

Material & Process Capability

Aluminum

Aluminum F357 is a beryllium-free aluminum-silicon alloy, similar to A357. It has excellent weldability and corrosion resistance. It 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 VELO^{3D} 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 VELO^{3D} standard 50 µm layer thickness parameters.

General Process Data

Accuracy, Small Parts	±0.050 (±0.002)	mm (in)
Accuracy, Large Parts	±0.2	percent
Minimum Wall Thickness; up to 500:1 aspect ratio	0.200 (0.008)	mm (in)
Typical Volume Rate ¹	81	cc per hr
Density	2.67 (0.097)	g/cc (lbs/in ³)
Relative Density	99.9+	percent
Surface Finish, Sa ²	6 (240)	µm (µin)

Mechanical Properties at Room Temperature

Property ³	As Printed		After Heat Treatment ⁵		After Hot Isostatic Pressing ⁶		
	Mean-3σ / Min	Average	Mean-3σ / Min	Average	Mean-3σ / Min	Average	
Modulus of Elasticity ⁴	43.6 (6.33)	72.4 (10.5)	52.7 (7.64)	69.6 (10.1)	41.7 (6.05)	71.9 (10.4)	GPa (MSI)
Ultimate Tensile Strength	363 (52.6)	377 (54.6)	297 (43.0)	318 (46.2)	292 (42.3)	320 (46.4)	MPa (KSI)
Yield (0.2% Offset)	209 (30.3)	215 (31.2)	238 (34.5)	255 (37.0)	223 (32.4)	252 (36.5)	MPa (KSI)
Elongation At Break	3.50	8.21	5.94	12.6	10.1	18.2	percent

Notes

1. Geometry-dependent.
2. Depends on orientation and process selected.
3. Mechanical & test samples printed in vertical orientation.
4. For reference; estimated from ASTM E8 tensile testing.
5. Heat treatment solution at 540°C for 30 minutes, age at 160°C for 6 hours.
6. HIP at 510°C at 15 KSI for 4 hours, solution at 540°C for 30 minutes, age at 160°C for 6 hours.