

Haynes Hastelloy® Hybrid-BC1® Nickel Alloy Plate, Hot Rolled and Solution Annealed

Category : Metal , Nonferrous Metal , Nickel Alloy

Material Notes:

HASTELLOY® HYBRID-BC1® alloy possesses much higher resistance to hydrochloric and sulfuric acids than the nickel-chromium-molybdenum (C-type) alloys, and can tolerate the presence of oxidizing species. The alloy also exhibits extremely high resistance to pitting and crevice corrosion. HYBRID-BC1 alloy is available in the form of plate, sheet, strip, billet, bar, wire, pipe, and tube. HYBRID-BC1 alloy is suitable for the following applications in the chemical processing, pharmaceutical, agricultural, food, petrochemical, and power industries: Reaction vessels Heat exchangers Valves Pumps Piping Storage tanks The alloy is suitable for use at temperatures up to approximately 427°C (800°F). HYBRID-BC1 alloy excels in reducing acids and acid mixtures (with or without halides) open to oxygen and other oxidizing residuals/contaminants. Heat Treatment: Wrought forms of HYBRID-BC1 alloy are furnished in the solution annealed condition, unless otherwise specified. The standard solution annealing treatment consists of heating to 1149°C (2100°F) followed by rapid air-cooling or (preferably) water quenching. Parts which have been hot formed should be solution annealed prior to final fabrication or installation. The minimum hot forming temperature of the alloy is 954°C (1750°F). Forming: HYBRID-BC1 alloy has excellent forming characteristics, and cold forming is the preferred method of shaping. The alloy can be easily cold worked due to its high ductility; however, the alloy is stronger than the austenitic stainless steels and therefore requires more energy during cold forming. Data provided by the manufacturer, Haynes International, Inc.

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http://www.lookpolymers.com/polymer_Haynes-Hastelloy-Hybrid-BC1-Nickel-Alloy-Plate-Hot-Rolled-and-Solution-Annealed.php

Physical Properties	Metric	English	Comments
Density	8.83 g/cc	0.319 lb/in ³	

Mechanical Properties	Metric	English	Comments
Tensile Strength, Ultimate	683 MPa	99100 psi	
	@Thickness 19.1 mm, Temperature 427 °C	@Thickness 0.752 in, Temperature 801 °F	
	688 MPa	99800 psi	
	@Thickness 19.1 mm, Temperature 371 °C	@Thickness 0.752 in, Temperature 700 °F	
	692 MPa	100000 psi	
@Thickness 19.1 mm, Temperature 316 °C	@Thickness 0.752 in, Temperature 601 °F		
706 MPa	102000 psi		
@Thickness 19.1 mm, Temperature 260 °C	@Thickness 0.752 in, Temperature 500 °F		
723 MPa	105000 psi		

Mechanical Properties	@Thickness 19.1 mm, Metric Temperature 204 °C	@Thickness 0.752 in, English Temperature 399 °F	Comments
	749 MPa	109000 psi	
	@Thickness 19.1 mm, Temperature 149 °C	@Thickness 0.752 in, Temperature 300 °F	
	778 MPa	113000 psi	
	@Thickness 19.1 mm, Temperature 93.0 °C	@Thickness 0.752 in, Temperature 199 °F	
	809 MPa	117000 psi	
	@Thickness 19.1 mm, Temperature 25.0 °C	@Thickness 0.752 in, Temperature 77.0 °F	
Tensile Strength, Yield	225 MPa	32600 psi	0.2% Offset
	@Thickness 19.1 mm, Temperature 427 °C	@Thickness 0.752 in, Temperature 801 °F	
	240 MPa	34800 psi	0.2% Offset
	@Thickness 19.1 mm, Temperature 371 °C	@Thickness 0.752 in, Temperature 700 °F	
	245 MPa	35500 psi	0.2% Offset
	@Thickness 19.1 mm, Temperature 316 °C	@Thickness 0.752 in, Temperature 601 °F	
	246 MPa	35700 psi	0.2% Offset
	@Thickness 19.1 mm, Temperature 260 °C	@Thickness 0.752 in, Temperature 500 °F	
	268 MPa	38900 psi	0.2% Offset
	@Thickness 19.1 mm, Temperature 204 °C	@Thickness 0.752 in, Temperature 399 °F	
	294 MPa	42600 psi	0.2% Offset
	@Thickness 19.1 mm, Temperature 149 °C	@Thickness 0.752 in, Temperature 300 °F	
	327 MPa	47400 psi	0.2% Offset
	@Thickness 19.1 mm, Temperature 93.0 °C	@Thickness 0.752 in, Temperature 199 °F	
	362 MPa	52500 psi	0.2% Offset
	@Thickness 19.1 mm, Temperature 25.0 °C	@Thickness 0.752 in, Temperature 77.0 °F	
Elongation at Break	70.5 %	70.5 %	
	@Thickness 19.1 mm, Temperature 25.0 °C	@Thickness 0.752 in, Temperature 77.0 °F	

Mechanical Properties	Metric	English	Comments
	@Thickness 19.1 mm, Temperature 316 °C	@Thickness 0.752 in, Temperature 601 °F	
	74 %	74 %	
	@Thickness 19.1 mm, Temperature 371 °C	@Thickness 0.752 in, Temperature 700 °F	
	74.6 %	74.6 %	
	@Thickness 19.1 mm, Temperature 204 °C	@Thickness 0.752 in, Temperature 399 °F	
	74.7 %	74.7 %	
	@Thickness 19.1 mm, Temperature 260 °C	@Thickness 0.752 in, Temperature 500 °F	
	74.8 %	74.8 %	
	@Thickness 19.1 mm, Temperature 93.0 °C	@Thickness 0.752 in, Temperature 199 °F	
	74.8 %	74.8 %	
	@Thickness 19.1 mm, Temperature 149 °C	@Thickness 0.752 in, Temperature 300 °F	
	76.3 %	76.3 %	
	@Thickness 19.1 mm, Temperature 427 °C	@Thickness 0.752 in, Temperature 801 °F	
Modulus of Elasticity	188 GPa	27300 ksi	Dynamic
	@Temperature 600 °C	@Temperature 1110 °F	
	191 GPa	27700 ksi	Dynamic
	@Temperature 500 °C	@Temperature 932 °F	
	197 GPa	28600 ksi	Dynamic
	@Temperature 400 °C	@Temperature 752 °F	
	200 GPa	29000 ksi	Dynamic
	@Temperature 300 °C	@Temperature 572 °F	
	205 GPa	29700 ksi	Dynamic
	@Temperature 200 °C	@Temperature 392 °F	
	211 GPa	30600 ksi	Dynamic
	@Temperature 100 °C	@Temperature 212 °F	
	217 GPa	31500 ksi	Dynamic
	@Temperature 25.0 °C	@Temperature 77.0 °F	

Mechanical Properties	347 J Metric	256 ft-lb English	Comments
Charpy Impact	@Temperature -196 °C	@Temperature -321 °F	Notched, Solution Annealed + 2000 h at 427°C
	>= 358 J @Temperature 25.0 °C	>= 264 ft-lb @Temperature 77.0 °F	Notched, Solution Annealed + 2000 h at 427°C
	>= 358 J @Temperature 25.0 °C	>= 264 ft-lb @Temperature 77.0 °F	Notched
	>= 358 J @Temperature -196 °C	>= 264 ft-lb @Temperature -321 °F	Notched

Thermal Properties	Metric	English	Comments
CTE, linear	11.5 µm/m-°C @Temperature 25.0 - 100 °C	6.39 µin/in-°F @Temperature 77.0 - 212 °F	
	11.9 µm/m-°C @Temperature 25.0 - 200 °C	6.61 µin/in-°F @Temperature 77.0 - 392 °F	
	12.2 µm/m-°C @Temperature 25.0 - 300 °C	6.78 µin/in-°F @Temperature 77.0 - 572 °F	
	12.5 µm/m-°C @Temperature 25.0 - 400 °C	6.94 µin/in-°F @Temperature 77.0 - 752 °F	
	12.7 µm/m-°C @Temperature 25.0 - 500 °C	7.06 µin/in-°F @Temperature 77.0 - 932 °F	
	12.7 µm/m-°C @Temperature 25.0 - 600 °C	7.06 µin/in-°F @Temperature 77.0 - 1110 °F	
	Specific Heat Capacity	0.403 J/g-°C @Temperature 25.0 °C	0.0963 BTU/lb-°F @Temperature 77.0 °F
0.416 J/g-°C @Temperature 100 °C		0.0994 BTU/lb-°F @Temperature 212 °F	
0.429 J/g-°C @Temperature 200 °C		0.103 BTU/lb-°F @Temperature 392 °F	

Thermal Properties	0.439 J/g-°C Metric	0.105 BTU/lb-°F English	Comments
	@Temperature 300 °C	@Temperature 572 °F	
	0.449 J/g-°C	0.107 BTU/lb-°F	
	@Temperature 400 °C	@Temperature 752 °F	
	0.457 J/g-°C	0.109 BTU/lb-°F	
	@Temperature 600 °C	@Temperature 1110 °F	
	0.461 J/g-°C	0.110 BTU/lb-°F	
	@Temperature 500 °C	@Temperature 932 °F	
Thermal Conductivity	9.30 W/m-K	64.5 BTU-in/hr-ft ² -°F	
	@Temperature 25.0 °C	@Temperature 77.0 °F	
	10.5 W/m-K	72.9 BTU-in/hr-ft ² -°F	
	@Temperature 100 °C	@Temperature 212 °F	
	11.9 W/m-K	82.6 BTU-in/hr-ft ² -°F	
	@Temperature 200 °C	@Temperature 392 °F	
	13.5 W/m-K	93.7 BTU-in/hr-ft ² -°F	
	@Temperature 300 °C	@Temperature 572 °F	
	14.9 W/m-K	103 BTU-in/hr-ft ² -°F	
	@Temperature 400 °C	@Temperature 752 °F	
	16.4 W/m-K	114 BTU-in/hr-ft ² -°F	
	@Temperature 500 °C	@Temperature 932 °F	
	17.5 W/m-K	121 BTU-in/hr-ft ² -°F	
	@Temperature 600 °C	@Temperature 1110 °F	
Maximum Service Temperature, Air	427 °C	800 °F	

Component Elements Properties	Metric	English	Comments
Aluminum, Al	<= 0.50 %	<= 0.50 %	
Carbon, C	<= 0.010 %	<= 0.010 %	
Chromium, Cr	15 %	15 %	
Iron, Fe	<= 1.25 %	<= 1.25 %	

Electrical Properties	Metric	English	Comments

Electrical Properties	0.000126 ohm-cm Metric	0.000126 ohm-cm English	Comments
	@Temperature 25.0 °C	@Temperature 77.0 °F	
	0.000127 ohm-cm	0.000127 ohm-cm	
	@Temperature 100 °C	@Temperature 212 °F	
	0.000127 ohm-cm	0.000127 ohm-cm	
	@Temperature 200 °C	@Temperature 392 °F	
	0.000128 ohm-cm	0.000128 ohm-cm	
	@Temperature 300 °C	@Temperature 572 °F	
	0.000128 ohm-cm	0.000128 ohm-cm	
	@Temperature 400 °C	@Temperature 752 °F	
	0.000129 ohm-cm	0.000129 ohm-cm	
	@Temperature 500 °C	@Temperature 932 °F	
	0.000131 ohm-cm	0.000131 ohm-cm	
	@Temperature 600 °C	@Temperature 1110 °F	

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