

Material & Process Capability

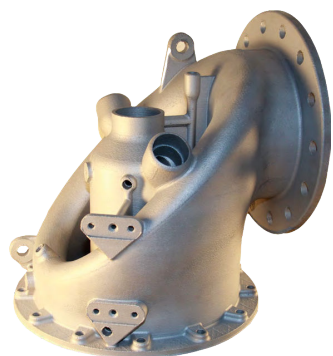
Scalmalloy[®] is a high-performance alloy made from scandium (Sc), aluminum (Al) and magnesium (Mg). It is the only additive manufacturing alloy which substitutes for high strength 7000 series aluminium alloys. Thanks to its low density, it provides density-specific properties which are extremely competitive with the highest strength alternatives. Combining high strength with excellent ductility and processability, it is the ideal material for use in highly loaded or safety-critical parts.

In additive manufacturing, the process time to build a part is the single biggest cost driver. Reducing the volume of the part by exploiting the higher strength of Scalmalloy provides cost savings as well as weight savings, enabling you to win on both fronts.

General Process

Scalmalloy is used for parts that are exposed to high mechanical stress and are required to be light at the same time. It has outstanding properties in terms of weldability and low thermal expansion (~1.8 E-05 K⁻¹ at 100°C). It is well-suited for anodizing processes and offers good corrosion resistance. This data sheet specifies the expected mechanical properties and characteristics of this alloy when manufactured on a Velo3D Sapphire System. Parts built from Scalmalloy on a Sapphire System can be heat treated with processes similar to those used on parts made by other methods.

All data is based on parts built with Velo3D standard 50µm layer thickness parameters, using Toyo Aluminum K.K. SCALMA40B5.

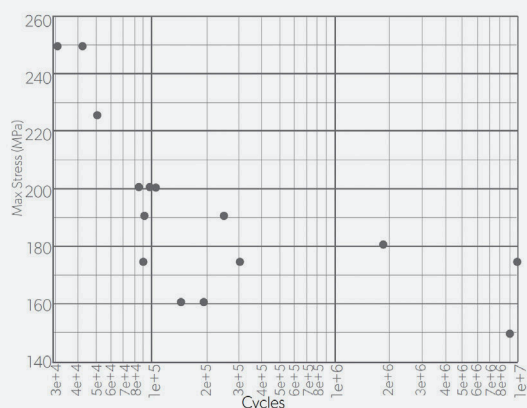


Density, g/cc (lbs/cubic in)	2.67 (0.0964)
Relative Density, percent	99.9+
Surface Finish ¹ , S _a , µm (µin)	<15 (590)

Mechanical Properties at Room Temperature

Property ²		Modulus of Elasticity, GPa (msi)		Ultimate Tensile Strength, MPa (ksi)		Yield (0.2% Offset), MPa (ksi)		Elongation At Break, percent		Hardness, HRBW	
Process Recipe	TBR (cc/h) ³	Mean	Mean-3σ	Mean	Mean-3σ	Mean	Mean-3σ	Mean	Mean-3σ	Mean	Mean-3σ
1kW/50 µm	48	As Printed	-	-	-	-	-	-	-	50	46.4
		After Heat Treatment ⁴	69 (10)	65(9)	503 (73)	496 (72)	477 (69)	470 (68)	11.7	7.8	77

Fatigue Summary



1. Depends on orientation and process selected; for angles >25° from horizontal **2.** Mechanical & test samples printed in vertical orientation, machined to ASTM E8 (round specimen #3). **3.** TBR: Theoretical Build Rate (TBR) is a per-laser build rate calculated from the process conditions of bulk core as *scan speed x hatch spacing x layer thickness*. This value represents a single laser only and is reported for comparison purposes across different materials and recipes, but does not correspond to true build rate, which is dependent on geometry and system characteristics (i.e. number of lasers, recoat times, etc.) **4.** Heat treatment solution at 325°C (615°F); hold for 4 hours. Air cool.