



Aheadd® CP1

High print quality at high productivity rates for Constellium's Aheadd® CP1 on 3D Systems DMP Flex 350 Triple printer. Aheadd CP1 is an Al-Fe-Zr alloy offering improved strength, thermal stability, and good corrosion resistance.

3D Systems offers application development and part production using the integrated additive manufacturing (AM) workflow software, 3DXpert®, and the DMP Flex 350 metal printer. 3D Systems' Aheadd CP1 parameters were developed, tested, and optimized on real applications in our AS9100/ISO9001 part production facilities, which have the unique distinction of printing more than 1,000,000 challenging metal production parts in various materials, year over year. The properties listed below provide high confidence to the user in terms of job-to-job and machine-to-machine repeatability.

For companies looking to develop new applications and processes with Aheadd CP1, please contact the 3D Systems Application Innovation Group (AIG).

Material description

Aheadd CP1 by Constellium is specifically designed for the L-PBF process resulting in a superior DMP process stability enabling higher productivity, thin wall capability and excellent surface quality.

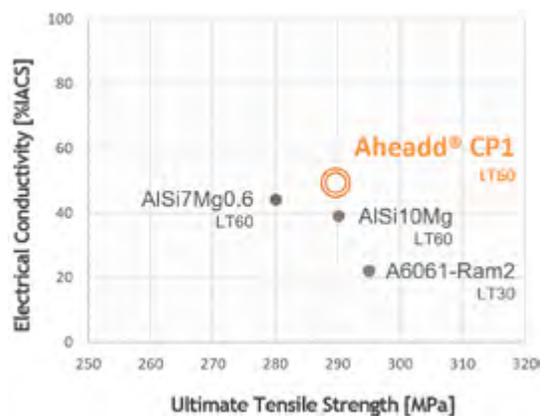
Both the Fe as well the Zr contribute to the higher strength through two mechanisms. The refining effect of Zr during the solidification as well as the formation of Fe-Al intermetallic particles will strengthen the material. The low levels of alloying elements ensures a good thermal conductivity which can be further increased by applying a heat treatment. Lastly, the absence of silicon in contrast to the traditional casting alloys such as AlSi10Mg in laser powder bed fusion (PBF-LB) allows for various surface finishing options such as chemical polishing, Decorative anodizing (type II) or Hard anodizing (type III).

Chemical Composition

ELEMENT	% OF WEIGHT
Al	Balance
Fe	0.8 - 1.4
Zr	0.9 - 1.4

Typical Properties^{1,2,3}

DMP FLEX 350 TRIPLE	NHT	SR
Ultimate tensile strength (MPa)	190	330
Yield strength Rp0.2% (MPa)	130	290
Plastic elongation (%)	30	20
Electrical conductivity (MS/m)	18	28



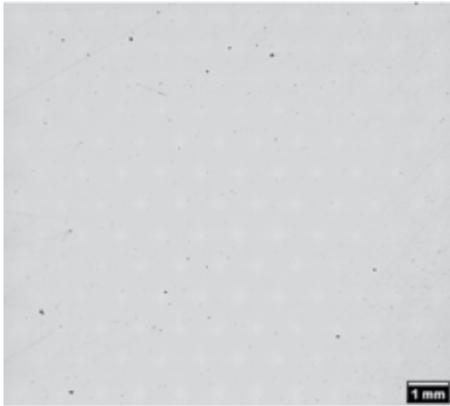
¹ Samples tested in non-heat treated (NHT) and stress relief (SR) condition. Stress relief treatment was performed for 4h at 400°C under air and then air cooling

² Mechanical properties tested using machined horizontally and vertically oriented ASTM E8 type 4 specimens printed with layer thickness 60 µm (LT60)

³ Values based on a limited sample population (<10)

⁴ Electrical Conductivity measured according to ASTM B193. IACS = International Annealed Copper Standard. Values based on a limited sample population (<10)

Layer thickness: 60µm
Typical relative density⁵: 99.9%



Application Focus: Semiconductor Wafer Table

The high-conductivity and corrosion resistance properties of Aheadd® CP1 are well-aligned to maximize heat transfer efficiency and improve semiconductor capital equipment throughput and accuracy. Optimized cooling channels and surface patterns dramatically improve surface temperatures and thermal gradients while reducing time constants. At the same time, assembly consolidation reduces part count which increases reliability.

COMPLEX CHANNEL DESIGN

Excellent as-built surface finish enables high quality internal channels not accessible to finish machining.

THIN WALLS

Wall thicknesses as low as 0.3 mm.

ORGANIC SHAPES

Reduce turbulence and pressure drops inside the cooling system.

PART COUNT REDUCTION AND IMPROVED LEAK-TIGHTNESS

Remove points of failure; simplify supply chain.



⁵Relative density values shown are typical values from density test coupons and may deviate depending on specific part geometry



To confirm the suitability of this material for your specific application, please contact the 3D Systems Application Innovation Group (AIG): <https://www.3dsystems.com/consulting/application-innovation-group>