



Certified HX (A)

3D Systems offers a print parameter database license for Certified HX (A) on the DMP Flex 350 and DMP Factory 500 metal 3D printers that can be applied using the integrated additive manufacturing workflow software, 3DXpert.

The print parameter database license available for nickel superalloy HX has been developed in a close collaboration between 3D Systems and GF Machining Solutions using real applications in turbomachinery and energy industrial sectors.

3D Systems' Application Innovation Group and manufacturing services bring high-quality part solutions to our customers and produce more than 1,000,000 challenging metal production parts in various materials, year over year.

Material description

Nickel-chromium-iron-molybdenum alloy with improved high temperature strength, corrosion resistance and excellent creep resistance. The service temperature of this alloy is up to 1200°C. Its composition corresponds to UNS N06002. This datasheet specifies the material properties of the parts printed on 3D Systems DMP machines using HX powder.

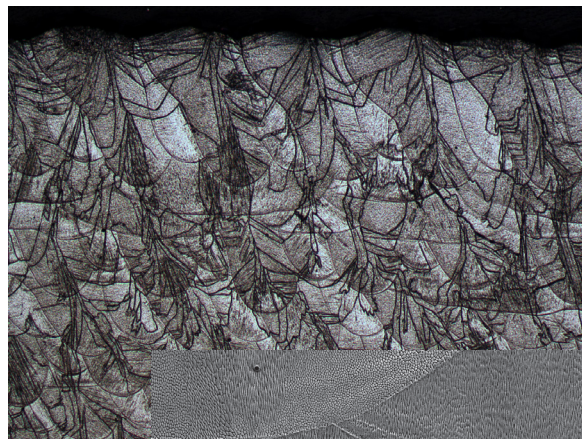
The applications for this alloy include but are not limited to:

- Jet engines and IGT turbine vanes and ducts
- Gas turbine engine combustion zone components such as transition ducts, combustor cans and spray bars
- Oil and gas components working in corrosive environments, e.g., drill bits, downhole tools and sensor casings
- Chemical processing parts such as heat exchangers, reaction vessels, evaporators, fans and fan housings

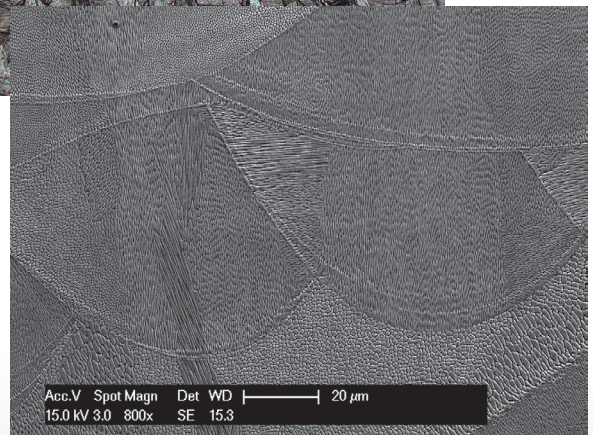
Turbine vane

The DMP technology and parameter set for Certified HX (A) allowed this large turbine vane ring (below) to print in under two days (build time 44 hours). This application is a great example of design and assembly simplification where 50+ parts are replaced by one and all joints are eliminated.

The developed parameter set for Certified HX (A) ensures the dimensional stability and repeatability of parts, delivering a superior surface quality finish ready for final processing.

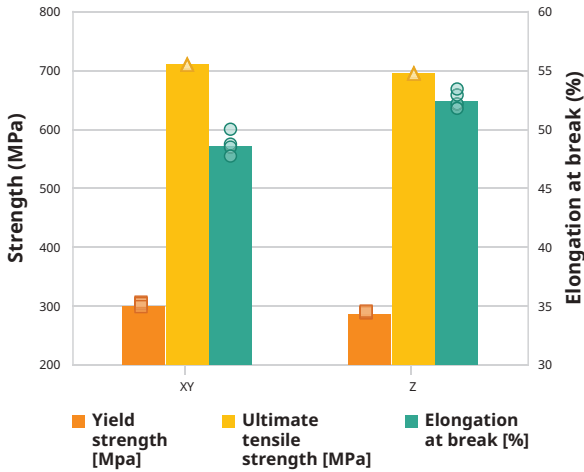


Typical density
~99.9%

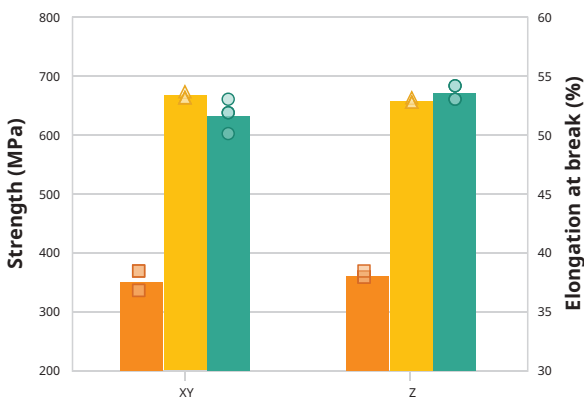


Homogeneous microstructure at higher magnification.

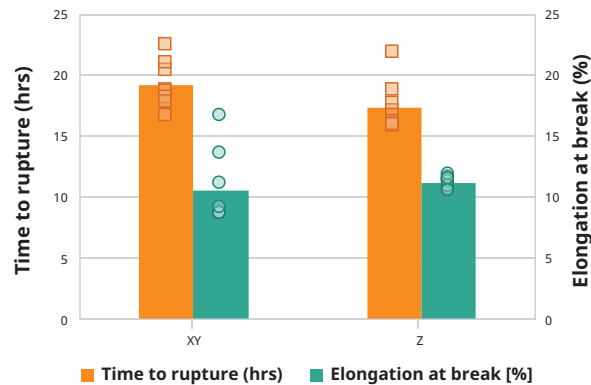
TENSILE TEST AT ROOM TEMPERATURE (ASTM E8)



TENSILE TEST AT 815°C (ASTM E21)

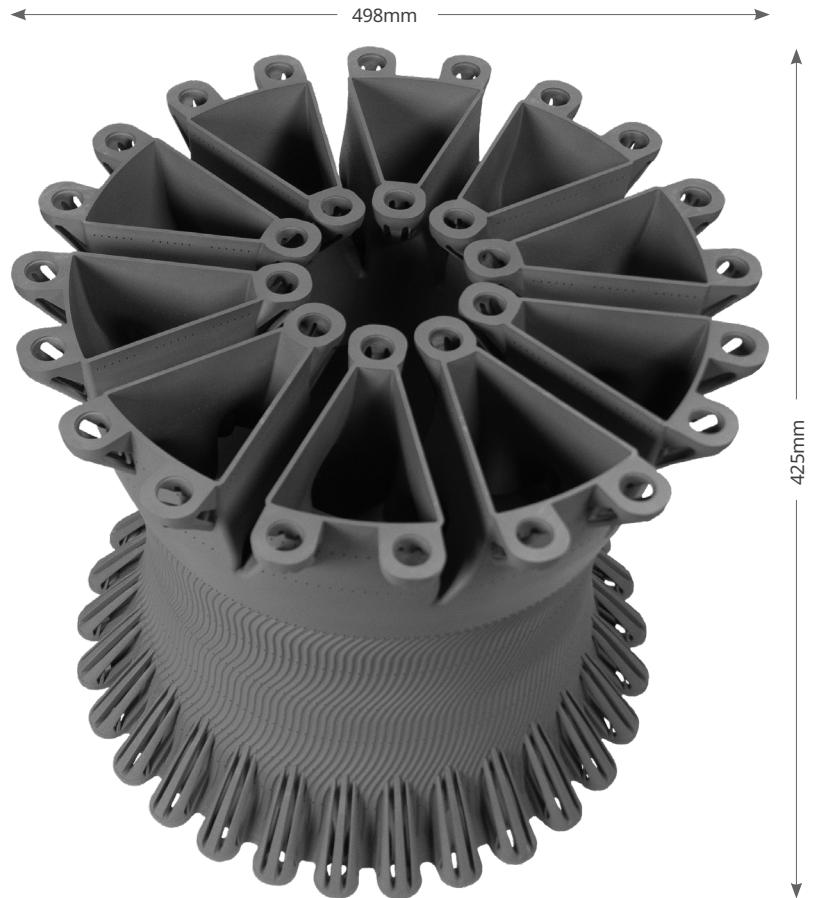


STRESS RUPTURE TESTING AT 815°C, 105MPa (ASTM E139)



Combustion chamber component:

The DMP technology and parameter set for Certified HX (A) allows complex welded assemblies of separate transition ducts and combustor casings to be transformed into a single additively manufactured component. Additional design for additive methods were applied to the flanges and complexly shaped cooling channels. Such parts are typically quite large, but in this case it was possible to fit the entire part into the DMP Factory 500's unique build envelope and allow seamless manufacturing. Total production time is 150 hours.



All specimens were stress relieved followed by HIP (~1130°C for 4hrs at 100MPa), and solution annealing (1177°C for 2hrs followed by rapid cooling below 60°C)



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>

ABOUT GF MACHINING SOLUTIONS

When all you need is everything, it's good to know that there is one company that you can count on to deliver complete solutions and services. From unmatched Electrical Discharge Machining (EDM), Laser texturing, Laser micromachining, Additive Manufacturing and first-class Milling and Spindles to Tooling and Automation, all of our solutions are backed by unrivaled Customer Services and expert GF Machining Solutions training. <https://www.gfms.com/com/en/machines/additive-manufacturing.html>

HX powder with product reference "TruForm™ HXLC powder" can be purchased directly from Praxair: <https://www.praxairsurfacetechologies.com/en/materials-and-equipment/materials/additive-manufacturing-powders>