

Haynes 282® Nickel Alloy Synergic Gas Metal Arc Welded (GMAW) Plate

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. Tensile properties reported are for transverse synergic gas metal arc welded plate specimens. Other properties are typical of the alloy. Data provided by the manufacturer, Haynes International, Inc.

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http://www.lookpolymers.com/polymer_Haynes-282-Nickel-Alloy-Synergic-Gas-Metal-Arc-Welded-GMAW-Plate.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	185 MPa	26800 psi	As Welded, Solution Annealed, and Aged; Weld/Weld Fracture
	@Thickness 12.7 mm, Temperature 982 °C	@Thickness 0.500 in, Temperature 1800 °F	
	565 MPa	81900 psi	As Welded, Solution Annealed, and Aged; Weld/Weld Fracture
	@Thickness 12.7 mm, Temperature 871 °C	@Thickness 0.500 in, Temperature 1600 °F	
	852 MPa	124000 psi	As Welded, Solution Annealed, and

Mechanical Properties	Metric @Thickness 12.7 mm, Temperature 760 Â°C	English @Thickness 0.500 in, Temperature 1400 Â°F	Aged: Base/Base Fracture Comments
	899 MPa @Thickness 12.7 mm, Temperature 25.0 Â°C	130000 psi @Thickness 0.500 in, Temperature 77.0 Â°F	As Welded, Base/Base Fracture
	910 MPa @Thickness 12.7 mm, Temperature 538 Â°C	132000 psi @Thickness 0.500 in, Temperature 1000 Â°F	As Welded, Solution Annealed, and Aged; Weld/Weld Fracture
	947 MPa @Thickness 12.7 mm, Temperature 649 Â°C	137000 psi @Thickness 0.500 in, Temperature 1200 Â°F	As Welded, Solution Annealed, and Aged; Weld/Weld Fracture
	977 MPa @Thickness 12.7 mm, Temperature 25.0 Â°C	142000 psi @Thickness 0.500 in, Temperature 77.0 Â°F	As Welded and Solution Annealed at 2075Â°F(1135Â°C)/30min/AC, Base/Base Fracture
	1074 MPa @Thickness 12.7 mm, Temperature 25.0 Â°C	155800 psi @Thickness 0.500 in, Temperature 77.0 Â°F	As Welded, Solution Annealed, and Aged; Base/Base Fracture
	1120 MPa @Thickness 12.7 mm, Temperature 25.0 Â°C	162000 psi @Thickness 0.500 in, Temperature 77.0 Â°F	As Welded and Aged at 1850Â°F(1010Â°C)/2hr/AC + 1450Â°F(788Â°C)/8h/AC; Weld/Weld Fracture
Tensile Strength, Yield	137 MPa @Temperature 982 Â°C, Time 45700 sec	19900 psi @Temperature 1800 Â°F, Time 12.7 hour	As Welded, Solution Annealed, and Aged; Weld/Weld Fracture; 0.2% Offset
	490 MPa @Temperature 871 Â°C, Time 45700 sec	71100 psi @Temperature 1600 Â°F, Time 12.7 hour	As Welded, Solution Annealed, and Aged; Weld/Weld Fracture; 0.2% Offset
	537 MPa @Temperature 25.0 Â°C, Time 45700 sec	77900 psi @Temperature 77.0 Â°F, Time 12.7 hour	As Welded, Base/Base Fracture; 0.2% Offset
	542 MPa @Temperature 25.0 Â°C, Time 45700 sec	78600 psi @Temperature 77.0 Â°F, Time 12.7 hour	As Welded and Solution Annealed at 2075Â°F(1135Â°C)/30min/AC, Base/Base Fracture; 0.2% Offset
	577 MPa @Temperature 760 Â°C, Time 45700 sec	83700 psi @Temperature 1400 Â°F, Time 12.7 hour	As Welded, Solution Annealed, and Aged; Base/Base Fracture; 0.2% Offset

Mechanical Properties	578 MPa Metric	83800 psi English	As Welded, Solution Annealed, and Aged; Weld/Weld Fracture; 0.2% Offset
	@Temperature 538 Â°C, Time 45700 sec	@Temperature 1000 Â°F, Time 12.7 hour	Offset
	587 MPa	85100 psi	
	@Temperature 649 Â°C, Time 45700 sec	@Temperature 1200 Â°F, Time 12.7 hour	As Welded, Solution Annealed, and Aged; Weld/Weld Fracture; 0.2% Offset
	651 MPa	94400 psi	
	@Temperature 25.0 Â°C, Time 45700 sec	@Temperature 77.0 Â°F, Time 12.7 hour	As Welded, Solution Annealed, and Aged; Base/Base Fracture; 0.2% Offset
	810 MPa	117000 psi	
	@Temperature 25.0 Â°C, Time 45700 sec	@Temperature 77.0 Â°F, Time 12.7 hour	As Welded and Aged at 1850Â°F(1010Â°C)/2hr/AC + 1450Â°F(788Â°C)/8h/AC; Weld/Weld Fracture; 0.2% Offset
Modulus of Elasticity	140 GPa	20300 ksi	Dynamic
	@Temperature 1000 Â°C	@Temperature 1830 Â°F	
	154 GPa	22300 ksi	
	@Temperature 900 Â°C	@Temperature 1650 Â°F	Dynamic
	166 GPa	24100 ksi	
	@Temperature 800 Â°C	@Temperature 1470 Â°F	Dynamic
	175 GPa	25400 ksi	
	@Temperature 700 Â°C	@Temperature 1290 Â°F	Dynamic
	183 GPa	26500 ksi	
	@Temperature 600 Â°C	@Temperature 1110 Â°F	Dynamic
	190 GPa	27600 ksi	
	@Temperature 500 Â°C	@Temperature 932 Â°F	Dynamic
	196 GPa	28400 ksi	
	@Temperature 400 Â°C	@Temperature 752 Â°F	Dynamic
	202 GPa	29300 ksi	
	@Temperature 300 Â°C	@Temperature 572 Â°F	Dynamic
	209 GPa	30300 ksi	
	@Temperature 200 Â°C	@Temperature 392 Â°F	Dynamic

Mechanical Properties	Metric	English	Comments
	21.3 GPa	31500 ksi	
	@Temperature 100 Â°C	@Temperature 212 Â°F	Dynamic
	217 GPa	31500 ksi	
	@Temperature 25.0 Â°C	@Temperature 77.0 Â°F	Dynamic
Poissons Ratio	0.319	0.319	
	@Temperature 25.0 Â°C	@Temperature 77.0 Â°F	
	0.326	0.326	
	@Temperature 100 Â°C	@Temperature 212 Â°F	
	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	
	51.0 GPa	7400 ksi	
Shear Modulus			Dynamic

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

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	

Thermal Properties	Metric	English	Comments
	@ Temperature 25.0 - 300 Â°C	@ Temperature 77.0 - 572 Â°F	

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.0001261 ohm-cm	0.0001261 ohm-cm	
	@Temperature 25.0 Â°C	@Temperature 77.0 Â°F	
	0.0001278 ohm-cm	0.0001278 ohm-cm	
	@Temperature 100 Â°C	@Temperature 212 Â°F	
	0.0001299 ohm-cm	0.0001299 ohm-cm	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	0.0001299 ohm-cm	0.0001299 ohm-cm	
	@Temperature 1000 Â°C	@Temperature 1830 Â°F	
	0.0001318 ohm-cm	0.0001318 ohm-cm	
	@Temperature 300 Â°C	@Temperature 572 Â°F	
	0.0001326 ohm-cm	0.0001326 ohm-cm	
	@Temperature 900 Â°C	@Temperature 1650 Â°F	
	0.0001334 ohm-cm	0.0001334 ohm-cm	
	@Temperature 400 Â°C	@Temperature 752 Â°F	
	0.0001345 ohm-cm	0.0001345 ohm-cm	
	@Temperature 800 Â°C	@Temperature 1470 Â°F	
	0.000135 ohm-cm	0.000135 ohm-cm	
	@Temperature 500 Â°C	@Temperature 932 Â°F	
	0.0001355 ohm-cm	0.0001355 ohm-cm	
	@Temperature 700 Â°C	@Temperature 1290 Â°F	
	0.0001362 ohm-cm	0.0001362 ohm-cm	
	@Temperature 600 Â°C	@Temperature 1110 Â°F	

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