

Haynes Hastelloy® S alloy, flat products, solution heat-treated at 649°C (1200°F), aged 1000 hours

Category : Metal , Nonferrous Metal , Nickel Alloy , Superalloy

Material Notes:

Nickel-based, high temperature alloy. Excellent thermal stability, low thermal expansion, excellent oxidation resistance to 1093°C, good high temperature and thermal fatigue strength. Applications include seal rings in gas turbine engines, and severe cyclical heating conditions where it retains strength, ductility, and integrity. Data provided by the manufacturer, Haynes International, Inc.

Order this product through the following link:

http://www.lookpolymers.com/polymer_Haynes-Hastelloy-S-alloy-flat-products-solution-heat-treated-at-649C-1200F-aged-1000-hours.php

Physical Properties	Metric	English	Comments
Density	8.75 g/cc	0.316 lb/in ³	

Mechanical Properties	Metric	English	Comments
Hardness, Rockwell A	56	56	
	@Thickness 1.45 mm	@Thickness 0.0571 in	
	57	57	
	@Thickness 12.7 mm	@Thickness 0.500 in	
Tensile Strength, Ultimate	863 MPa	125000 psi	
	@Thickness 12.7 mm	@Thickness 0.500 in	
	920 MPa	133000 psi	
	@Thickness 1.45 mm	@Thickness 0.0571 in	
Tensile Strength, Yield	390 MPa	56600 psi	
	@Strain 0.200 %, Thickness 12.7 mm	@Strain 0.200 %, Thickness 0.500 in	
	478 MPa	69300 psi	
	@Strain 0.200 %, Thickness 1.45 mm	@Strain 0.200 %, Thickness 0.0571 in	
Elongation at Break	50 %	50 %	in 50.8 mm
	@Thickness 1.45 mm	@Thickness 0.0571 in	
	56 %	56 %	in 50.8 mm
	@Thickness 1.45 mm	@Thickness 0.0571 in	
	57 %	57 %	in 50.8 mm
	@Thickness 12.7 mm	@Thickness 0.500 in	

Mechanical Properties	Metric	English	Comments
Modulus of Elasticity	@Temperature 1093 °C	@Temperature 1999 °F	Heat treated at 1066 °C, air cooled
	151 GPa	21900 ksi	Heat treated at 1066°C, air cooled
	@Temperature 927 °C	@Temperature 1700 °F	
	161 GPa	23400 ksi	Heat treated at 1066°C, air cooled
	@Temperature 813 °C	@Temperature 1500 °F	
	166 GPa	24100 ksi	Heat treated at 1066°C, air cooled
	@Temperature 760 °C	@Temperature 1400 °F	
	174 GPa	25200 ksi	Heat treated at 1066°C, air cooled
Charpy Impact	@Temperature 649 °C	@Temperature 1200 °F	
	182 GPa	26400 ksi	Heat treated at 1066°C, air cooled
	@Temperature 538 °C	@Temperature 1000 °F	
	194 GPa	28100 ksi	Heat treated at 1066°C, air cooled
	@Temperature 357 °C	@Temperature 675 °F	
	212 GPa	30700 ksi	
	@Temperature 24.0 °C	@Temperature 75.2 °F	
Charpy Impact	190 J	140 ft-lb	V Notch; plate

Thermal Properties	Metric	English	Comments
CTE, linear	11.5 µm/m-°C	6.39 µin/in-°F	
	@Temperature 20.0 - 93.0 °C	@Temperature 68.0 - 199 °F	
	12.2 µm/m-°C	6.78 µin/in-°F	
	@Temperature 20.0 - 204 °C	@Temperature 68.0 - 399 °F	
	12.8 µm/m-°C	7.11 µin/in-°F	
	@Temperature 20.0 - 316 °C	@Temperature 68.0 - 601 °F	
	13.1 µm/m-°C	7.28 µin/in-°F	
	@Temperature 20.0 - 427 °C	@Temperature 68.0 - 801 °F	
	13.3 µm/m-°C	7.39 µin/in-°F	
	@Temperature 20.0 - 538 °C	@Temperature 68.0 - 1000 °F	

Thermal Properties	Metric $\text{m}^2/\text{m}^2\text{-}^\circ\text{C}$	English $\text{in}^2/\text{in}^2\text{-}^\circ\text{F}$	Comments
	@Temperature 20.0 - 760 $^\circ\text{C}$	@Temperature 68.0 - 1400 $^\circ\text{F}$	
	14.9 $\mu\text{m}/\text{m}^2\text{-}^\circ\text{C}$	8.28 $\mu\text{in}/\text{in}^2\text{-}^\circ\text{F}$	
	@Temperature 20.0 - 871 $^\circ\text{C}$	@Temperature 68.0 - 1600 $^\circ\text{F}$	
	15.5 $\mu\text{m}/\text{m}^2\text{-}^\circ\text{C}$	8.61 $\mu\text{in}/\text{in}^2\text{-}^\circ\text{F}$	
	@Temperature 20.0 - 982 $^\circ\text{C}$	@Temperature 68.0 - 1800 $^\circ\text{F}$	
	16.0 $\mu\text{m}/\text{m}^2\text{-}^\circ\text{C}$	8.89 $\mu\text{in}/\text{in}^2\text{-}^\circ\text{F}$	
	@Temperature 20.0 - 1093 $^\circ\text{C}$	@Temperature 68.0 - 1999 $^\circ\text{F}$	
Specific Heat Capacity	0.398 J/g- $^\circ\text{C}$	0.0951 BTU/lb- $^\circ\text{F}$	
	@Temperature 0.000 $^\circ\text{C}$	@Temperature 32.0 $^\circ\text{F}$	
	0.414 J/g- $^\circ\text{C}$	0.0989 BTU/lb- $^\circ\text{F}$	
	@Temperature 50.0 $^\circ\text{C}$	@Temperature 122 $^\circ\text{F}$	
	0.440 J/g- $^\circ\text{C}$	0.105 BTU/lb- $^\circ\text{F}$	
	@Temperature 150 $^\circ\text{C}$	@Temperature 302 $^\circ\text{F}$	
	0.456 J/g- $^\circ\text{C}$	0.109 BTU/lb- $^\circ\text{F}$	
	@Temperature 250 $^\circ\text{C}$	@Temperature 482 $^\circ\text{F}$	
	0.473 J/g- $^\circ\text{C}$	0.113 BTU/lb- $^\circ\text{F}$	
	@Temperature 350 $^\circ\text{C}$	@Temperature 662 $^\circ\text{F}$	
	0.481 J/g- $^\circ\text{C}$	0.115 BTU/lb- $^\circ\text{F}$	
	@Temperature 450 $^\circ\text{C}$	@Temperature 842 $^\circ\text{F}$	
	0.494 J/g- $^\circ\text{C}$	0.118 BTU/lb- $^\circ\text{F}$	
	@Temperature 550 $^\circ\text{C}$	@Temperature 1020 $^\circ\text{F}$	
	0.502 J/g- $^\circ\text{C}$	0.120 BTU/lb- $^\circ\text{F}$	
	@Temperature 650 $^\circ\text{C}$	@Temperature 1200 $^\circ\text{F}$	
	0.590 J/g- $^\circ\text{C}$	0.141 BTU/lb- $^\circ\text{F}$	
	@Temperature 800 $^\circ\text{C}$	@Temperature 1470 $^\circ\text{F}$	
	0.594 J/g- $^\circ\text{C}$	0.142 BTU/lb- $^\circ\text{F}$	
	@Temperature 850 $^\circ\text{C}$	@Temperature 1560 $^\circ\text{F}$	
	0.594 J/g- $^\circ\text{C}$	0.142 BTU/lb- $^\circ\text{F}$	

Thermal Properties	Metric @ Temperature 900 °C	English @ Temperature 1650 °F	Comments
	0.594 J/g-°C	0.142 BTU/lb-°F	
	@Temperature 700 °C	@Temperature 1290 °F	
	0.594 J/g-°C	0.142 BTU/lb-°F	
	@Temperature 750 °C	@Temperature 1380 °F	
	0.598 J/g-°C	0.143 BTU/lb-°F	
	@Temperature 950 °C	@Temperature 1740 °F	
	0.598 J/g-°C	0.143 BTU/lb-°F	
	@Temperature 1000 °C	@Temperature 1830 °F	
	0.598 J/g-°C	0.143 BTU/lb-°F	
	@Temperature 1050 °C	@Temperature 1920 °F	
	0.603 J/g-°C	0.144 BTU/lb-°F	
	@Temperature 1100 °C	@Temperature 2010 °F	
Thermal Conductivity	14.0 W/m-K	97.2 BTU-in/hr-ft²-°F	
	@Temperature 200 °C	@Temperature 392 °F	
	16.1 W/m-K	112 BTU-in/hr-ft²-°F	
	@Temperature 300 °C	@Temperature 572 °F	
	17.9 W/m-K	124 BTU-in/hr-ft²-°F	
	@Temperature 400 °C	@Temperature 752 °F	
	19.5 W/m-K	135 BTU-in/hr-ft²-°F	
	@Temperature 500 °C	@Temperature 932 °F	
	21.0 W/m-K	146 BTU-in/hr-ft²-°F	
	@Temperature 600 °C	@Temperature 1110 °F	
	26.1 W/m-K	181 BTU-in/hr-ft²-°F	
	@Temperature 700 °C	@Temperature 1290 °F	
	26.1 W/m-K	181 BTU-in/hr-ft²-°F	
	@Temperature 800 °C	@Temperature 1470 °F	
	26.1 W/m-K	181 BTU-in/hr-ft²-°F	
	@Temperature 900 °C	@Temperature 1650 °F	
	27.1 W/m-K	188 BTU-in/hr-ft²-°F	
	@Temperature 950 °C	@Temperature 1740 °F	

Thermal Properties	Metric 28.0 W/m-K	English 100 BTU-in/hr-ft²-°F	Comments
	@Temperature 1000 °C	@Temperature 1830 °F	
Melting Point	1335 - 1380 °C	2435 - 2520 °F	
Solidus	1335 °C	2435 °F	
Liquidus	1380 °C	2520 °F	
Maximum Service Temperature, Air	1093 °C	1999 °F	

Component Elements Properties	Metric	English	Comments
Aluminum, Al	0.10 - 0.50 %	0.10 - 0.50 %	
Boron, B	<= 0.015 %	<= 0.015 %	
Carbon, C	<= 0.020 %	<= 0.020 %	
Chromium, Cr	14.5 - 17 %	14.5 - 17 %	
Cobalt, Co	<= 2.0 %	<= 2.0 %	
Copper, Cu	<= 0.35 %	<= 0.35 %	
Iron, Fe	<= 3.0 %	<= 3.0 %	
Lanthanum, La	0.010 - 0.10 %	0.010 - 0.10 %	
Manganese, Mn	0.30 - 1.0 %	0.30 - 1.0 %	
Molybdenum, Mo	14 - 16.5 %	14 - 16.5 %	
Nickel, Ni	67 %	67 %	

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.000128 ohm-cm @Temperature 25.0 °C	0.000128 ohm-cm @Temperature 77.0 °F	specimen aged 16000 hours at 650°C (1200°F)

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