Haynes HastelloyÂ® C-4 alloy, all-weld metal, as welded, GTAW

Category : Metal , Nonferrous Metal , Nickel Alloy , Superalloy

Material Notes:

Nickel-chromium-molybdenum alloy with outstanding high-temperature stability as evidenced by high ductility and corrosion resistance even after aging in the 1200 to 1900Â°F (649 to 1038Â°C) range. This alloy resists the formation of grain-boundary precipitates in the weld heat-affected zone, thus making it suitable for most chemical process applications in the as-welded condition. C-4 alloy also has excellent resistance to stress-corrosion cracking and to oxidizing atmospheres up to 1900Â°F (1038Â°C). HASTELLOY C-4 alloy has exceptional resistance to wide variety of chemical process environments. These include hot contaminated mineral acids, solvents, chlorine and chlorine contaminated media (organic and inorganic), dry chlorine, formic and acetic acids, acetic anhydride, and seawater and brine solutions. Laboratory precipitation studies on C-4 alloy indicate that the intermetallic precipitates (Mu phase) associated with other nickel alloys in the 1200 to 2000Â°F (649 to 1093Â°C) temperature range have not been detected. Fine intergranular M6C carbides can form but their damaging effect is minimal.HASTELLOY C-4 alloy can be forged, hot-upset, and impact extruded. Although the alloy tends to work-harden, it can be successfully deep-drawn, spun, press formed or punched. All of the common methods of welding can be used to weld HASTELLOY C-4 alloy, although the oxy-acetylene and submerged arc processes are not recommended when the fabricated item is intended for use in corrosion service. Special precautions should be taken to avoid excessive heat input.Wrought forms of HASTELLOY C-4 alloy are furnished in the solution heat-treated condition unless otherwise specified. C-4 alloy is solution heat-treated at 1950Â°F (1066Â°C) and rapid quenched.Data provided by the manufacturer, Haynes International, Inc.

Order this product through the following link:
http://www.lookpolymers.com/polymer_Haynes-Hastelloy-C-4-alloy-all-weld-metal-as-welded-GTAW.php

Physical Properties	Metric	English	Comments
Density	8.64 g/cc	0.312 lb/inÂ³	at RT

Mechanical Properties	Metric	English	Comments
Tensile Strength, Ultimate	738 MPa	107000 psi	
Tensile Strength, Yield	492 MPa @Strain 0.200 %	71400 psi @Strain 0.200 %	
Elongation at Break	42 %	42 %	in 50.8 mm
Modulus of Elasticity	211 GPa	30600 ksi	RT
	141 GPa @Temperature 982 Â°C	20500 ksi @Temperature 1800 Â°F	
	152 GPa @Temperature 871 Â°C	22000 ksi @Temperature 1600 Â°F	
	162 GPa	23500 ksi	

Mechanical Properties	Metric	English	Comments
	@Temperature 760 Â°C	@Temperature 1400 Â°F	
	171 GPa @Temperature 649 Â°C	24800 ksi @Temperature 1200 Â°F	
	179 GPa @Temperature 538 Â°C	26000 ksi @Temperature 1000 Â°F	
	187 GPa @Temperature 427 Â°C	27100 ksi @Temperature 801 Â°F	
	194 GPa @Temperature 316 Â°C	28100 ksi @Temperature 601 Â°F	
	201 GPa @Temperature 204 Â°C	29200 ksi @Temperature 399 Â°F	
	207 GPa @Temperature 93.0 Â°C	30000 ksi @Temperature 199 Â°F	

Thermal Properties	Metric	English	Comments
CTE, linear	10.8 Âµm/m-Â°C @Temperature 20.0 Â°C	6.00 Âµin/in-Â°F @Temperature 68.0 Â°F	
	11.9 Âµm/m-Â°C @Temperature 20.0 - 204 Â°C	6.61 Âµin/in-Â°F @Temperature 68.0 - 399 Â°F	
	12.6 Âµm/m-Â°C @Temperature 20.0 - 316 Â°C	7.00 Âµin/in-Â°F @Temperature 68.0 - 601 Â°F	
	13.3 Âµm/m-Â°C @Temperature 20.0 - 427 Â°C	7.39 Âµin/in-Â°F @Temperature 68.0 - 801 Â°F	
	13.3 Âµm/m-Â°C @Temperature 20.0 - 538 Â°C	7.39 Âµin/in-Â°F @Temperature 68.0 - 1000 Â°F	
	13.5 Âµm/m-Â°C @Temperature 20.0 - 649 Â°C	7.50 Âµin/in-Â°F @Temperature 68.0 - 1200 Â°F	

Thermal Properties	Metric	English	Comments
	14.4 Âµm/m-Â°C	8.00 Âµin/in-Â°F	
	@Temperature 20.0 - 760 Â°C	@Temperature 68.0 - 1400 Â°F	
	14.9 Âµm/m-Â°C	8.28 Âµin/in-Â°F	
	@Temperature 24.0 - 871 Â°C	@Temperature 75.2 - 1600 Â°F	
	15.7 Âµm/m-Â°C	8.72 Âµin/in-Â°F	
	@Temperature 20.0 - 982 Â°C	@Temperature 68.0 - 1800 Â°F	
Specific Heat Capacity	0.406 J/g-Â°C	0.0970 BTU/lb-Â°F	
	@Temperature 0.000 Â°C	@Temperature 32.0 Â°F	
	0.427 J/g-Â°C	0.102 BTU/lb-Â°F	
	@Temperature 100 Â°C	@Temperature 212 Â°F	
	0.448 J/g-Â°C	0.107 BTU/lb-Â°F	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	0.465 J/g-Â°C	0.111 BTU/lb-Â°F	
	@Temperature 300 Â°C	@Temperature 572 Â°F	
	0.477 J/g-Â°C	0.114 BTU/lb-Â°F	
	@Temperature 400 Â°C	@Temperature 752 Â°F	
	0.490 J/g-Â°C	0.117 BTU/lb-Â°F	
	@Temperature 500 Â°C	@Temperature 932 Â°F	
	0.502 J/g-Â°C	0.120 BTU/lb-Â°F	
	@Temperature 600 Â°C	@Temperature 1110 Â°F	
Thermal Conductivity	10.1 W/m-K	70.1 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 23.0 Â°C	@Temperature 73.4 Â°F	
	11.4 W/m-K	79.1 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 100 Â°C	@Temperature 212 Â°F	
	13.2 W/m-K	91.6 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	15.0 W/m-K	104 BTU-in/hr-ftÂ²-Â°F	

Thermal Properties	Metric	English	Comments
	@Temperature 300 Â°C	@Temperature 572 Â°F	
	16.7 W/m-K	116 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 400 Â°C	@Temperature 752 Â°F	
	18.4 W/m-K	128 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 500 Â°C	@Temperature 932 Â°F	
	20.5 W/m-K	142 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 600 Â°C	@Temperature 1110 Â°F	

Component Elements Properties	Metric	English	Comments
Carbon, C	<= 0.010 %	<= 0.010 %	
Chromium, Cr	14 - 18 %	14 - 18 %	
Cobalt, Co	<= 2.0 %	<= 2.0 %	
Iron, Fe	<= 3.0 %	<= 3.0 %	
Manganese, Mn	<= 1.0 %	<= 1.0 %	
Molybdenum, Mo	14 - 17 %	14 - 17 %	
Nickel, Ni	58 %	58 %	As Remainder
Phosphorous, P	<= 0.025 %	<= 0.025 %	
Silicon, Si	<= 0.080 %	<= 0.080 %	
Sulfur, S	<= 0.010 %	<= 0.010 %	
Titanium, Ti	<= 0.70 %	<= 0.70 %	

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.000125 ohm-cm	0.000125 ohm-cm	
	@Temperature 23.0 Â°C	@Temperature 73.4 Â°F	
	0.000125 ohm-cm	0.000125 ohm-cm	
	@Temperature 100 Â°C	@Temperature 212 Â°F	
	0.000126 ohm-cm	0.000126 ohm-cm	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	0.000127 ohm-cm	0.000127 ohm-cm	

Electrical Properties	Metric	English	Comments
	@Temperature 300 Â°C	@Temperature 572 Â°F	
	0.000128 ohm-cm	0.000128 ohm-cm	
	@Temperature 400 Â°C	@Temperature 752 Â°F	
	0.000129 ohm-cm	0.000129 ohm-cm	
	@Temperature 500 Â°C	@Temperature 932 Â°F	
	0.000132 ohm-cm	0.000132 ohm-cm	
	@Temperature 600 Â°C	@Temperature 1110 Â°F	

Descriptive Properties	Value	Comments
Average Oxidation Rate per 100-hour test period (mm)	0.004	at 1038Â°C
Thermal Diffusivity	0.028 cm^2/s	at 23Â°C
	0.031 cm^2/s	at 100Â°C
	0.033 cm^2/s	at 200Â°C
	0.037 cm^2/s	at 300Â°C
	0.04 cm^2/s	at 400Â°C
	0.043 cm^2/s	at 500Â°C
	0.047 cm^2/s	at 600Â°C

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