

## Haynes 230® alloy, 50% cold reduction, 1177°C anneal for 5 minutes

Category : Metal , Nonferrous Metal , Nickel Alloy , Superalloy

### Material Notes:

Excellent high-temperature strength, outstanding resistance to oxidizing environments up to 1149°C, premier resistance to nitriding environments, and excellent long-term thermal stability. Applications include combustion cans, transition ducts, flameholders, thermocouple sheaths and other gas turbine components; used for catalyst grid supports in ammonia burners, high-strength thermocouple protection tubes, high-temperature heat exchangers, ducts, high-temperature bellows; furnace retorts, chains and fixtures, burner flame shrouds, recuperator internals, dampers, nitriding furnace internals, heat-treating baskets, grates, trays, sparger tubes, and cyclone internals. Data provided by the manufacturer, Haynes International, Inc.

Order this product through the following link:

[http://www.lookpolymers.com/polymer\\_Haynes-230-alloy-50-cold-reduction-1177C-anneal-for-5-minutes.php](http://www.lookpolymers.com/polymer_Haynes-230-alloy-50-cold-reduction-1177C-anneal-for-5-minutes.php)

Physical Properties	Metric	English	Comments
Density	8.97 g/cc	0.324 lb/in <sup>3</sup>	at RT

Mechanical Properties	Metric	English	Comments
Tensile Strength, Ultimate	950 MPa	138000 psi	
Tensile Strength, Yield	495 MPa @Strain 0.200 %	71800 psi @Strain 0.200 %	
Elongation at Break	39.1 %	39.1 %	in 50.8 mm
Modulus of Elasticity	211 GPa	30600 ksi	RT
	150 GPa @Temperature 1000 °C	21800 ksi @Temperature 1830 °F	
	157 GPa @Temperature 900 °C	22800 ksi @Temperature 1650 °F	
	164 GPa @Temperature 800 °C	23800 ksi @Temperature 1470 °F	
	171 GPa @Temperature 700 °C	24800 ksi @Temperature 1290 °F	
	177 GPa @Temperature 600 °C	25700 ksi @Temperature 1110 °F	
	184 GPa @Temperature 500 °C	26700 ksi @Temperature 932 °F	

Mechanical Properties	190 GPa Metric	27600 ksi English	Comments
	@Temperature 400 °C	@Temperature 752 °F	
	196 GPa	28400 ksi	
	@Temperature 300 °C	@Temperature 572 °F	
	202 GPa	29300 ksi	
	@Temperature 200 °C	@Temperature 392 °F	
	207 GPa	30000 ksi	
	@Temperature 100 °C	@Temperature 212 °F	
Charpy Impact	73.0 J	53.8 ft-lb	solution annealed (unknown temp)

Thermal Properties	Metric	English	Comments
CTE, linear	12.7 $\mu\text{m}/\text{m}\cdot\text{°C}$	7.06 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 25.0 - 100 °C	@Temperature 77.0 - 212 °F	
	13.0 $\mu\text{m}/\text{m}\cdot\text{°C}$	7.22 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 25.0 - 200 °C	@Temperature 77.0 - 392 °F	
	13.3 $\mu\text{m}/\text{m}\cdot\text{°C}$	7.39 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 25.0 - 300 °C	@Temperature 77.0 - 572 °F	
	13.7 $\mu\text{m}/\text{m}\cdot\text{°C}$	7.61 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 25.0 - 400 °C	@Temperature 77.0 - 752 °F	
	14.0 $\mu\text{m}/\text{m}\cdot\text{°C}$	7.78 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 25.0 - 500 °C	@Temperature 77.0 - 932 °F	
	14.4 $\mu\text{m}/\text{m}\cdot\text{°C}$	8.00 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 25.0 - 600 °C	@Temperature 77.0 - 1110 °F	
	14.8 $\mu\text{m}/\text{m}\cdot\text{°C}$	8.22 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 25.0 - 700 °C	@Temperature 77.0 - 1290 °F	
	15.2 $\mu\text{m}/\text{m}\cdot\text{°C}$	8.44 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 25.0 - 800 °C	@Temperature 77.0 - 1470 °F	
	15.7 $\mu\text{m}/\text{m}\cdot\text{°C}$	8.72 $\mu\text{in}/\text{in}\cdot\text{°F}$	

Thermal Properties	Metric	English	Comments
	@ Temperature 25.0 - 900 °C	@ Temperature 77.0 - 1650 °F	
	16.1 μm/m-°C	8.94 μin/in-°F	
	@Temperature 25.0 - 1000 °C	@Temperature 77.0 - 1830 °F	
Specific Heat Capacity	0.397 J/g-°C	0.0949 BTU/lb-°F	RT
	0.419 J/g-°C	0.100 BTU/lb-°F	
	@Temperature 100 °C	@Temperature 212 °F	
	0.435 J/g-°C	0.104 BTU/lb-°F	
	@Temperature 200 °C	@Temperature 392 °F	
	0.448 J/g-°C	0.107 BTU/lb-°F	
	@Temperature 300 °C	@Temperature 572 °F	
	0.465 J/g-°C	0.111 BTU/lb-°F	
	@Temperature 400 °C	@Temperature 752 °F	
	0.473 J/g-°C	0.113 BTU/lb-°F	
	@Temperature 500 °C	@Temperature 932 °F	
	0.486 J/g-°C	0.116 BTU/lb-°F	
	@Temperature 600 °C	@Temperature 1110 °F	
	0.574 J/g-°C	0.137 BTU/lb-°F	
	@Temperature 700 °C	@Temperature 1290 °F	
	0.595 J/g-°C	0.142 BTU/lb-°F	
	@Temperature 800 °C	@Temperature 1470 °F	
	0.609 J/g-°C	0.146 BTU/lb-°F	
	@Temperature 900 °C	@Temperature 1650 °F	
	0.617 J/g-°C	0.147 BTU/lb-°F	
	@Temperature 1000 °C	@Temperature 1830 °F	
Thermal Conductivity	8.90 W/m-K	61.8 BTU-in/hr-ft <sup>2</sup> -°F	RT
	10.4 W/m-K	72.2 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 100 °C	@Temperature 212 °F	
	12.4 W/m-K	86.1 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 200 °C	@Temperature 392 °F	

Thermal Properties	Metric	English	Comments
	@Temperature 300 °C	@Temperature 572 °F	
	16.4 W/m-K	114 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 400 °C	@Temperature 752 °F	
	18.4 W/m-K	128 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 500 °C	@Temperature 932 °F	
	20.4 W/m-K	142 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 600 °C	@Temperature 1110 °F	
	22.4 W/m-K	155 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 700 °C	@Temperature 1290 °F	
	24.4 W/m-K	169 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 800 °C	@Temperature 1470 °F	
	26.4 W/m-K	183 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 900 °C	@Temperature 1650 °F	
	28.4 W/m-K	197 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 1000 °C	@Temperature 1830 °F	
Melting Point	1301 - 1371 °C	2374 - 2500 °F	
Solidus	1301 °C	2374 °F	
Liquidus	1371 °C	2500 °F	

Component Elements Properties	Metric	English	Comments
Aluminum, Al	0.30 %	0.30 %	
Boron, B	<= 0.015 %	<= 0.015 %	
Carbon, C	0.10 %	0.10 %	
Chromium, Cr	22 %	22 %	
Cobalt, Co	<= 5.0 %	<= 5.0 %	
Iron, Fe	<= 3.0 %	<= 3.0 %	
Lanthanum, La	0.020 %	0.020 %	

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.000125 ohm-cm	0.000125 ohm-cm	RT

Electrical Properties	0.000125 ohm-cm Metric	0.000125 ohm-cm English	Comments
	@Temperature 1000 °C	@Temperature 1830 °F	
	0.0001258 ohm-cm	0.0001258 ohm-cm	
	@Temperature 100 °C	@Temperature 212 °F	
	0.0001265 ohm-cm	0.0001265 ohm-cm	
	@Temperature 200 °C	@Temperature 392 °F	
	0.0001271 ohm-cm	0.0001271 ohm-cm	
	@Temperature 900 °C	@Temperature 1650 °F	
	0.0001273 ohm-cm	0.0001273 ohm-cm	
	@Temperature 300 °C	@Temperature 572 °F	
	0.0001284 ohm-cm	0.0001284 ohm-cm	
	@Temperature 400 °C	@Temperature 752 °F	
	0.0001291 ohm-cm	0.0001291 ohm-cm	
	@Temperature 800 °C	@Temperature 1470 °F	
	0.0001302 ohm-cm	0.0001302 ohm-cm	
	@Temperature 500 °C	@Temperature 932 °F	
	0.0001307 ohm-cm	0.0001307 ohm-cm	
	@Temperature 700 °C	@Temperature 1290 °F	
	0.0001312 ohm-cm	0.0001312 ohm-cm	
	@Temperature 600 °C	@Temperature 1110 °F	

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