

# GRCop-42 Copper

To Learn More Visit  
[velo3d.com](http://velo3d.com)  
[info@velo3d.com](mailto: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 <sup>1</sup> , cc/hour              | 36  |
| Density, g/cc (lbs/cubic in)                            | 8.79 (0.318)                              |
| Relative Density, percent                               | 99+                                       |
| Surface Finish <sup>2</sup> , S <sub>a</sub> , µm (µin) | <25 (980) for angles >25° from horizontal |

## Mechanical Properties at Room Temperature

| Property <sup>3</sup>                | As Printed |            | After HIP <sup>4</sup> |            |
|--------------------------------------|------------|------------|------------------------|------------|
|                                      | 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.