

## Haynes 282<sup>®</sup> Nickel Alloy Sheet, Plate and Bar, Solution Annealed

Category : Metal , Nonferrous Metal , Nickel Alloy

### Material Notes:

Excellent High Temperature Strength HAYNES<sup>®</sup> 282<sup>®</sup> 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<sup>°</sup>F (649 to 927<sup>°</sup>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<sup>°</sup>F (1121 to 1149<sup>°</sup>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<sup>°</sup>F (1010<sup>°</sup>C) / 2 hours / AC (air cool) + 1450<sup>°</sup>F (788<sup>°</sup>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-Plate-and-Bar-Solution-Annealed.php](http://www.lookpolymers.com/polymer_Haynes-282-Nickel-Alloy-Sheet-Plate-and-Bar-Solution-Annealed.php)

Physical Properties	Metric	English	Comments
Density	8.27 g/cc	0.299 lb/in <sup>3</sup>	

Mechanical Properties	Metric	English	Comments
Hardness, Rockwell B	93	93	Sheet
Hardness, Rockwell C	15	15	Sheet
Tensile Strength, Ultimate	816 MPa	118000 psi	Bar
	830 MPa	120000 psi	Plate
	834 MPa @Thickness 3.20 mm	121000 psi @Thickness 0.126 in	Sheet
Tensile Strength, Yield	348 MPa @Strain 0.200 %	50500 psi @Strain 0.200 %	Bar

Mechanical Properties	Metric	English	Comments
	@Strain 0.200 %	@Strain 0.200 %	Plate
	<b>383 MPa</b>	<b>55500 psi</b>	
	@Strain 0.200 %, Thickness 3.20 mm	@Strain 0.200 %, Thickness 0.126 in	Sheet
<b>Elongation at Break</b>	<b>60 %</b>	<b>60 %</b>	<b>Plate</b>
	<b>62 %</b>	<b>62 %</b>	<b>Bar</b>
	<b>58 %</b>	<b>58 %</b>	
	@Thickness 3.20 mm	@Thickness 0.126 in	Sheet
<b>Reduction of Area</b>	<b>61 %</b>	<b>61 %</b>	<b>Plate</b>
	<b>69 %</b>	<b>69 %</b>	<b>Bar</b>
<b>Creep Strength</b>	<b>12.0 MPa</b>	<b>1740 psi</b>	
	@Temperature 982 Â°C, Time 3.60e+6 sec	@Temperature 1800 Â°F, Time 1000 hour	0.5% Creep
	<b>29.0 MPa</b>	<b>4210 psi</b>	
	@Temperature 982 Â°C, Time 360000 sec	@Temperature 1800 Â°F, Time 100 hour	0.5% Creep
	<b>33.0 MPa</b>	<b>4790 psi</b>	
	@Temperature 927 Â°C, Time 3.60e+6 sec	@Temperature 1700 Â°F, Time 1000 hour	0.5% Creep
	<b>65.0 MPa</b>	<b>9430 psi</b>	
	@Temperature 927 Â°C, Time 360000 sec	@Temperature 1700 Â°F, Time 100 hour	0.5% Creep
	<b>76.0 MPa</b>	<b>11000 psi</b>	
	@Temperature 871 Â°C, Time 3.60e+6 sec	@Temperature 1600 Â°F, Time 1000 hour	0.5% Creep
	<b>124 MPa</b>	<b>18000 psi</b>	
	@Temperature 871 Â°C, Time 360000 sec	@Temperature 1600 Â°F, Time 100 hour	0.5% Creep
	<b>138 MPa</b>	<b>20000 psi</b>	
	@Temperature 816 Â°C, Time 3.60e+6 sec	@Temperature 1500 Â°F, Time 1000 hour	0.5% Creep

Mechanical Properties	Metric	Time 1000 hour English	Comments
	221 MPa	32100 psi	
	@Temperature 816 Â°C, Time 360000 sec	@Temperature 1500 Â°F, Time 100 hour	0.5% Creep
	241 MPa	35000 psi	
	@Temperature 760 Â°C, Time 3.60e+6 sec	@Temperature 1400 Â°F, Time 1000 hour	0.5% Creep
	338 MPa	49000 psi	
	@Temperature 760 Â°C, Time 360000 sec	@Temperature 1400 Â°F, Time 100 hour	0.5% Creep
	365 MPa	52900 psi	
	@Temperature 704 Â°C, Time 3.60e+6 sec	@Temperature 1300 Â°F, Time 1000 hour	0.5% Creep
	503 MPa	73000 psi	
	@Temperature 704 Â°C, Time 360000 sec	@Temperature 1300 Â°F, Time 100 hour	0.5% Creep
	558 MPa	80900 psi	
	@Temperature 649 Â°C, Time 3.60e+6 sec	@Temperature 1200 Â°F, Time 1000 hour	0.5% Creep
<b>Rupture Strength</b>	25.0 MPa	3630 psi	
	@Temperature 982 Â°C, Time 3.60e+6 sec	@Temperature 1800 Â°F, Time 1000 hour	Plate
	43.0 MPa	6240 psi	
	@Temperature 982 Â°C, Time 360000 sec	@Temperature 1800 Â°F, Time 100 hour	Plate
	48.0 MPa	6960 psi	
	@Temperature 927 Â°C, Time 3.60e+6 sec	@Temperature 1700 Â°F, Time 1000 hour	Plate
	90.0 MPa	13100 psi	
	@Temperature 927 Â°C, Time 360000 sec	@Temperature 1700 Â°F, Time 100 hour	Plate
	97.0 MPa	14100 psi	

Mechanical Properties	Metric	English	Plate Comments
	@Temperature 871 Â°C, Time 3.60e+6 sec	@Temperature 1600 Â°F, Time 1000 hour	
	159 MPa	23100 psi	
	@Temperature 871 Â°C, Time 360000 sec	@Temperature 1600 Â°F, Time 100 hour	Plate
	172 MPa	24900 psi	
	@Temperature 816 Â°C, Time 3.60e+6 sec	@Temperature 1500 Â°F, Time 1000 hour	Plate
	186 MPa	27000 psi	
	@Temperature 760 Â°C, Time 3.60e+7 sec	@Temperature 1400 Â°F, Time 10000 hour	Plate
	262 MPa	38000 psi	
	@Temperature 816 Â°C, Time 360000 sec	@Temperature 1500 Â°F, Time 100 hour	Plate
	283 MPa	41000 psi	
	@Temperature 760 Â°C, Time 3.60e+6 sec	@Temperature 1400 Â°F, Time 1000 hour	Plate
	310 MPa	45000 psi	
	@Temperature 704 Â°C, Time 3.60e+7 sec	@Temperature 1300 Â°F, Time 10000 hour	Plate
	393 MPa	57000 psi	
	@Temperature 760 Â°C, Time 360000 sec	@Temperature 1400 Â°F, Time 100 hour	Plate
	421 MPa	61100 psi	
	@Temperature 704 Â°C, Time 3.60e+6 sec	@Temperature 1300 Â°F, Time 1000 hour	Plate
	441 MPa	64000 psi	
	@Temperature 649 Â°C, Time 3.60e+7 sec	@Temperature 1200 Â°F, Time 10000 hour	Plate
	552 MPa	80100 psi	
	@Temperature 704 Â°C, Time 360000 sec	@Temperature 1300 Â°F, Time 100 hour	Plate

Mechanical Properties	595 MPa Metric	85000 psi English	Comments
	@Temperature 649 Å°C, Time 3.60e+6 sec	@Temperature 1200 Å°F, Time 1000 hour	Plate
Modulus of Elasticity	140 GPa	20300 ksi	Dynamic
	@Temperature 1000 Å°C	@Temperature 1830 Å°F	
	154 GPa	22300 ksi	Dynamic
	@Temperature 900 Å°C	@Temperature 1650 Å°F	
	166 GPa	24100 ksi	Dynamic
	@Temperature 800 Å°C	@Temperature 1470 Å°F	
	175 GPa	25400 ksi	Dynamic
	@Temperature 700 Å°C	@Temperature 1290 Å°F	
	183 GPa	26500 ksi	Dynamic
	@Temperature 600 Å°C	@Temperature 1110 Å°F	
	190 GPa	27600 ksi	Dynamic
	@Temperature 500 Å°C	@Temperature 932 Å°F	
	196 GPa	28400 ksi	Dynamic
	@Temperature 400 Å°C	@Temperature 752 Å°F	
	202 GPa	29300 ksi	Dynamic
	@Temperature 300 Å°C	@Temperature 572 Å°F	
	209 GPa	30300 ksi	Dynamic
	@Temperature 200 Å°C	@Temperature 392 Å°F	
	213 GPa	30900 ksi	Dynamic
	@Temperature 100 Å°C	@Temperature 212 Å°F	
	217 GPa	31500 ksi	Dynamic
	@Temperature 25.0 Å°C	@Temperature 77.0 Å°F	
Poissons Ratio	0.319	0.319	
	@Temperature 25.0 Å°C	@Temperature 77.0 Å°F	
	0.326	0.326	

Mechanical Properties	@Temperature 100 Â°C Metric	@Temperature 212 Â°F English	Comments
	0.335	0.335	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	0.335	0.335	
	@Temperature 300 Â°C	@Temperature 572 Â°F	
	0.337	0.337	
	@Temperature 400 Â°C	@Temperature 752 Â°F	
	0.341	0.341	
	@Temperature 500 Â°C	@Temperature 932 Â°F	
	0.346	0.346	
	@Temperature 600 Â°C	@Temperature 1110 Â°F	
	0.352	0.352	
	@Temperature 700 Â°C	@Temperature 1290 Â°F	
	0.355	0.355	
	@Temperature 800 Â°C	@Temperature 1470 Â°F	
	0.357	0.357	
	@Temperature 900 Â°C	@Temperature 1650 Â°F	
	0.363	0.363	
	@Temperature 1000 Â°C	@Temperature 1830 Â°F	
Shear Modulus	51.0 GPa	7400 ksi	Dynamic
	@Temperature 1000 Â°C	@Temperature 1830 Â°F	
	57.0 GPa	8270 ksi	Dynamic
	@Temperature 900 Â°C	@Temperature 1650 Â°F	
	61.0 GPa	8850 ksi	Dynamic
	@Temperature 800 Â°C	@Temperature 1470 Â°F	
	65.0 GPa	9430 ksi	Dynamic
	@Temperature 700 Â°C	@Temperature 1290 Â°F	

Mechanical Properties	68.0 GPa Metric	9860 ksi English	Comments
	@Temperature 600 Å°C	@Temperature 1110 Å°F	Dynamic
	71.0 GPa	10300 ksi	Dynamic
	@Temperature 500 Å°C	@Temperature 932 Å°F	
	73.0 GPa	10600 ksi	Dynamic
	@Temperature 400 Å°C	@Temperature 752 Å°F	

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