

HASTELLOY C22

Material & Process Capability

HASTELLOY® C22 is one of the most versatile alloys available today with resistance to both uniform and localized corrosion and a variety of mixed industrial chemicals. It is used in severely corrosive environments with high chloride and high temperature conditions, such as flue-gas scrubbers, nuclear fuel re-processing, sour gas handling, and pesticide productions. It provides superior protection from pitting, crevice attack, and stress corrosion cracking.

The VELO^{3D} intelligent additive printing solution uniquely enables companies to build the parts they need without compromising design or quality - resulting in complex parts higher in performance than traditional casting techniques or other additive methods.

General Process

HASTELLOY® C22 contains chromium, molybdenum, tungsten, and iron, making the alloy resistant to seawater corrosion. It exhibits excellent weldability and is easily fabricated into industrial components. This datasheet specifies the expected mechanical properties and characteristics of this alloy when manufactured on a VELO^{3D} Sapphire® System. All data is based on parts built using VELO^{3D} standard 50 µm layer thickness parameters, using Praxair TruForm C22, a VELO^{3D}-approved powder.

Accuracy, Small Parts	±0.050 (±0.002)	mm (in)
Accuracy, Large Parts	±0.2	percent
Minimum Wall Thickness; up to 500:1 aspect ratio	0.200 (0.008)	mm (in)
Typical Volume Rate ¹	60	cc per hr
Density	8.69 (0.313)	g/cc (lbs/in ³)
Relative Density	99.9+	percent
Surface Finish, Sa ²	6 (240)	µm (µin)
Electrical Conductivity (ASTM E1004-17)	1.4	%IACS
Thermal Conductivity (ASTM E1225-13)	8.9 @ 23C; 15.2 @ 400C	W/mK

Corrosion³

- ASTM G28A: Corrosion rate noted after 24 hrs is 29 mpy
- ASTM G36: No cracking in 48 hrs
- ASTM G48B : No pitting, crevice corrosion or weight loss noted in 48 hrs
- ASTM G150: No pitting or crevice corrosion noted up to 85 C

Mechanical Properties at Room Temperature

Property ⁴	As Printed				After Hot Isostatic Pressing ⁵				
	Without Stress Relief		With Stress Relief ⁶		Without Stress Relief		With Stress Relief ⁶		
	Min	Average	Min	Average	Min	Average	Min	Average	
Modulus of Elasticity	141	176	158	163	173	206	156	160	GPa
Ultimate Tensile Strength	780 (113)	784 (114)	840 (122)	845 (123)	720 (104)	722 (105)	705 (102)	710 (103)	MPa (KSI)
Yield (0.2% Offset)	520 (75.4)	537 (78)	490 (71.1)	493 (71.5)	380 (55.1)	386 (56.0)	420 (60.9)	423 (61.3)	MPa (KSI)
Elongation At Break	34.5	38.3	39.5	41.6	31	43.3	55.5	56.5	percent

1. Geometry-dependent. 2. Depends on orientation and process selected. 3. Results were also obtained for commercially available rolled material and found to be comparable. 4. Mechanical & test samples printed in vertical orientation, machined to ASTM E8 (specimen #3). 5. HIP at 100 MPa, 1120 C ± 15 C, hold for 240 min ± 60 min and cool under inert atmosphere to below 425 C. 6. Stress relief at 1038 C ± 14 C for 45 min and air cool. Mechanical properties were also checked in the following states and verified to be within ASTM B575 specification: Vertical orientation, net shape (not machined) / Horizontal orientation / Horizontal orientation utilizing both lasers (stitch line at gauge region of tensile bar). Note: specifications may change without notice.

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