

## Haynes 188 alloy, 10% cold reduction, 3.2 mm thick sheet, 1175°C for 5 minutes

Category : Metal , Nonferrous Metal , Cobalt Alloy , Superalloy

### Material Notes:

Excellent high temperature strength and very good resistance to oxidizing environments up to 1095°C for prolonged exposure, and excellent resistance to sulfate deposit hot corrosion. Readily fabricated and formed, excellent resistance to molten chloride salts, and good resistance to gaseous sulfidation. Applications include a variety of fabricated component applications in the aerospace industry, commercial gas turbine engines for combustion cans, transition ducts and afterburner components. Data provided by the manufacturer, Haynes International, Inc.

Order this product through the following link:

[http://www.lookpolymers.com/polymer\\_Haynes-188-alloy-10-cold-reduction-32-mm-thick-sheet-1175C-for-5-minutes.php](http://www.lookpolymers.com/polymer_Haynes-188-alloy-10-cold-reduction-32-mm-thick-sheet-1175C-for-5-minutes.php)

Physical Properties	Metric	English	Comments
Density	8.98 g/cc	0.324 lb/in <sup>3</sup>	at RT.

Mechanical Properties	Metric	English	Comments
Hardness, Brinell	164	164	Converted from Rockwell B hardness.
Hardness, Knoop	182	182	Converted from Rockwell B hardness.
Hardness, Rockwell B	95.6	95.6	
Hardness, Vickers	223	223	Converted from Rockwell B hardness.
Tensile Strength, Ultimate	965 MPa	140000 psi	
Tensile Strength, Yield	425 MPa @Strain 0.200 %	61600 psi @Strain 0.200 %	
Elongation at Break	55.3 %	55.3 %	in 51 mm
Modulus of Elasticity	232 GPa	33600 ksi	RT
	153 GPa @Temperature 1000 °C	22200 ksi @Temperature 1830 °F	
	161 GPa @Temperature 900 °C	23400 ksi @Temperature 1650 °F	
	169 GPa @Temperature 800 °C	24500 ksi @Temperature 1470 °F	

Mechanical Properties	Metric	English	Comments
	@Temperature 700 Â°C	@Temperature 1290 Â°F	
	176 GPa	25500 ksi	
	@Temperature 600 Â°C	@Temperature 1110 Â°F	
	193 GPa	28000 ksi	
	@Temperature 500 Â°C	@Temperature 932 Â°F	
	201 GPa	29200 ksi	
	@Temperature 400 Â°C	@Temperature 752 Â°F	
	209 GPa	30300 ksi	
	@Temperature 300 Â°C	@Temperature 572 Â°F	
	217 GPa	31500 ksi	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	225 GPa	32600 ksi	
	@Temperature 100 Â°C	@Temperature 212 Â°F	

Thermal Properties	Metric	English	Comments
CTE, linear	11.9 Âµm/m-Â°C	6.61 Âµin/in-Â°F	
	@Temperature 25.0 - 100 Â°C	@Temperature 77.0 - 212 Â°F	
	12.6 Âµm/m-Â°C	7.00 Âµin/in-Â°F	
	@Temperature 25.0 - 200 Â°C	@Temperature 77.0 - 392 Â°F	
	13.2 Âµm/m-Â°C	7.33 Âµin/in-Â°F	
	@Temperature 25.0 - 300 Â°C	@Temperature 77.0 - 572 Â°F	
	13.8 Âµm/m-Â°C	7.67 Âµin/in-Â°F	
	@Temperature 25.0 - 400 Â°C	@Temperature 77.0 - 752 Â°F	
	14.5 Âµm/m-Â°C	8.06 Âµin/in-Â°F	
	@Temperature 25.0 - 500 Â°C	@Temperature 77.0 - 932 Â°F	
	15.2 Âµm/m-Â°C	8.44 Âµin/in-Â°F	
	@Temperature 25.0 - 600 Â°C	@Temperature 77.0 - 1110 Â°F	

Thermal Properties	Metric $\mu\text{m}/\text{m}\cdot\text{Å}^\circ\text{C}$	English $\mu\text{in}/\text{in}\cdot\text{Å}^\circ\text{F}$	Comments
	@Temperature 25.0 - 700 Å°C	@Temperature 77.0 - 1290 Å°F	
	16.5 Å $\mu\text{m}/\text{m}\cdot\text{Å}^\circ\text{C}$	9.17 Å $\mu\text{in}/\text{in}\cdot\text{Å}^\circ\text{F}$	
	@Temperature 25.0 - 800 Å°C	@Temperature 77.0 - 1470 Å°F	
	17.1 Å $\mu\text{m}/\text{m}\cdot\text{Å}^\circ\text{C}$	9.50 Å $\mu\text{in}/\text{in}\cdot\text{Å}^\circ\text{F}$	
	@Temperature 25.0 - 800 Å°C	@Temperature 77.0 - 1470 Å°F	
	17.9 Å $\mu\text{m}/\text{m}\cdot\text{Å}^\circ\text{C}$	9.94 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	0.403 J/g-Å°C	0.0963 BTU/lb-Å°F	RT
	0.423 J/g-Å°C	0.101 BTU/lb-Å°F	
	@Temperature 100 Å°C	@Temperature 212 Å°F	
	0.444 J/g-Å°C	0.106 BTU/lb-Å°F	
	@Temperature 200 Å°C	@Temperature 392 Å°F	
	0.465 J/g-Å°C	0.111 BTU/lb-Å°F	
	@Temperature 300 Å°C	@Temperature 572 Å°F	
	0.486 J/g-Å°C	0.116 BTU/lb-Å°F	
	@Temperature 400 Å°C	@Temperature 752 Å°F	
	0.502 J/g-Å°C	0.120 BTU/lb-Å°F	
	@Temperature 500 Å°C	@Temperature 932 Å°F	
	0.523 J/g-Å°C	0.125 BTU/lb-Å°F	
	@Temperature 600 Å°C	@Temperature 1110 Å°F	
	0.540 J/g-Å°C	0.129 BTU/lb-Å°F	
	@Temperature 700 Å°C	@Temperature 1290 Å°F	
	0.557 J/g-Å°C	0.133 BTU/lb-Å°F	
	@Temperature 800 Å°C	@Temperature 1470 Å°F	
	0.573 J/g-Å°C	0.137 BTU/lb-Å°F	
	@Temperature 900 Å°C	@Temperature 1650 Å°F	

Thermal Properties	0.590 J/g-Å°C Metric	0.141 BTU/lb-Å°F English	Comments
	@Temperature 1000 Å°C	@Temperature 1830 Å°F	
Thermal Conductivity	10.4 W/m-K	72.2 BTU-in/hr-ftÅ²-Å°F	RT
	12.2 W/m-K @Temperature 100 Å°C	84.7 BTU-in/hr-ftÅ²-Å°F @Temperature 212 Å°F	
	14.3 W/m-K @Temperature 200 Å°C	99.2 BTU-in/hr-ftÅ²-Å°F @Temperature 392 Å°F	
	15.9 W/m-K @Temperature 300 Å°C	110 BTU-in/hr-ftÅ²-Å°F @Temperature 572 Å°F	
	17.5 W/m-K @Temperature 400 Å°C	121 BTU-in/hr-ftÅ²-Å°F @Temperature 752 Å°F	
	19.3 W/m-K @Temperature 500 Å°C	134 BTU-in/hr-ftÅ²-Å°F @Temperature 932 Å°F	
	21.1 W/m-K @Temperature 600 Å°C	146 BTU-in/hr-ftÅ²-Å°F @Temperature 1110 Å°F	
	23.0 W/m-K @Temperature 700 Å°C	160 BTU-in/hr-ftÅ²-Å°F @Temperature 1290 Å°F	
	24.8 W/m-K @Temperature 800 Å°C	172 BTU-in/hr-ftÅ²-Å°F @Temperature 1470 Å°F	
	25.5 W/m-K @Temperature 900 Å°C	177 BTU-in/hr-ftÅ²-Å°F @Temperature 1650 Å°F	
	27.6 W/m-K @Temperature 1000 Å°C	192 BTU-in/hr-ftÅ²-Å°F @Temperature 1830 Å°F	
Melting Point	1315 - 1410 Å°C	2399 - 2570 Å°F	
Solidus	1315 Å°C	2399 Å°F	
Liquidus	1410 Å°C	2570 Å°F	
	1095 Å°C	2003 Å°F	

Maximum Service Temperature, Air			
Thermal Properties	Metric	English	Comments
<b>Component Elements Properties</b>	<b>Metric</b>	<b>English</b>	<b>Comments</b>
Boron, B	<= 0.015 %	<= 0.015 %	
Carbon, C	0.050 - 0.15 %	0.050 - 0.15 %	

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.000101 ohm-cm	0.000101 ohm-cm	RT
	0.000103 ohm-cm	0.000103 ohm-cm	
	@Temperature 100 Â°C	@Temperature 212 Â°F	
	0.000105 ohm-cm	0.000105 ohm-cm	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	0.0001077 ohm-cm	0.0001077 ohm-cm	
	@Temperature 300 Â°C	@Temperature 572 Â°F	
	0.0001105 ohm-cm	0.0001105 ohm-cm	
	@Temperature 400 Â°C	@Temperature 752 Â°F	
	0.0001127 ohm-cm	0.0001127 ohm-cm	
	@Temperature 500 Â°C	@Temperature 932 Â°F	
	0.0001148 ohm-cm	0.0001148 ohm-cm	
	@Temperature 600 Â°C	@Temperature 1110 Â°F	
	0.0001164 ohm-cm	0.0001164 ohm-cm	
	@Temperature 700 Â°C	@Temperature 1290 Â°F	
	0.0001175 ohm-cm	0.0001175 ohm-cm	
	@Temperature 800 Â°C	@Temperature 1470 Â°F	
	0.0001183 ohm-cm	0.0001183 ohm-cm	
	@Temperature 900 Â°C	@Temperature 1650 Â°F	
	0.0001191 ohm-cm	0.0001191 ohm-cm	
	@Temperature 1000 Â°C	@Temperature 1830 Â°F	

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