Preliminary

GRCop-42 Copper

To Learn More Visit
velo3d.com
info@velo3d.com

Headquarters
511 Division Street
Campbell, CA 95008

European Technology Center
Am Technologiezentrum 5
86159 Augsburg, Germany

Material & Process Capability

GRCop-42 is a copper/chromium/niobium alloy. The alloy was developed by NASA to additively manufacture parts in need of high-strength dispersion and high conductivity. It retains strength at high temperature, due to the use of chromium and niobium in the alloy. Velo3D has developed processes that maintain high density in the printed part. GRCop-42 also has excellent creep resistance, and a low cycle fatigue life.

All of these properties are particularly valuable for rocket engine components such as fuel injector faces and combustion chamber linings with regenerative cooling.

General Process

Velo3D has successfully printed dense components with GRCop-42 using its Intelligent Fusion additive manufacturing process. This data sheet specifies the expected mechanical properties and characteristics of this alloy when manufactured on a Velo3D Sapphire System. All data is based on parts built using Velo3D standard 50 µm layer thickness parameters, using Praxair TruForm CU42-N30, a Velo3D-approved powder. Parts built from GRCop-42 on a Sapphire System can be heat treated like those manufactured by other methods.

Typical Volume Rate[1], cc/hour	36
Density, g/cc (lbs/cubic in)	8.79 (0.318)
Relative Density, percent	99+
Surface Finish[2], S_a, µm (µin)	<25 (980) for angles >25° from horizontal

Mechanical Properties at Room Temperature

		As Printed		After HIP[4]	
Property[3]		Mean -3σ	Mean	Mean -3σ	Mean
Ultimate Tensile Strength, MPa (ksi)		521 (75.6)	533 (77.3)	382 (55.4)	391 (56.7)
Yield (0.2% Offset), MPa (ksi)		292 (42.3)	296 (42.9)	194 (28.1)	198 (28.7)
Elongation At Break, percent		14.1	23.8	31.3	34.1
Thermal Conductivity, W/mK	25°C			303	323
	260°C			309	317
	537.8°C			299	303

1. Geometry-dependent. **2.** Depends on orientation and process selected. **3.** Mechanical & test samples printed in vertical orientation.
4. HIP conditions: 1750 ± 25 F, 15 ± 0.5 ksi; 3 hours (+15/-0 min) in inert environment.