

Haynes 282® Nickel Alloy Synergic Gas Metal Arc Welded (GMAW) All Weld Cruciform

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 all-weld-metal specimens from Cruciform. 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-All-Weld-Cruciform.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	860 MPa	125000 psi	As Welded
	@Diameter 12.7 mm	@Diameter 0.500 in	
	913 MPa	132000 psi	As Welded and Solution Annealed at 2075°F(1135°C)/30min/AC
@Diameter 12.7 mm	@Diameter 0.500 in		
	1029 MPa	149200 psi	As Welded, Solution Annealed, and Aged

Mechanical Properties	@Diameter 12.7 mm Metric	@Diameter 0.500 in English	Comments
	1045 MPa @Diameter 12.7 mm	151600 psi @Diameter 0.500 in	As Welded and Aged at 1850°F(1010°C)/2hr/AC + 1450°F(788°C)/8h/AC
Tensile Strength, Yield	560 MPa @Strain 0.200 %, Diameter 12.7 mm	81200 psi @Strain 0.200 %, Diameter 0.500 in	As Welded and Solution Annealed at 2075°F(1135°C)/30min/AC
	586 MPa @Strain 0.200 %, Diameter 12.7 mm	85000 psi @Strain 0.200 %, Diameter 0.500 in	As Welded
	696 MPa @Strain 0.200 %, Diameter 12.7 mm	101000 psi @Strain 0.200 %, Diameter 0.500 in	As Welded, Solution Annealed, and Aged
	727 MPa @Strain 0.200 %, Diameter 12.7 mm	105000 psi @Strain 0.200 %, Diameter 0.500 in	As Welded and Aged at 1850°F(1010°C)/2hr/AC + 1450°F(788°C)/8h/AC
Elongation at Break	20.3 % @Diameter 12.7 mm	20.3 % @Diameter 0.500 in	As Welded and Aged at 1850°F(1010°C)/2hr/AC + 1450°F(788°C)/8h/AC
	22.7 % @Diameter 12.7 mm	22.7 % @Diameter 0.500 in	As Welded, Solution Annealed, and Aged
	40 % @Diameter 12.7 mm	40 % @Diameter 0.500 in	As Welded
	40.1 % @Diameter 12.7 mm	40.1 % @Diameter 0.500 in	As Welded and Solution Annealed at 2075°F(1135°C)/30min/AC
Reduction of Area	20 % @Thickness 12.7 mm	20 % @Thickness 0.500 in	As Welded, Solution Annealed, and Aged
	22.4 % @Thickness 12.7 mm	22.4 % @Thickness 0.500 in	As Welded and Aged at 1850°F(1010°C)/2hr/AC + 1450°F(788°C)/8h/AC
	43.8 % @Thickness 12.7 mm	43.8 % @Thickness 0.500 in	As Welded
	45.5 % @Thickness 12.7 mm	45.5 % @Thickness 0.500 in	As Welded and Solution Annealed at 2075°F(1135°C)/30min/AC
Modulus of Elasticity	140 GPa @Temperature 1000 °C	20300 ksi @Temperature 1830 °F	Dynamic

Mechanical Properties	Metric	English	Comments
	154 GPa		
	@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
	213 GPa	30900 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	

Mechanical Properties	Metric	English	Comments
	@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	
	68.0 GPa	9860 ksi	Dynamic
	@Temperature 600 Â°C	@Temperature 1110 Â°F	
	71.0 GPa	10300 ksi	Dynamic
	@Temperature 500 Â°C	@Temperature 932 Â°F	

Mechanical Properties	73.0 GPa Metric	10600 ksi English	Comments
	@Temperature 400 Â°C	@Temperature 752 Â°F	
	76.0 GPa	11000 ksi	Dynamic
	@Temperature 300 Â°C	@Temperature 572 Â°F	
	78.0 GPa	11300 ksi	Dynamic
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	80.0 GPa	11600 ksi	Dynamic
	@Temperature 100 Â°C	@Temperature 212 Â°F	
	82.0 GPa	11900 ksi	Dynamic
	@Temperature 25.0 Â°C	@Temperature 77.0 Â°F	

Thermal Properties	Metric	English	Comments
CTE, linear	12.1 Âµm/m-Â°C	6.72 Âµin/in-Â°F	
	@Temperature 25.0 - 100 Â°C	@Temperature 77.0 - 212 Â°F	
	12.4 Âµm/m-Â°C	6.89 Âµin/in-Â°F	
	@Temperature 25.0 - 200 Â°C	@Temperature 77.0 - 392 Â°F	
	12.8 Âµm/m-Â°C	7.11 Âµin/in-Â°F	
	@Temperature 25.0 - 300 Â°C	@Temperature 77.0 - 572 Â°F	
	13.1 Âµm/m-Â°C	7.28 Âµin/in-Â°F	
	@Temperature 25.0 - 400 Â°C	@Temperature 77.0 - 752 Â°F	
	13.5 Âµm/m-Â°C	7.50 Âµin/in-Â°F	
	@Temperature 25.0 - 500 Â°C	@Temperature 77.0 - 932 Â°F	
	13.7 Âµm/m-Â°C	7.61 Âµin/in-Â°F	
	@Temperature 25.0 - 600 Â°C	@Temperature 77.0 - 1110 Â°F	
	14.2 Âµm/m-Â°C	7.89 Âµin/in-Â°F	
	@Temperature 25.0 - 700 Â°C	@Temperature 77.0 - 1290 Â°F	
	14.9 Âµm/m-Â°C	8.28 Âµin/in-Â°F	
	@Temperature 25.0 -	@Temperature 77.0 -	

Thermal Properties	800 Å°C Metric	1470 Å°F English	Comments
	15.9 Åµm/m-Å°C	8.83 Åµin/in-Å°F	
	@Temperature 25.0 - 900 Å°C	@Temperature 77.0 - 1650 Å°F	

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

Contact Songhan Plastic Technology Co.,Ltd.

Website : www.lookpolymers.com

Email : sales@lookpolymers.com

Tel : +86 021-51131842

Mobile : +86 13061808058

Skype : lookpolymers

Address : United North Road 215,Fengxian District, Shanghai City,China