

Haynes 282® Nickel Alloy Sheet, Gamma-Prime Strengthened

Category : Metal , Nonferrous Metal , Nickel Alloy

Material Notes:

Excellent High Temperature Strength HAYNES® 282® alloy is a wrought, gamma-prime strengthened superalloy developed for high temperature structural applications, especially those in aero and land-based gas turbine engines. It possesses a unique combination of creep strength, thermal stability, weldability, and fabricability not found in currently available commercial alloys. The alloy has excellent creep strength in the temperature range of 1200 to 1700°F (649 to 927°C), surpassing that of Waspaloy alloy, and approaching that of R-41 alloy. Easily Fabricated: This high level of creep strength in HAYNES 282 alloy has been attained at a relatively low volume fraction of the strengthening gamma-prime phase, resulting in outstanding resistance to strain-age cracking (normally a problem with superalloys in this creep strength range). Additionally, slow gamma-prime precipitation kinetics allow for the alloy to have excellent ductility in the as-annealed condition. Consequently, HAYNES 282 alloy exhibits superior weldability and fabricability. Product Forms: HAYNES 282 alloy is designed for use in the form of plate, sheet, strip, foil, billet, bar, wire welding products, pipe, and tubing. Heat Treatment: HAYNES 282 alloy is provided in the solution-annealed condition, in which it is readily formable. The typical solution annealing temperature is in the range of 2050 to 2100°F (1121 to 1149°C). After component fabrication, a two-step age hardening treatment is required to put the alloy into the high-strength condition. The treatment includes 1850°F (1010°C) / 2 hours / AC (air cool) + 1450°F (788°C) / 8 hours / AC. Applications: Suitable for critical gas turbine applications, such as sheet fabrications, seamless and flash butt-welded rings, and cases found in compressor, combustor, and turbine sections. In augmented aircraft gas turbines, it is useful for exhaust and nozzle components. In land-based gas turbines, HAYNES 282 alloy is a good candidate for transition sections and other hot-gas-path components. Machining: HAYNES 282 alloy has similar machining characteristics to other nickel alloys used at high temperatures. Rough machining should be carried out prior to age-hardening, using the following guidelines. Final machining or finish grinding may be done after age-hardening. Data provided by the manufacturer, Haynes International, Inc.

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http://www.lookpolymers.com/polymer_Haynes-282-Nickel-Alloy-Sheet-Gamma-Prime-Strengthened.php

Physical Properties	Metric	English	Comments
Density	8.27 g/cc	0.299 lb/in ³	Solution Annealed
	8.29 g/cc	0.299 lb/in ³	Age-hardened

Mechanical Properties	Metric	English	Comments
Tensile Strength, Ultimate	975 MPa	141000 psi	Room temp test after thermal exposure
	@Treatment Temp. 871 °C, Time 3.60e+6 sec	@Treatment Temp. 1600 °F, Time 1000 hour	
	1102 MPa	159800 psi	Room temp test after thermal exposure
@Treatment Temp. 816 °C, Time 3.60e+6 sec	@Treatment Temp. 1500 °F, Time 1000 hour		
	1176 MPa	170600 psi	

Mechanical Properties	@Treatment Temp. 760 °C, Metric Time 3.60e+6 sec	@Treatment Temp. 1400 °F, English Time 1000 hour	Room temp test after thermal exposure
	1191 MPa	172700 psi	Room temp test after thermal exposure
	@Treatment Temp. 649 °C, Time 3.60e+6 sec	@Treatment Temp. 1200 °F, Time 1000 hour	
Tensile Strength, Yield	502 MPa	72800 psi	0.2%. Room temp test after thermal exposure
	@Treatment Temp. 502 °C, Time 3.60e+6 sec	@Treatment Temp. 936 °F, Time 1000 hour	
	634 MPa	92000 psi	0.2%. Room temp test after thermal exposure
	@Treatment Temp. 634 °C, Time 3.60e+6 sec	@Treatment Temp. 1170 °F, Time 1000 hour	
	718 MPa	104000 psi	0.2%. Room temp test after thermal exposure
	@Treatment Temp. 718 °C, Time 3.60e+6 sec	@Treatment Temp. 1320 °F, Time 1000 hour	
	778 MPa	113000 psi	0.2%. Room temp test after thermal exposure
	@Treatment Temp. 778 °C, Time 3.60e+6 sec	@Treatment Temp. 1430 °F, Time 1000 hour	
Elongation at Break	22.3 %	22.3 %	Room temp test after thermal exposure
	@Treatment Temp. 634 °C, Time 3.60e+6 sec	@Treatment Temp. 1170 °F, Time 1000 hour	
	22.8 %	22.8 %	Room temp test after thermal exposure
	@Treatment Temp. 718 °C, Time 3.60e+6 sec	@Treatment Temp. 1320 °F, Time 1000 hour	
	24.2 %	24.2 %	Room temp test after thermal exposure
	@Treatment Temp. 502 °C, Time 3.60e+6 sec	@Treatment Temp. 936 °F, Time 1000 hour	
	25.8 %	25.8 %	Room temp test after thermal exposure
	@Treatment Temp. 778 °C, Time 3.60e+6 sec	@Treatment Temp. 1430 °F, Time 1000 hour	
Creep Strength	34.0 MPa	4930 psi	1% Creep
	@Temperature 927 °C, Time 3.60e+6 sec	@Temperature 1700 °F, Time 1000 hour	
	62.0 MPa	8990 psi	

Mechanical Properties	Metric	English	Comments
	@Temperature 927 °C, Time 360000 sec	@Temperature 1700 °F, Time 100 hour	
	69.0 MPa	10000 psi	
	@Temperature 871 °C, Time 3.60e+6 sec	@Temperature 1600 °F, Time 1000 hour	1% Creep
	124 MPa	18000 psi	
	@Temperature 871 °C, Time 360000 sec	@Temperature 1600 °F, Time 100 hour	1% Creep
	145 MPa	21000 psi	
	@Temperature 816 °C, Time 3.60e+6 sec	@Temperature 1500 °F, Time 1000 hour	1% Creep
	221 MPa	32100 psi	
	@Temperature 816 °C, Time 360000 sec	@Temperature 1500 °F, Time 100 hour	1% Creep
	241 MPa	35000 psi	
	@Temperature 760 °C, Time 3.60e+6 sec	@Temperature 1400 °F, Time 1000 hour	1% Creep
	331 MPa	48000 psi	
	@Temperature 760 °C, Time 360000 sec	@Temperature 1400 °F, Time 100 hour	1% Creep
	365 MPa	52900 psi	
	@Temperature 704 °C, Time 3.60e+6 sec	@Temperature 1300 °F, Time 1000 hour	1% Creep
	496 MPa	71900 psi	
	@Temperature 704 °C, Time 360000 sec	@Temperature 1300 °F, Time 100 hour	1% Creep
	545 MPa	79000 psi	
	@Temperature 649 °C, Time 3.60e+6 sec	@Temperature 1200 °F, Time 1000 hour	1% Creep
Rupture Strength	41.0 MPa	5950 psi	
	@Temperature 927 °C, Time 3.60e+6 sec	@Temperature 1700 °F, Time 1000 hour	
	83.0 MPa	12000 psi	
	@Temperature 927 °C, Time 360000 sec	@Temperature 1700 °F, Time 100 hour	
	83.0 MPa	12000 psi	
	@Temperature 871 °C, Time 3.60e+6 sec	@Temperature 1600 °F, Time 1000 hour	

Mechanical Properties	Metric	English	Comments
	@Temperature 871 °C, Time 360000 sec	@Temperature 1600 °F, Time 100 hour	
	159 MPa	23100 psi	
	@Temperature 816 °C, Time 3.60e+6 sec	@Temperature 1500 °F, Time 1000 hour	
	255 MPa	37000 psi	
	@Temperature 816 °C, Time 360000 sec	@Temperature 1500 °F, Time 100 hour	
	262 MPa	38000 psi	
	@Temperature 760 °C, Time 3.60e+6 sec	@Temperature 1400 °F, Time 1000 hour	
	386 MPa	56000 psi	
	@Temperature 760 °C, Time 360000 sec	@Temperature 1400 °F, Time 100 hour	
	386 MPa	56000 psi	
	@Temperature 704 °C, Time 3.60e+6 sec	@Temperature 1300 °F, Time 1000 hour	
	517 MPa	75000 psi	
	@Temperature 704 °C, Time 360000 sec	@Temperature 1300 °F, Time 100 hour	
	552 MPa	80100 psi	
	@Temperature 649 °C, Time 3.60e+6 sec	@Temperature 1200 °F, Time 1000 hour	
Modulus of Elasticity	140 GPa	20300 ksi	Dynamic
	@Temperature 1000 °C	@Temperature 1830 °F	
	154 GPa	22300 ksi	Dynamic
	@Temperature 900 °C	@Temperature 1650 °F	
	166 GPa	24100 ksi	Dynamic
	@Temperature 800 °C	@Temperature 1470 °F	
	175 GPa	25400 ksi	Dynamic
	@Temperature 700 °C	@Temperature 1290 °F	
	183 GPa	26500 ksi	Dynamic
	@Temperature 600 °C	@Temperature 1110 °F	
	190 GPa	27600 ksi	

Mechanical Properties	Metric @ Temperature 500 °C	English @ Temperature 932 °F	Dynamic Comments
	196 GPa	28400 ksi	Dynamic
	@Temperature 400 °C	@Temperature 752 °F	
	202 GPa	29300 ksi	Dynamic
	@Temperature 300 °C	@Temperature 572 °F	
	209 GPa	30300 ksi	Dynamic
	@Temperature 200 °C	@Temperature 392 °F	
	213 GPa	30900 ksi	Dynamic
	@Temperature 100 °C	@Temperature 212 °F	
	217 GPa	31500 ksi	Dynamic
	@Temperature 25.0 °C	@Temperature 77.0 °F	
Poissons Ratio	0.319	0.319	
	@Temperature 25.0 °C	@Temperature 77.0 °F	
	0.326	0.326	
	@Temperature 100 °C	@Temperature 212 °F	
	0.335	0.335	
	@Temperature 200 °C	@Temperature 392 °F	
	0.335	0.335	
	@Temperature 300 °C	@Temperature 572 °F	
	0.337	0.337	
	@Temperature 400 °C	@Temperature 752 °F	
	0.341	0.341	
	@Temperature 500 °C	@Temperature 932 °F	
	0.346	0.346	
	@Temperature 600 °C	@Temperature 1110 °F	
	0.352	0.352	
	@Temperature 700 °C	@Temperature 1290 °F	
	0.355	0.355	
	@Temperature 800 °C	@Temperature 1470 °F	
	0.357	0.357	
	@Temperature 900 °C	@Temperature 1650 °F	

Mechanical Properties	Metric	English	Comments
	@Temperature 1000 °C	@Temperature 1830 °F	
Shear Modulus	51.0 GPa	7400 ksi	Dynamic
	@Temperature 1000 °C	@Temperature 1830 °F	
	57.0 GPa	8270 ksi	Dynamic
	@Temperature 900 °C	@Temperature 1650 °F	
	61.0 GPa	8850 ksi	Dynamic
	@Temperature 800 °C	@Temperature 1470 °F	
	65.0 GPa	9430 ksi	Dynamic
	@Temperature 700 °C	@Temperature 1290 °F	
	68.0 GPa	9860 ksi	Dynamic
	@Temperature 600 °C	@Temperature 1110 °F	
	71.0 GPa	10300 ksi	Dynamic
	@Temperature 500 °C	@Temperature 932 °F	
	73.0 GPa	10600 ksi	Dynamic
	@Temperature 400 °C	@Temperature 752 °F	
	76.0 GPa	11000 ksi	Dynamic
	@Temperature 300 °C	@Temperature 572 °F	
	78.0 GPa	11300 ksi	Dynamic
	@Temperature 200 °C	@Temperature 392 °F	
	80.0 GPa	11600 ksi	Dynamic
	@Temperature 100 °C	@Temperature 212 °F	
	82.0 GPa	11900 ksi	Dynamic
	@Temperature 25.0 °C	@Temperature 77.0 °F	

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