Hastelloy C-22 TECHNICAL DATA

Element	Min	Max
Molybdenum	12.5	14.5
Chromium	20.0	22.5
Iron	2.00	6.00
Tungsten	2.50	3.50
Cobalt	--	2.50
Carbon	--	0.010
Silicon	--	0.08
Manganese	--	0.50
Vanadium	--	0.35
Phosphorus	--	0.025
Sulfur	--	0.010
Nickel	Remainder	

Corrosion Resistance in the As-Welded Condition

Hastelloy C-22 is a versatile nickel-chromium-molybdenum alloy with better overall corrosion resistance than other Ni-Cr-Mo alloys available today, including hastelloy C-276, C-4, and A625. Alloy C-22 has outstanding resistance to pitting, crevice corrosion and stress-corrosion cracking. It has excellent resistance to oxidizing aqueous media including acids with oxidizing agents, wet chlorine and mixtures containing nitric acid or oxidizing acids with chlorine ions. Hastelloy C-22 has outstanding resistance to both reducing and oxidizing media, and because of its versatility can be used where "upset" conditions are likely to occur or in multipurpose plants.
Hastelloy C-22 has exceptional resistance to a wide variety of chemical process environments, including strong oxidizers such as ferric and cupric chlorides, hot contaminated media (organic and inorganic), chlorine, formic and acetic acids, acetic anhydride, and seawater amd brine solutions.
Hastelloy C-22 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.

Workability

Hastelloy C-22 can be fabricated using the same techniques as are used for alloys C-276 or C-4. It can be welded, forged, hot-upset and impact extruded. Alloy C-22 can also be successfully deep-drawn, spun, press formed or punched, although the alloy tends to work-harden. Parts which have been hot formed or severely cold formed should be heat treated at 2050 °F and rapid quenched prior to final fabrication or installation.

Specifications

Hastelloy C-22 is covered by ASME . Plate, sheet, strip, bar, tubing, and pipe are covered by ASME specifications SB-574, SB-575, SB-619, SB-622 and SB-626 and by ASTM specifications B-574, B-575, B-619, B-622 and B-626. The UNS number is NO6022.

Applications

Some of the area of present or potential use for alloy C-22 are: Acetic acid/Acetic Anhydride, cellophane manufacturing, chlorine spargers, chlorination systems, circuit board etching equipment, complex acid/chemical mixtures, fans and blowers, galvanizing line equipment, gas scrubber systems, geothermal wells, HF furnaces, incineration systems, nuclear fuel reprocessing, pesticide production, phosphoric acid applications, pickling system components, plate heat exchangers, selective leaching systems, sulfur oxide cooling towers, sulfonation systems, and tubular heat exchangers.

Average Physical Properties

Physical Properties	°F	British Units	°C	Metric Units
Density	75	0.314 lb./in.(3)	24	8.69 g/cm(3)
Melting Range	2475-2550		1357-1399	
Electrical Resistivity	75	44.8 microhm-in.	24	1.14 microhm-m
	212	48.3 microhm-in.	100	1.23 microhm-m
	392	48.7 microhm-in.	200	1.24 microhm-m
	572	49.3 microhm-in.	300	1.25 microhm-m
	752	49.6 microhm-in.	400	1.26 microhm-m
	932	49.9 microhm-in.	500	1.27 microhm-m
	1112	50.2 microhm-in.	600	1.28 microhm-m
Mean Coefficient of Thermal Expansion	75-200	6.9 microin./in.-°F	24-93	12.4 X 10(-6)m/m-K
	75-400	6.9 microin./in.-°F	24-204	12.4 X 10(-6)m/m-K
	75-600	7.0 microin./in.-°F	24-316	12.6 X 10(-6)m/m-K
	75-800	7.4 microin./in.-°F	24-427	13.3 X 10(-6)m/m-K
	75-1000	7.7 microin./in.-°F	24-538	13.9 X 10(-6)m/m-K
	75-1200	8.1 microin./in.-°F	24-649	14.6 X 10(-6)m/m-K
	75-1400	8.5 microin./in.-°F	24-760	15.3 X 10(-6)m/m-K
	75-1600	8.8 microin./in.-°F	24-871	15.8 X 10(-6)m/m-K
	75-1800	9.0 microin./in.-°F	24-982	16.2 X 10(-6)m/m-K

Thermal Conductivity	118	70 Btu-in/ft²-hr-°F	48	10.1 W/m-K
	212	77 Btu-in/ft²-hr-°F	100	11.1 W/m-K
	392	93 Btu-in/ft²-hr-°F	200	13.4 W/m-K
	572	108 Btu-in/ft²-hr-°F	300	15.5 W/m-K
	752	121 Btu-in/ft²-hr-°F	400	17.5 W/m-K
	932	135 Btu-in/ft²-hr-°F	500	19.5 W/m-K
	1112	148 Btu-in/ft²-hr-°F	600	21.3 W/m-K
Thermal Diffusivity	70	0.004 in²/sec	21	2.7 x 10(-6)m²/s
	212	0.005 in²/sec	100	3.0 x 10(-6)m²/s
	392	0.005 in²/sec	200	3.5 x 10(-6)m²/s
	572	0.006 in²/sec	300	3.9 x 10(-6)m²/s
	752	0.007 in²/sec	400	4.2 x 10(-6)m²/s
	932	0.007 in²/sec	500	4.6 x 10(-6)m²/s
	1112	0.007 in²/sec	600	4.8 x 10(-6)m²/s

Average Dynamic Modulus of Elasticity

Form	Condition	Test Temp, °F(°C)	Average Dynamic Modulus of Elasticity,10(6) psi (MPa)
Plate	Heat-treated at 2050 °F (1121 °C), Rapid Quenched	Room	29.9 (206)
		200 (93)	29.4 (203)
		400 (204)	28.5 (196)
		600 (316)	27.6 (190)
		800 (427)	26.6 (183)
		1000 (538)	25.7 (177)
		1200 (649)	24.8 (171)
		1400 (760)	23.6 (163)
		1600 (871)	22.4 (154)
		1800 (982)	21.1 (145)

Average Room Temperature Hardness

Form	Hardness, Rockwell
Sheet	Rb 93
Plate	Rb 95

Average Tensile Data, Solution Heat-Treated

Form	Test Temp., °F(°C)	Ultimate Tensile Strength ksi (MPa)	Yield Strength at 0.2% offset ksi (MPa)	Elongation in 2" percent
Sheet, 0.028-0.125" thick	Room 200 (93) 400 (204) 600 (316) 800 (427) 1000 (538) 1200 (649) 1400 (760)	116.3 (802) 109.5 (755) 101.6 (701) 97.7 (674) 95.4 (658) 90.7 (625) 84.6 (583) 76.0 (524)	58.5 (403) 53.8 (371) 43.9 (303) 41.8 (288) 41.0 (283) 39.7 (274) 36.1 (249) 34.5 (238)	57 58 57 62 67 61 65 63
Plate, 1/4-3/4" thick	Room 200 (93) 400 (204) 600 (316) 800 (427) 1000 (538) 1200 (649) 1400 (760)	113.9 (785) 107.1 (738) 98.1 (676) 94.5 (652) 91.5 (631) 87.5 (603) 83.2 (574) 75.6 (521)	54.1 (373) 48.8 (336) 40.5 (279) 36.3 (250) 34.6 (239) 34.0 (234) 32.1 (221) 31.0 (214)	62 65 66 68 68 67 69 68
Bar, 1/2 to 2" diameter	Room 200 (93) 400 (204) 600 (316) 800 (427) 1000 (538) 1200 (649) 1400 (760)	111.0 (765) 104.9 (723) 96.2 (663) 91.6 (631) 89.1 (614) 84.3 (581) 79.5 (548) 72.2 (498)	51.9 (358) 45.4 (313) 37.5 (259) 33.8 (233) 30.7 (212) 28.8 (199) 28.3 (195) 29.0 (200)	70 73 74 79 79 80 80 77