

Material & Process Capability

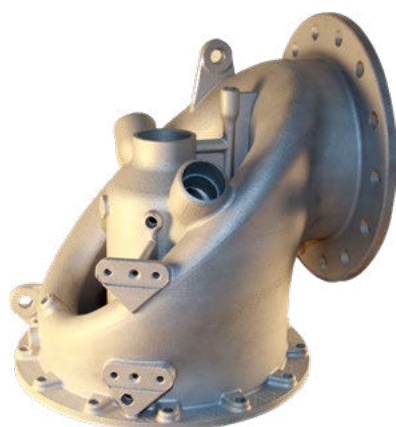
Scalmalloy[®] is a high-performance alloy made from scandium (Sc), aluminum (Al) and magnesium (Mg) alloy. It is the only additive manufacturing alloy which substitutes for high strength 7000 series aluminium alloys. Thanks to its low density, it provides density-specific properties which are extremely 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.



	Sapphire Sapphire 1MZ	Sapphire XC Sapphire XC 1MZ
Typical Volume Rate ¹ , cc/hour	54	216
Density, g/cc (lbs/cubic in)	2.67 (0.0964)	
Relative Density, percent	99.9+	
Surface Finish ² , S _a , µm (µin)	<15 (590)	

Mechanical Properties at Room Temperature

Property ³	As Printed		After Heat Treatment ⁴	
	Mean	Mean-3σ	Mean	Mean-3σ
Modulus of Elasticity, GPa (msi)	-	-	69.2	64.7
Ultimate Tensile Strength, MPa (ksi)	-	-	503	496
Yield (0.2% Offset), MPa (ksi)	-	-	477	470
Elongation At Break, percent	-	-	11.7	7.8
Hardness, HRBW	50	46.4	77	73.4

1. Geometry-dependent. 2. Depends on orientation and process selected; for angles >25° from horizontal
 3. Mechanical & test samples printed in vertical orientation, machined to ASTM E8 (round specimen #3).
 4. Heat treatment solution at 325°C (615°F); hold for 4 hours. Air cool.

Fatigue Summary

