10.2
1600	870	43.9	305	30.6	210	27.7
1800	980	20.9	145	13.0	90	37.0

TYPICAL STRESS-RUPTURE STRENGTH, SHEET (AMS 5596):

Test Temperature		Approximate Initial Stress, Ksi (MPa) to Produce Rupture in:					
°F	°C	10 Hours		100 Hours		1000 Hours	
1000	540	-	-	165	(1140)	134	(925)
1100	595	150	(1035)	124	(855)	110	(760)
1200	650	120	(825)	105	(725)	87	(600)
1300	705	100	(690)	76	(525)	43	(295)
1400	760	70	(485)	36	(250)	14	(97)

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