

## Haynes 188 alloy, plate at RT after 16000 hours at 870Â°C (1600Â°F)

Category : Metal , Nonferrous Metal , Cobalt Alloy , Superalloy

### Material Notes:

Excellent high temperature strength and very good resistance to oxidizing environments up to 1095Â°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.

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[http://www.lookpolymers.com/polymer\\_Haynes-188-alloy-plate-at-RT-after-16000-hours-at-870C-1600F.php](http://www.lookpolymers.com/polymer_Haynes-188-alloy-plate-at-RT-after-16000-hours-at-870C-1600F.php)

Physical Properties	Metric	English	Comments
Density	8.98 g/cc	0.324 lb/inÂ³	at RT.

Mechanical Properties	Metric	English	Comments
Tensile Strength, Ultimate	1005 MPa	145800 psi	
Tensile Strength, Yield	440 MPa @Strain 0.200 %	63800 psi @Strain 0.200 %	
Elongation at Break	24 %	24 %	in 51 mm
Modulus of Elasticity	232 GPa	33600 ksi	RT
	153 GPa @Temperature 1000 Â°C	22200 ksi @Temperature 1830 Â°F	
	161 GPa @Temperature 900 Â°C	23400 ksi @Temperature 1650 Â°F	
	169 GPa @Temperature 800 Â°C	24500 ksi @Temperature 1470 Â°F	
	176 GPa @Temperature 700 Â°C	25500 ksi @Temperature 1290 Â°F	
	184 GPa @Temperature 600 Â°C	26700 ksi @Temperature 1110 Â°F	
	193 GPa	28000 ksi	

Mechanical Properties	Metric	English	Comments
	201 GPa @Temperature 500 Å°C	29200 ksi @Temperature 932 Å°F	
	@Temperature 400 Å°C	@Temperature 752 Å°F	
	209 GPa @Temperature 300 Å°C	30300 ksi @Temperature 572 Å°F	
	217 GPa @Temperature 200 Å°C	31500 ksi @Temperature 392 Å°F	
	225 GPa @Temperature 100 Å°C	32600 ksi @Temperature 212 Å°F	
Charpy Impact	12.0 J	8.85 ft-lb	after 8000 hours at 870Å°C

Thermal Properties	Metric	English	Comments
CTE, linear	11.9 Åµm/m-Å°C @Temperature 25.0 - 100 Å°C	6.61 Åµin/in-Å°F @Temperature 77.0 - 212 Å°F	
	12.6 Åµm/m-Å°C @Temperature 25.0 - 200 Å°C	7.00 Åµin/in-Å°F @Temperature 77.0 - 392 Å°F	
	13.2 Åµm/m-Å°C @Temperature 25.0 - 300 Å°C	7.33 Åµin/in-Å°F @Temperature 77.0 - 572 Å°F	
	13.8 Åµm/m-Å°C @Temperature 25.0 - 400 Å°C	7.67 Åµin/in-Å°F @Temperature 77.0 - 752 Å°F	
	14.5 Åµm/m-Å°C @Temperature 25.0 - 500 Å°C	8.06 Åµin/in-Å°F @Temperature 77.0 - 932 Å°F	
	15.2 Åµm/m-Å°C @Temperature 25.0 - 600 Å°C	8.44 Åµin/in-Å°F @Temperature 77.0 - 1110 Å°F	
	15.8 Åµm/m-Å°C @Temperature 25.0 - 700 Å°C	8.78 Åµin/in-Å°F @Temperature 77.0 - 1290 Å°F	
	16.5 Åµm/m-Å°C @Temperature 25.0 -	9.17 Åµin/in-Å°F @Temperature 77.0 -	

Thermal Properties	800 °C Metric	1470 °F English	Comments
	17.1 Åµm/m-Å°C	9.50 Åµin/in-Å°F	
	@Temperature 25.0 - 800 Å°C	@Temperature 77.0 - 1470 Å°F	
	17.9 Åµm/m-Å°C	9.94 Åµin/in-Å°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	
	0.590 J/g-Å°C	0.141 BTU/lb-Å°F	
	@Temperature 1000 Å°C	@Temperature 1830 Å°F	
Thermal Conductivity	10.4 W/m-K	72.2 BTU-in/hr-ftÅ²-Å°F	RT

Thermal Properties	Metric	English	Comments
	@Temperature 100 Â°C	@Temperature 212 Â°F	
	14.3 W/m-K	99.2 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	15.9 W/m-K	110 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 300 Â°C	@Temperature 572 Â°F	
	17.5 W/m-K	121 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 400 Â°C	@Temperature 752 Â°F	
	19.3 W/m-K	134 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 500 Â°C	@Temperature 932 Â°F	
	21.1 W/m-K	146 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 600 Â°C	@Temperature 1110 Â°F	
	23.0 W/m-K	160 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 700 Â°C	@Temperature 1290 Â°F	
	24.8 W/m-K	172 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 800 Â°C	@Temperature 1470 Â°F	
	25.5 W/m-K	177 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 900 Â°C	@Temperature 1650 Â°F	
	27.6 W/m-K	192 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 1000 Â°C	@Temperature 1830 Â°F	
Melting Point	1315 - 1410 Â°C	2399 - 2570 Â°F	
Solidus	1315 Â°C	2399 Â°F	
Liquidus	1410 Â°C	2570 Â°F	
Maximum Service Temperature, Air	1095 Â°C	2003 Â°F	

Component Elements Properties	Metric	English	Comments
Boron, B	<= 0.015 %	<= 0.015 %	
Carbon, C	0.050 - 0.15 %	0.050 - 0.15 %	

Component Elements Properties	Metric	English	Comments
Cobalt, Co	42 %	42 %	As remainder
Iron, Fe	<= 3.0 %	<= 3.0 %	

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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