

Haynes 282® Nickel Alloy Plate, Solution Annealed and Age-Hardened, after long term high temperature exposure

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.

Order this product through the following link:

http://www.lookpolymers.com/polymer_Haynes-282-Nickel-Alloy-Plate-Solution-Annealed-and-Age-Hardened-after-long-term-high-temperature-exposure.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	1152 MPa	167100 psi	Room temp test prior to thermal exposure
	978 MPa	142000 psi	Room temp test after thermal exposure
	@Treatment Temp. 871 °C, Time 5.76e+7 sec	@Treatment Temp. 1600 °F, Time 16000 hour	
	1006 MPa	145900 psi	Room temp test after thermal

Mechanical Properties	@Treatment Temp. 871 Metric	@Treatment Temp. 1600 °F, English	exposure Comments
	Time 2.88e+7 sec	Time 8000 hour	
	1022 MPa	148200 psi	
	@Treatment Temp. 871 °C, Time 1.44e+7 sec	@Treatment Temp. 1600 °F, Time 4000 hour	Room temp test after thermal exposure
	1065 MPa	154500 psi	
	@Treatment Temp. 871 °C, Time 3.60e+6 sec	@Treatment Temp. 1600 °F, Time 1000 hour	Room temp test after thermal exposure
	1114 MPa	161600 psi	
	@Treatment Temp. 871 °C, Time 360000 sec	@Treatment Temp. 1600 °F, Time 100 hour	Room temp test after thermal exposure
	1161 MPa	168400 psi	
	@Treatment Temp. 760 °C, Time 5.76e+7 sec	@Treatment Temp. 1400 °F, Time 16000 hour	Room temp test after thermal exposure
	1191 MPa	172700 psi	
	@Treatment Temp. 760 °C, Time 2.88e+7 sec	@Treatment Temp. 1400 °F, Time 8000 hour	Room temp test after thermal exposure
	1205 MPa	174800 psi	
	@Treatment Temp. 760 °C, Time 1.44e+7 sec	@Treatment Temp. 1400 °F, Time 4000 hour	Room temp test after thermal exposure
	1223 MPa	177400 psi	
	@Treatment Temp. 760 °C, Time 360000 sec	@Treatment Temp. 1400 °F, Time 100 hour	Room temp test after thermal exposure
	1226 MPa	177800 psi	
	@Treatment Temp. 760 °C, Time 3.60e+6 sec	@Treatment Temp. 1400 °F, Time 1000 hour	Room temp test after thermal exposure
	1247 MPa	180900 psi	
	@Treatment Temp. 649 °C, Time 360000 sec	@Treatment Temp. 1200 °F, Time 100 hour	Room temp test after thermal exposure
	1248 MPa	181000 psi	
	@Treatment Temp. 649 °C, Time 3.60e+6 sec	@Treatment Temp. 1200 °F, Time 1000 hour	Room temp test after thermal exposure

Mechanical Properties	1255 MPa Metric	182000 psi English	Comments Room temp test after thermal exposure
	@Treatment Temp. 649 °C, Time 1.44e+7 sec	@Treatment Temp. 1200 °F, Time 4000 hour	
	1260 MPa @Treatment Temp. 649 °C, Time 5.76e+7 sec	183000 psi @Treatment Temp. 1200 °F, Time 16000 hour	Room temp test after thermal exposure
	1264 MPa @Treatment Temp. 649 °C, Time 2.88e+7 sec	183300 psi @Treatment Temp. 1200 °F, Time 8000 hour	Room temp test after thermal exposure
Tensile Strength, Yield	705 MPa	102000 psi	0.2%. Room temp test prior to thermal exposure
	452 MPa @Treatment Temp. 871 °C, Time 5.76e+7 sec	65600 psi @Treatment Temp. 1600 °F, Time 16000 hour	0.2%. Room temp test after thermal exposure
	473 MPa @Treatment Temp. 871 °C, Time 2.88e+7 sec	68600 psi @Treatment Temp. 1600 °F, Time 8000 hour	0.2%. Room temp test after thermal exposure
	487 MPa @Treatment Temp. 871 °C, Time 1.44e+7 sec	70600 psi @Treatment Temp. 1600 °F, Time 4000 hour	0.2%. Room temp test after thermal exposure
	533 MPa @Treatment Temp. 871 °C, Time 3.60e+6 sec	77300 psi @Treatment Temp. 1600 °F, Time 1000 hour	0.2%. Room temp test after thermal exposure
	618 MPa @Treatment Temp. 871 °C, Time 360000 sec	89600 psi @Treatment Temp. 1600 °F, Time 100 hour	0.2%. Room temp test after thermal exposure
	658 MPa @Treatment Temp. 760 °C, Time 5.76e+7 sec	95400 psi @Treatment Temp. 1400 °F, Time 16000 hour	0.2%. Room temp test after thermal exposure
	690 MPa @Treatment Temp. 760 °C, Time 2.88e+7 sec	100000 psi @Treatment Temp. 1400 °F, Time 8000 hour	0.2%. Room temp test after thermal exposure
	707 MPa	103000 psi	

Mechanical Properties	Metric @ Treatment Temp. 760 °C, Time 1.44e+7 sec	English @ Treatment Temp. 1400 °F, Time 4000 hour	0.2%. Room temp test after thermal exposure
	742 MPa	108000 psi	0.2%. Room temp test after thermal exposure
	@Treatment Temp. 760 °C, Time 3.60e+6 sec	@Treatment Temp. 1400 °F, Time 1000 hour	
	759 MPa	110000 psi	0.2%. Room temp test after thermal exposure
	@Treatment Temp. 760 °C, Time 360000 sec	@Treatment Temp. 1400 °F, Time 100 hour	
	798 MPa	116000 psi	0.2%. Room temp test after thermal exposure
	@Treatment Temp. 649 °C, Time 360000 sec	@Treatment Temp. 1200 °F, Time 100 hour	
	814 MPa	118000 psi	0.2%. Room temp test after thermal exposure
	@Treatment Temp. 649 °C, Time 3.60e+6 sec	@Treatment Temp. 1200 °F, Time 1000 hour	
	816 MPa	118000 psi	0.2%. Room temp test after thermal exposure
	@Treatment Temp. 649 °C, Time 5.76e+7 sec	@Treatment Temp. 1200 °F, Time 16000 hour	
	819 MPa	119000 psi	0.2%. Room temp test after thermal exposure
	@Treatment Temp. 649 °C, Time 2.88e+7 sec	@Treatment Temp. 1200 °F, Time 8000 hour	
	830 MPa	120000 psi	0.2%. Room temp test after thermal exposure
	@Treatment Temp. 649 °C, Time 1.44e+7 sec	@Treatment Temp. 1200 °F, Time 4000 hour	
Elongation at Break	30 %	30 %	Room temp test prior to thermal exposure
	20 %	20 %	
	@Treatment Temp. 760 °C, Time 2.88e+7 sec	@Treatment Temp. 1400 °F, Time 8000 hour	Room temp test after thermal exposure
	20 %	20 %	
	@Treatment Temp. 760 °C, Time 5.76e+7 sec	@Treatment Temp. 1400 °F, Time 16000 hour	Room temp test after thermal exposure
	21 %	21 %	
			Room temp test after thermal

Mechanical Properties	@Treatment Temp. 760 Metric	@Treatment Temp. English	exposure Comments
	Time 1.44e+7 sec	Time 4000 hour	
	23 %	23 %	
	@Treatment Temp. 649 °C, Time 5.76e+7 sec	@Treatment Temp. 1200 °F, Time 16000 hour	Room temp test after thermal exposure
	24 %	24 %	
	@Treatment Temp. 649 °C, Time 2.88e+7 sec	@Treatment Temp. 1200 °F, Time 8000 hour	Room temp test after thermal exposure
	26 %	26 %	
	@Treatment Temp. 649 °C, Time 3.60e+6 sec	@Treatment Temp. 1200 °F, Time 1000 hour	Room temp test after thermal exposure
	26 %	26 %	
	@Treatment Temp. 649 °C, Time 1.44e+7 sec	@Treatment Temp. 1200 °F, Time 4000 hour	Room temp test after thermal exposure
	26 %	26 %	
	@Treatment Temp. 760 °C, Time 3.60e+6 sec	@Treatment Temp. 1400 °F, Time 1000 hour	Room temp test after thermal exposure
	27 %	27 %	
	@Treatment Temp. 649 °C, Time 360000 sec	@Treatment Temp. 1200 °F, Time 100 hour	Room temp test after thermal exposure
	27 %	27 %	
	@Treatment Temp. 760 °C, Time 360000 sec	@Treatment Temp. 1400 °F, Time 100 hour	Room temp test after thermal exposure
	30 %	30 %	
	@Treatment Temp. 871 °C, Time 3.60e+6 sec	@Treatment Temp. 1600 °F, Time 1000 hour	Room temp test after thermal exposure
	31 %	31 %	
	@Treatment Temp. 871 °C, Time 360000 sec	@Treatment Temp. 1600 °F, Time 100 hour	Room temp test after thermal exposure
	32 %	32 %	
	@Treatment Temp. 871 °C, Time 1.44e+7 sec	@Treatment Temp. 1600 °F, Time 4000 hour	Room temp test after thermal exposure

Mechanical Properties	32 % Metric	32 % English	Comments <i>test after thermal exposure</i>
	@Treatment Temp. 871 °C, Time 2.88e+7 sec	@Treatment Temp. 1600 °F, Time 8000 hour	
	33 %	33 %	
	@Treatment Temp. 871 °C, Time 5.76e+7 sec	@Treatment Temp. 1600 °F, Time 16000 hour	Room temp test after thermal exposure
Reduction of Area	33 %	33 %	Room temp test prior to thermal exposure
	19 %	19 %	
	@Treatment Temp. 760 °C, Time 5.76e+7 sec	@Treatment Temp. 1400 °F, Time 16000 hour	Room temp test after thermal exposure
	21 %	21 %	
	@Treatment Temp. 760 °C, Time 2.88e+7 sec	@Treatment Temp. 1400 °F, Time 8000 hour	Room temp test after thermal exposure
	22 %	22 %	
	@Treatment Temp. 760 °C, Time 1.44e+7 sec	@Treatment Temp. 1400 °F, Time 4000 hour	Room temp test after thermal exposure
	25 %	25 %	
	@Treatment Temp. 649 °C, Time 5.76e+7 sec	@Treatment Temp. 1200 °F, Time 16000 hour	Room temp test after thermal exposure
	27 %	27 %	
	@Treatment Temp. 649 °C, Time 2.88e+7 sec	@Treatment Temp. 1200 °F, Time 8000 hour	Room temp test after thermal exposure
	29 %	29 %	
	@Treatment Temp. 649 °C, Time 3.60e+6 sec	@Treatment Temp. 1200 °F, Time 1000 hour	Room temp test after thermal exposure
	29 %	29 %	
	@Treatment Temp. 649 °C, Time 1.44e+7 sec	@Treatment Temp. 1200 °F, Time 4000 hour	Room temp test after thermal exposure
	29 %	29 %	
	@Treatment Temp. 760 °C, Time 3.60e+6 sec	@Treatment Temp. 1400 °F, Time 1000 hour	Room temp test after thermal exposure
	30 %	30 %	

Mechanical Properties	Metric	English	Comments
	@ Treatment Temp. 760 °C, Time 360000 sec	@ Treatment Temp. 1400 °F, Time 100 hour	Room temp test after thermal exposure
	30 %	30 %	
	@Treatment Temp. 871 °C, Time 3.60e+6 sec	@Treatment Temp. 1600 °F, Time 1000 hour	Room temp test after thermal exposure
	31 %	31 %	
	@Treatment Temp. 649 °C, Time 360000 sec	@Treatment Temp. 1200 °F, Time 100 hour	Room temp test after thermal exposure
	31 %	31 %	
	@Treatment Temp. 871 °C, Time 1.44e+7 sec	@Treatment Temp. 1600 °F, Time 4000 hour	Room temp test after thermal exposure
	31 %	31 %	
	@Treatment Temp. 871 °C, Time 2.88e+7 sec	@Treatment Temp. 1600 °F, Time 8000 hour	Room temp test after thermal exposure
	32 %	32 %	
	@Treatment Temp. 871 °C, Time 5.76e+7 sec	@Treatment Temp. 1600 °F, Time 16000 hour	Room temp test after thermal exposure
	36 %	36 %	
	@Treatment Temp. 871 °C, Time 360000 sec	@Treatment Temp. 1600 °F, Time 100 hour	Room temp test after thermal exposure
Modulus of Elasticity	217 GPa @Temperature 25.0 °C	31500 ksi @Temperature 77.0 °F	Dynamic
Poissons Ratio	0.319 @Temperature 25.0 °C	0.319 @Temperature 77.0 °F	
Shear Modulus	82.0 GPa @Temperature 25.0 °C	11900 ksi @Temperature 77.0 °F	Dynamic

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.0001278 ohm-cm	0.0001278 ohm-cm	
	0.0001299 ohm-cm	0.0001299 ohm-cm	
	0.0001299 ohm-cm	0.0001299 ohm-cm	
	0.0001318 ohm-cm	0.0001318 ohm-cm	

Electrical Properties	Metric	English	Comments
	0.0001326 ohm-cm	0.0001326 ohm-cm	

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