

## Haynes 282® Nickel Alloy Plate, Solution Annealed and Age-Hardened

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-Plate-Solution-Annealed-and-Age-Hardened.php](http://www.lookpolymers.com/polymer_Haynes-282-Nickel-Alloy-Plate-Solution-Annealed-and-Age-Hardened.php)

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

Mechanical Properties	Metric	English	Comments
Hardness, Rockwell C	32	32	Age-hardened
Tensile Strength, Ultimate	115 MPa	16700 psi	
	@Temperature 1000 °C	@Temperature 1830 °F	
	458 MPa	66400 psi	
	@Temperature 900 °C	@Temperature 1650 °F	
	750 MPa	109000 psi	
	@Temperature 800 °C	@Temperature 1470 °F	

Mechanical Properties	Metric	English	Comments
	@Temperature 700 °C	@Temperature 1290 °F	
	<b>1023 MPa</b>	<b>148400 psi</b>	
	@Temperature 600 °C	@Temperature 1110 °F	
	<b>1147 MPa</b>	<b>166400 psi</b>	
	@Temperature 25.0 °C	@Temperature 77.0 °F	
<b>Tensile Strength, Yield</b>	<b>75.0 MPa</b>	<b>10900 psi</b>	
	@Strain 0.200 %, Temperature 1000 °C	@Strain 0.200 %, Temperature 1830 °F	
	<b>404 MPa</b>	<b>58600 psi</b>	
	@Strain 0.200 %, Temperature 900 °C	@Strain 0.200 %, Temperature 1650 °F	
	<b>590 MPa</b>	<b>85600 psi</b>	
	@Strain 0.200 %, Temperature 800 °C	@Strain 0.200 %, Temperature 1470 °F	
	<b>645 MPa</b>	<b>93500 psi</b>	
	@Strain 0.200 %, Temperature 600 °C	@Strain 0.200 %, Temperature 1110 °F	
	<b>648 MPa</b>	<b>94000 psi</b>	
	@Strain 0.200 %, Temperature 700 °C	@Strain 0.200 %, Temperature 1290 °F	
	<b>715 MPa</b>	<b>104000 psi</b>	
	@Strain 0.200 %, Temperature 25.0 °C	@Strain 0.200 %, Temperature 77.0 °F	
<b>Elongation at Break</b>	<b>26 %</b>	<b>26 %</b>	
	@Temperature 800 °C	@Temperature 1470 °F	
	<b>29 %</b>	<b>29 %</b>	
	@Temperature 700 °C	@Temperature 1290 °F	
	<b>30 %</b>	<b>30 %</b>	
	@Temperature 25.0 °C	@Temperature 77.0 °F	
	<b>32 %</b>	<b>32 %</b>	
	@Temperature 600 °C	@Temperature 1110 °F	
	<b>41 %</b>	<b>41 %</b>	
	@Temperature 900 °C	@Temperature 1650 °F	

Mechanical Properties	Metric	English	Comments
	@Temperature 1000 °C	@Temperature 1830 °F	
Reduction of Area	28 %	28 %	
	@Temperature 700 °C	@Temperature 1290 °F	
	29 %	29 %	
	@Temperature 800 °C	@Temperature 1470 °F	
	31 %	31 %	
	@Temperature 25.0 °C	@Temperature 77.0 °F	
	33 %	33 %	
	@Temperature 600 °C	@Temperature 1110 °F	
	56 %	56 %	
	@Temperature 900 °C	@Temperature 1650 °F	
	98 %	98 %	
	@Temperature 1000 °C	@Temperature 1830 °F	
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	Dynamic
	@Temperature 500 °C	@Temperature 932 °F	
	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	

Mechanical Properties	Metric @Temperature 200 °C	English @Temperature 392 °F	Dynamic Comments
	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	
	0.363	0.363	
	@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	

Mechanical Properties	Metric <sup>1</sup>	English <sup>1</sup>	Comments
	@Temperature 800 °C	@Temperature 1470 °F	Dynamic
	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	

Thermal Properties	Metric	English	Comments
CTE, linear	12.1 µm/m-°C	6.72 µin/in-°F	
	@Temperature 25.0 - 100 °C	@Temperature 77.0 - 212 °F	
	12.4 µm/m-°C	6.89 µin/in-°F	
	@Temperature 25.0 - 200 °C	@Temperature 77.0 - 392 °F	
	12.8 µm/m-°C	7.11 µin/in-°F	
	@Temperature 25.0 - 300 °C	@Temperature 77.0 - 572 °F	

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.0001261 ohm-cm	0.0001261 ohm-cm	
	@Temperature 25.0 °C	@Temperature 77.0 °F	

Electrical Properties	0.0001278 ohm-cm Metric	0.0001278 ohm-cm English	Comments
	@Temperature 100 °C	@Temperature 212 °F	
	0.0001299 ohm-cm	0.0001299 ohm-cm	
	@Temperature 200 °C	@Temperature 392 °F	
	0.0001299 ohm-cm	0.0001299 ohm-cm	
	@Temperature 1000 °C	@Temperature 1830 °F	
	0.0001318 ohm-cm	0.0001318 ohm-cm	
	@Temperature 300 °C	@Temperature 572 °F	
	0.0001326 ohm-cm	0.0001326 ohm-cm	
	@Temperature 900 °C	@Temperature 1650 °F	
	0.0001334 ohm-cm	0.0001334 ohm-cm	
	@Temperature 400 °C	@Temperature 752 °F	
	0.0001345 ohm-cm	0.0001345 ohm-cm	
	@Temperature 800 °C	@Temperature 1470 °F	
	0.000135 ohm-cm	0.000135 ohm-cm	
	@Temperature 500 °C	@Temperature 932 °F	
	0.0001355 ohm-cm	0.0001355 ohm-cm	
	@Temperature 700 °C	@Temperature 1290 °F	
	0.0001362 ohm-cm	0.0001362 ohm-cm	
	@Temperature 600 °C	@Temperature 1110 °F	

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