Aheadd® CP1

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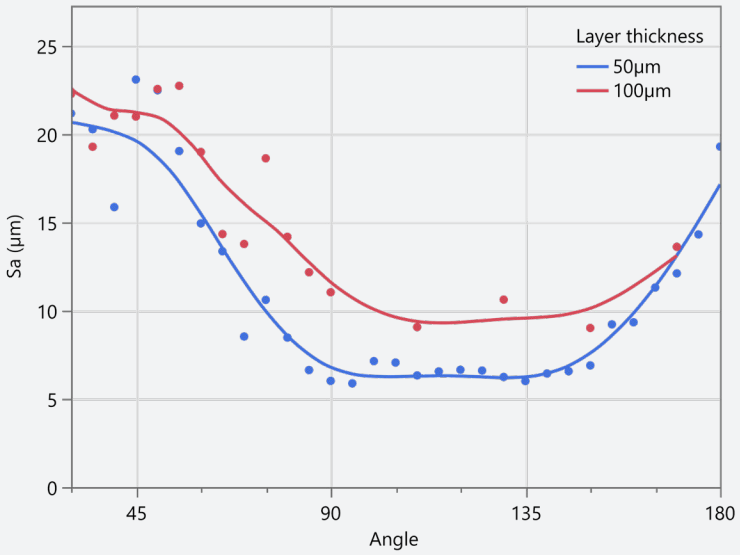
Material & Process Capability

Aheadd is Constellium's new generation of optimized high-performance aluminium powders for Laser Powder Bed Fusion (LPBF). This Aluminum-Iron-Zirconium powder solution is designed specifically for additive manufacturing using laser powder bed fusion (L-PBF). Aheadd CP1 brings multiple advantages including high strength and ductility, excellent thermal and electrical conductivity, high productivity LPBF processing, and simplified post-processing. It is ideal for heat transfer applications in the motor sports, defense and aerospace industries.

General Process

This data sheet specifies the expected mechanical properties and characteristics of this alloy when manufactured on a Velo3D Sapphire System. Parts built from Aheadd CP1 on a Sapphire System can be heat treated using a simplified process compared to other Aluminum alloys making it an attractive choice for consistent material properties. All data is based on parts built with Velo3D standard 50 µm or 100 µm layer thickness parameters. Velo3D uses Constellium Aheadd CP1.

Surface Angle versus Finish



Density, g/cc (lbs/cubic in)	2.67 (0.097)
Relative Density, percent	99%+ (1 kW / 50 µm process) 98%+ (1 kW / 100 µm process)
Surface Finish[1], S_a, µm (µin)	<25 (985)

Mechanical Properties at Room Temperature

			After Heat treatment[4]					
Property[2]			Ultimate Tensile Strength, MPa (ksi)		Yield (0.2% Offset), MPa (ksi)		Elongation At Break, percent	
Process Recipe	TBR (cc/h)[3]	Sample Size[5]	Mean	Min	Mean	Min	Mean	Min
1kW/50 µm	65	56	335 (49)	331 (48)	302 (44)	297 (43)	17.6	13.9
1kW/100 µm	101	56	306 (44)	303 (44)	274 (40)	270 (39)	14.1	8.2

1. For angles >25° from horizontal, actual finish 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 400 °C (752 °F) for 4 hours dwell. **5.** Data collected from single Sapphire printer.

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