

## Haynes 230® alloy, 40% cold reduction

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-40-cold-reduction.php](http://www.lookpolymers.com/polymer_Haynes-230-alloy-40-cold-reduction.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	1390 MPa	202000 psi	
Tensile Strength, Yield	1190 MPa @Strain 0.200 %	173000 psi @Strain 0.200 %	
Elongation at Break	7.5 %	7.5 %	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	

Mechanical Properties	Metric	English	Comments
	184 GPa	26700 ksi	
	@Temperature 500 Å°C	@Temperature 932 Å°F	
	190 GPa	27600 ksi	
	@Temperature 400 Å°C	@Temperature 752 Å°F	
	196 GPa	28400 ksi	
	@Temperature 300 Å°C	@Temperature 572 Å°F	
	202 GPa	29300 ksi	
	@Temperature 200 Å°C	@Temperature 392 Å°F	
	207 GPa	30000 ksi	
	@Temperature 100 Å°C	@Temperature 212 Å°F	

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

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

Thermal Properties	Metric	English	Comments
	12.4 W/m-K @Temperature 100 Â°C	86.1 BTU-in/hr-ftÂ²-Â°F @Temperature 212 Â°F	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	14.4 W/m-K @Temperature 300 Â°C	99.9 BTU-in/hr-ftÂ²-Â°F @Temperature 572 Â°F	
	16.4 W/m-K @Temperature 400 Â°C	114 BTU-in/hr-ftÂ²-Â°F @Temperature 752 Â°F	
	18.4 W/m-K @Temperature 500 Â°C	128 BTU-in/hr-ftÂ²-Â°F @Temperature 932 Â°F	
	20.4 W/m-K @Temperature 600 Â°C	142 BTU-in/hr-ftÂ²-Â°F @Temperature 1110 Â°F	
	22.4 W/m-K @Temperature 700 Â°C	155 BTU-in/hr-ftÂ²-Â°F @Temperature 1290 Â°F	
	24.4 W/m-K @Temperature 800 Â°C	169 BTU-in/hr-ftÂ²-Â°F @Temperature 1470 Â°F	
	26.4 W/m-K @Temperature 900 Â°C	183 BTU-in/hr-ftÂ²-Â°F @Temperature 1650 Â°F	
	28.4 W/m-K @Temperature 1000 Â°C	197 BTU-in/hr-ftÂ²-Â°F @Temperature 1830 Â°F	
Melting Point	1301 - 1371 Â°C	2374 - 2500 Â°F	
Solidus	1301 Â°C	2374 Â°F	
Liquidus	1371 Â°C	2500 Â°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 Component Elements Properties	22 % Metric	22 % English	Comments
Cobalt, Co	<= 5.0 %	<= 5.0 %	
Iron, Fe	<= 3.0 %	<= 3.0 %	
Lanthanum, La	0.020 %	0.020 %	
Manganese, Mn	0.50 %	0.50 %	

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

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