Aluminum F357

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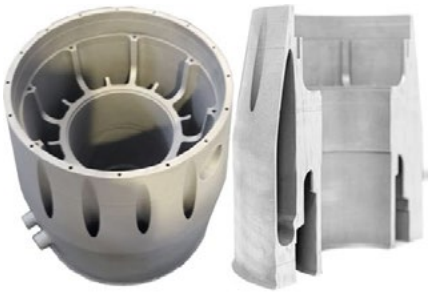
Material & Process Capability

Aluminum F357 is a lightweight, corrosion resistant, and highly dynamic load-bearing material ideal for applications that require a combination of mechanical and thermal load endurance with low weight. It is typically used for heat transfer and other components in the defense and automotive industries. The Velo3D 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

Aluminum F357 is a foundry-grade beryllium-free aluminum-silicon alloy, similar to A357. It has excellent weldability and corrosion resistance and is heat-treatable to T5, T6, and T7.
This data sheet specifies the expected mechanical properties and characteristics of this alloy when manufactured on a Velo3D Sapphire System. Parts built from Aluminum F357 on a Sapphire System can be heat treated using processes similar to those used on parts manufactured by other methods. All data is based on parts built with Velo3D standard 50 µm layer thickness parameters. Velo3D uses Tekna Aluminium F357.



Density, g/cc (lbs/cubic in)	2.67 (0.097)
Relative Density, percent	99+
Surface Finish[1], S_a, µm (µin)	<20 (787)

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	
Process Recipe	TBR (cc/h)[3]		Mean-3σ	Mean	Mean-3σ	Mean	Mean-3σ	Mean	Mean-3σ	Mean
1kW/50 µm	65	As Printed	53 (8)	73 (11)	332 (48)	350 (51)	230 (33)	238 (35)	2.61	7.09
		After Heat Treatment[4]	48 (7)	72 (10)	279 (41)	307 (45)	225 (33)	252 (37)	5.45	10
		After HIP[5]	49 (7)	76 (11)	302 (44)	329 (48)	226 (33)	262 (38)	9.12	12.76

1. Depends on orientation and process selected.
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 540 °C (1000 °F) for 30 minutes, water quench and age at 160 °C (320 °F) for 6 hours
5. Hot Isostatic Pressing at 510 °C (950 °F) at 15 ksi for 4 hours, rapid cool, solution at 540 °C (1000 °F) for 30 minutes, water quench and age at 160 °C (320 °F) for 6 hours.