

## Haynes 230<sup>®</sup> alloy, 40% cold reduction, 1177<sup>°</sup>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<sup>°</sup>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-1177C-anneal-for-5-minutes.php](http://www.lookpolymers.com/polymer_Haynes-230-alloy-40-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	960 MPa	139000 psi	
Tensile Strength, Yield	505 MPa @Strain 0.200 %	73200 psi @Strain 0.200 %	
Elongation at Break	38.1 %	38.1 %	in 50.8 mm
Modulus of Elasticity	211 GPa	30600 ksi	RT
	150 GPa @Temperature 1000 <sup>°</sup> C	21800 ksi @Temperature 1830 <sup>°</sup> F	
	157 GPa @Temperature 900 <sup>°</sup> C	22800 ksi @Temperature 1650 <sup>°</sup> F	
	164 GPa @Temperature 800 <sup>°</sup> C	23800 ksi @Temperature 1470 <sup>°</sup> F	
	171 GPa @Temperature 700 <sup>°</sup> C	24800 ksi @Temperature 1290 <sup>°</sup> F	
	177 GPa @Temperature 600 <sup>°</sup> C	25700 ksi @Temperature 1110 <sup>°</sup> F	

Mechanical Properties	Metric	English	Comments
	184 GPa	26700 ksi	
	@Temperature 500 Â°C	@Temperature 932 Â°F	
	190 GPa	27600 ksi	
	@Temperature 400 Â°C	@Temperature 752 Â°F	
	196 GPa	28400 ksi	
	@Temperature 300 Â°C	@Temperature 572 Â°F	
	202 GPa	29300 ksi	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	207 GPa	30000 ksi	
	@Temperature 100 Â°C	@Temperature 212 Â°F	
Charpy Impact	73.0 J	53.8 ft-lb	solution annealed (unknown temp)

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

Thermal Properties	Metric @Temperature 25.0 - 900 Å°C	English @Temperature 77.0 - 1650 Å°F	Comments
	15.7 Åµm/m-Å°C	8.72 Åµin/in-Å°F	
	@Temperature 25.0 - 900 Å°C	@Temperature 77.0 - 1650 Å°F	
	16.1 Åµm/m-Å°C	8.94 Åµin/in-Å°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-ftÅ²- Å°F	RT

Thermal Properties	Metric	English	Comments
	10.4 W/m-K @Temperature 100 Å°C	U-in/hr-ftÅ²-Å°F @Temperature 212 Å°F	
	12.4 W/m-K @Temperature 200 Å°C	86.1 BTU-in/hr-ftÅ²-Å°F @Temperature 392 Å°F	
	14.4 W/m-K @Temperature 300 Å°C	99.9 BTU-in/hr-ftÅ²-Å°F @Temperature 572 Å°F	
	16.4 W/m-K @Temperature 400 Å°C	114 BTU-in/hr-ftÅ²-Å°F @Temperature 752 Å°F	
	18.4 W/m-K @Temperature 500 Å°C	128 BTU-in/hr-ftÅ²-Å°F @Temperature 932 Å°F	
	20.4 W/m-K @Temperature 600 Å°C	142 BTU-in/hr-ftÅ²-Å°F @Temperature 1110 Å°F	
	22.4 W/m-K @Temperature 700 Å°C	155 BTU-in/hr-ftÅ²-Å°F @Temperature 1290 Å°F	
	24.4 W/m-K @Temperature 800 Å°C	169 BTU-in/hr-ftÅ²-Å°F @Temperature 1470 Å°F	
	26.4 W/m-K @Temperature 900 Å°C	183 BTU-in/hr-ftÅ²-Å°F @Temperature 1650 Å°F	
	28.4 W/m-K @Temperature 1000 Å°C	197 BTU-in/hr-ftÅ²-Å°F @Temperature 1830 Å°F	
Melting Point	1301 - 1371 Å°C	2374 - 2500 Å°F	
Solidus	1301 Å°C	2374 Å°F	
Liquidus	1371 Å°C	2500 Å°F	

Component Elements Properties	Metric	English	Comments
Aluminum, Al	0.30 %	0.30 %	
Boron, B	<= 0.015 %	<= 0.015 %	

Component Elements Properties	Metric	English	Comments
Chromium, Cr	22 %	22 %	
Cobalt, Co	<= 5.0 %	<= 5.0 %	
Iron, Fe	<= 3.0 %	<= 3.0 %	

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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