

## Haynes Hastelloy® C-22® alloy, 0.71-3.2 mm thick sheet, solution heat treated

Category : Metal , Nonferrous Metal , Nickel Alloy , Superalloy

### Material Notes:

HASTELLOY® C-22® alloy is a nickel-chromium-molybdenum-tungsten alloy with excellent overall corrosion resistance compared to other Ni-Cr-Mo alloys, including HASTELLOY C-276 and C-4 alloys and alloy 625. C-22 alloy has outstanding resistance to pitting, crevice corrosion, and stress corrosion cracking. It has excellent resistance to oxidizing aqueous media including wet chlorine and mixtures containing nitric acid or oxidizing acids with chloride ions. C-22 alloy offers optimum resistance to environments where reducing and oxidizing conditions are encountered in process streams. Because of such versatility it can be used where "upset" conditions are likely to occur or in multi-purpose plants. C-22 alloy has exceptional resistance to a wide variety of chemical process environments, including strong oxidizers such as ferric and cupric chlorides, chlorine, hot contaminated solutions (organic and inorganic), formic and acetic acids, acetic anhydride, and seawater and brine solutions. C-22 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. Product Forms: C-22 alloy is available in most common product forms: plate, sheet, strip, billet, bar, wire, covered electrodes, pipe, and tubing. Applications: Acetic Acid/Acetic Anhydride Acid Etching Cellophane Manufacturing Chlorination Systems Complex Acid Mixtures Electro-Galvanizing Rolls Expansion Bellows Flue Gas Scrubber Systems Geothermal Wells HF Furnace Scrubbers Incineration Scrubber Systems Nuclear Fuel Reprocessing Pesticide Production Phosphoric Acid Production Pickling Systems Plate Heat Exchangers Selective Leaching Systems SO2 Cooling Towers Sulfonation Systems Tubular Heat Exchangers Weld Overlay-Valves Data provided by the manufacturer, Haynes International, Inc.

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[http://www.lookpolymers.com/polymer\\_Haynes-Hastelloy-C-22-alloy-071-32-mm-thick-sheet-solution-heat-treated.php](http://www.lookpolymers.com/polymer_Haynes-Hastelloy-C-22-alloy-071-32-mm-thick-sheet-solution-heat-treated.php)

Physical Properties	Metric	English	Comments
Density	8.69 g/cc	0.314 lb/in <sup>3</sup>	

Mechanical Properties	Metric	English	Comments
Hardness, Rockwell B	93	93	
	@Temperature 23.0 Å°C	@Temperature 73.4 Å°F	
	95	95	
	@Temperature 23.0 Å°C	@Temperature 73.4 Å°F	
Tensile Strength, Ultimate	800 MPa	116000 psi	
	524 MPa	76000 psi	
	@Temperature 760 Å°C	@Temperature 1400 Å°F	
	586 MPa	85000 psi	

Mechanical Properties	@Temperature 649 Â°C Metric	@Temperature 1200 Â°F English	Comments
	627 MPa	90900 psi	
	@Temperature 538 Â°C	@Temperature 1000 Â°F	
	655 MPa	95000 psi	
	@Temperature 427 Â°C	@Temperature 801 Â°F	
	676 MPa	98000 psi	
	@Temperature 316 Â°C	@Temperature 601 Â°F	
	703 MPa	102000 psi	
	@Temperature 204 Â°C	@Temperature 399 Â°F	
	758 MPa	110000 psi	
	@Temperature 93.0 Â°C	@Temperature 199 Â°F	
Tensile Strength, Yield	407 MPa	59000 psi	
	@Strain 0.200 %	@Strain 0.200 %	
	241 MPa	35000 psi	
	@Strain 0.200 %, Temperature 760 Â°C	@Strain 0.200 %, Temperature 1400 Â°F	
	248 MPa	36000 psi	
	@Strain 0.200 %, Temperature 649 Â°C	@Strain 0.200 %, Temperature 1200 Â°F	
	276 MPa	40000 psi	
	@Strain 0.200 %, Temperature 538 Â°C	@Strain 0.200 %, Temperature 1000 Â°F	
	283 MPa	41000 psi	
	@Strain 0.200 %, Temperature 427 Â°C	@Strain 0.200 %, Temperature 801 Â°F	
	290 MPa	42100 psi	
	@Strain 0.200 %, Temperature 316 Â°C	@Strain 0.200 %, Temperature 601 Â°F	
	303 MPa	43900 psi	
	@Strain 0.200 %, Temperature 204 Â°C	@Strain 0.200 %, Temperature 399 Â°F	
	372 MPa	54000 psi	
	@Strain 0.200 %, Temperature 93.0 Â°C	@Strain 0.200 %, Temperature 199 Â°F	

Mechanical Properties	Metric	English	Comments
Elongation at Break	57 %	57 %	in 50.8 mm
	@Temperature 204 Â°C	@Temperature 399 Â°F	
	58 %	58 %	in 50.8 mm
	@Temperature 93.0 Â°C	@Temperature 199 Â°F	
	61 %	61 %	in 50.8 mm
	@Temperature 538 Â°C	@Temperature 1000 Â°F	
	62 %	62 %	in 50.8 mm
	@Temperature 316 Â°C	@Temperature 601 Â°F	
	63 %	63 %	in 50.8 mm
	@Temperature 760 Â°C	@Temperature 1400 Â°F	
	65 %	65 %	in 50.8 mm
	@Temperature 649 Â°C	@Temperature 1200 Â°F	
	67 %	67 %	in 50.8 mm
	@Temperature 427 Â°C	@Temperature 801 Â°F	
Modulus of Elasticity	206 GPa	29900 ksi	heat-treated at 1121Â°C (2050Â°F), rapid quenched, plate
	145 GPa	21000 ksi	heat-treated at 1121Â°C (2050Â°F), rapid quenched, plate
	@Temperature 982 Â°C	@Temperature 1800 Â°F	
	154 GPa	22300 ksi	heat-treated at 1121Â°C (2050Â°F), rapid quenched, plate
	@Temperature 871 Â°C	@Temperature 1600 Â°F	
	163 GPa	23600 ksi	heat-treated at 1121Â°C (2050Â°F), rapid quenched, plate
	@Temperature 760 Â°C	@Temperature 1400 Â°F	
	171 GPa	24800 ksi	heat-treated at 1121Â°C (2050Â°F), rapid quenched, plate
	@Temperature 649 Â°C	@Temperature 1200 Â°F	
	177 GPa	25700 ksi	heat-treated at 1121Â°C (2050Â°F), rapid quenched, plate
	@Temperature 538 Â°C	@Temperature 1000 Â°F	

Mechanical Properties	Metric	English	Comments
	183 GPa @Temperature 427 Â°C	26500 ksi @Temperature 801 Â°F	heat-treated at 1121Â°C (2050Â°F), rapid quenched, plate
	190 GPa @Temperature 316 Â°C	27600 ksi @Temperature 601 Â°F	heat-treated at 1121Â°C (2050Â°F), rapid quenched, plate
	196 GPa @Temperature 204 Â°C	28400 ksi @Temperature 399 Â°F	heat-treated at 1121Â°C (2050Â°F), rapid quenched, plate
	203 GPa @Temperature 93.0 Â°C	29400 ksi @Temperature 199 Â°F	heat-treated at 1121Â°C (2050Â°F), rapid quenched, plate
Charpy Impact	353 J	260 ft-lb	heat treated at 1121Â°C (2050Â°F) then rapid quenched
	351 J @Temperature -196 Â°C	259 ft-lb @Temperature -321 Â°F	heat treated at 1121Â°C (2050Â°F) then rapid quenched

Thermal Properties	Metric	English	Comments
CTE, linear	12.4 Âµm/m-Â°C @Temperature 24.0 - 93.0 Â°C	6.89 Âµin/in-Â°F @Temperature 75.2 - 199 Â°F	
	12.4 Âµm/m-Â°C @Temperature 24.0 - 204 Â°C	6.89 Âµin/in-Â°F @Temperature 75.2 - 399 Â°F	
	12.6 Âµm/m-Â°C @Temperature 24.0 - 316 Â°C	7.00 Âµin/in-Â°F @Temperature 75.2 - 601 Â°F	
	13.3 Âµm/m-Â°C @Temperature 24.0 - 427 Â°C	7.39 Âµin/in-Â°F @Temperature 75.2 - 801 Â°F	
	13.9 Âµm/m-Â°C @Temperature 24.0 - 538 Â°C	7.72 Âµin/in-Â°F @Temperature 75.2 - 1000 Â°F	
	14.6 Âµm/m-Â°C @Temperature 24.0 - 649 Â°C	8.11 Âµin/in-Â°F @Temperature 75.2 - 1200 Â°F	
	15.3 Âµm/m-Â°C @Temperature 24.0 - 760 Â°C	8.50 Âµin/in-Â°F @Temperature 75.2 - 1400 Â°F	

Thermal Properties	Metric	English	Comments
	@Temperature 24.0 - 871 Â°C	@Temperature 75.2 - 1600 Â°F	
	16.2 Âµm/m-Â°C	9.00 Âµin/in-Â°F	
	@Temperature 24.0 - 982 Â°C	@Temperature 75.2 - 1800 Â°F	
Specific Heat Capacity	0.414 J/g-Â°C	0.0989 BTU/lb-Â°F	
	@Temperature 52.0 Â°C	@Temperature 126 Â°F	
	0.423 J/g-Â°C	0.101 BTU/lb-Â°F	
	@Temperature 100 Â°C	@Temperature 212 Â°F	
	0.444 J/g-Â°C	0.106 BTU/lb-Â°F	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	0.460 J/g-Â°C	0.110 BTU/lb-Â°F	
	@Temperature 300 Â°C	@Temperature 572 Â°F	
	0.476 J/g-Â°C	0.114 BTU/lb-Â°F	
	@Temperature 400 Â°C	@Temperature 752 Â°F	
	0.489 J/g-Â°C	0.117 BTU/lb-Â°F	
	@Temperature 500 Â°C	@Temperature 932 Â°F	
	0.514 J/g-Â°C	0.123 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 48.0 Â°C	@Temperature 118 Â°F	
	11.1 W/m-K	77.0 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 100 Â°C	@Temperature 212 Â°F	
	13.4 W/m-K	93.0 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	15.5 W/m-K	108 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	

Thermal Properties	Metric	English	Comments
Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.000114 ohm-cm	0.000114 ohm-cm	
	@Temperature 24.0 Â°C	@Temperature 75.2 Â°F	
	0.000123 ohm-cm	0.000123 ohm-cm	
	@Temperature 100 Â°C	@Temperature 212 Â°F	
	0.000124 ohm-cm	0.000124 ohm-cm	
	@Temperature 200 Â°C	@Temperature 392 Â°F	
	0.000125 ohm-cm	0.000125 ohm-cm	
	@Temperature 300 Â°C	@Temperature 572 Â°F	
	0.000126 ohm-cm	0.000126 ohm-cm	
	@Temperature 400 Â°C	@Temperature 752 Â°F	
	0.000127 ohm-cm	0.000127 ohm-cm	
	@Temperature 500 Â°C	@Temperature 932 Â°F	
	0.000128 ohm-cm	0.000128 ohm-cm	
	@Temperature 600 Â°C	@Temperature 1110 Â°F	

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