

# Tungsten (A)

3D Systems offers a print parameter database license for Tungsten (A) on the DMP Flex 350 metal 3D printer that can be applied using the integrated additive manufacturing workflow software, 3DXpert®.

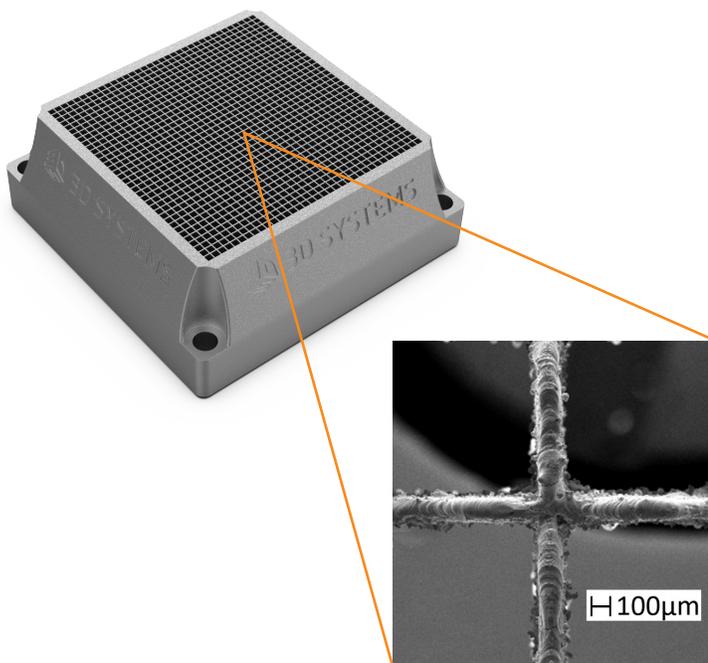
## Material Description

The high-tech and semiconductor industries benefit from this material's excellent radiation shielding capabilities for manufacturing high-precision components used in imaging equipment (e.g., collimators). Tungsten's high-temperature properties are deployed in plasma environments such as in ion generation equipment (e.g., arc slits, beam targets, anodes, and cathodes). In the nuclear industry, tungsten components are used to withstand extreme high-temperature and corrosive working environments.

Commercially pure tungsten, W1 (W > 99.9%), is a high-density refractory metal exhibiting the highest melting point (3422°C) among all metals. Tungsten yields excellent radiation absorption properties (X-ray, gamma radiation) combined with an outstanding resistance against heat and corrosion.

## Application Focus: Collimator

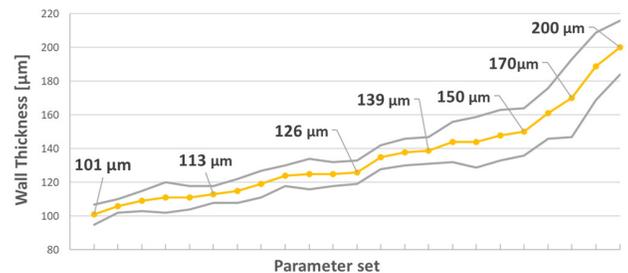
The DMP technology and parameter set for Tungsten (A) allows for manufacturing high-precision components such as thinly-walled anti-scatter grid structures, used in medical and industrial imaging equipment. The high material density (19.25 g/cc) provides excellent X-ray and gamma radiation shielding capabilities. The thinly-walled anti-scatter grid structures can be additively manufactured in a cost-effective manner, avoiding extensive conventional post-process machining steps.



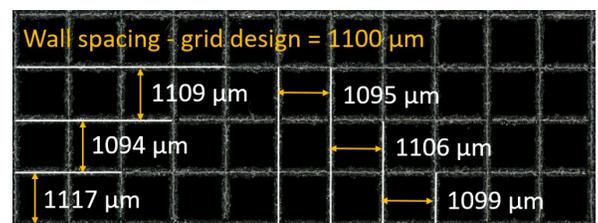
Direct metal printing (DMP) with a low-oxygen printing environment is essential for producing highly dense pure tungsten DMP parts. Superior part density of pure tungsten can be achieved thanks to the best-in-class vacuum technology of the DMP Flex 350.

## Indicative part properties - Layer thickness 30 µm

Property	Test method	Metric	US
Relative density	Optical method (pixel count)	97%	
Electrical resistivity	ASTM B193 at 20°C / 68°F	9.7 µΩ.cm	3.8 µΩ.in
Roughness Ra Vertical side surface <sup>1</sup>	ISO 25178	5.7 µm	225 µin



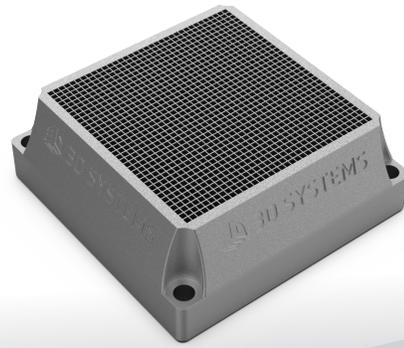
Extensive parameter database for **customizable wall thickness** reliable down to 100 µm.<sup>2</sup>



AM allows for accurate wall spacing.

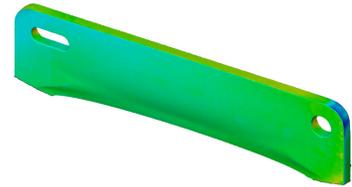
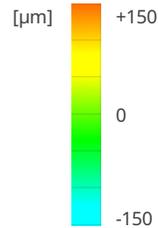
<sup>1</sup> Surface treatment performed with zirconia blasting medium at 2 bar.

<sup>2</sup> Measurements done on top surface of the grid, based on analysis of 80x and 250x magnification SEM imaging.

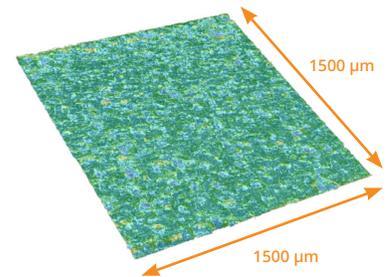
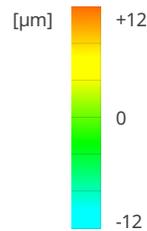


## Application Focus: Arc Slit

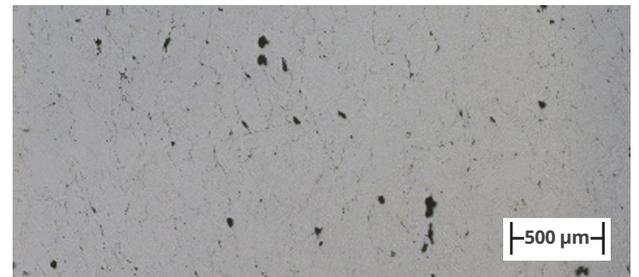
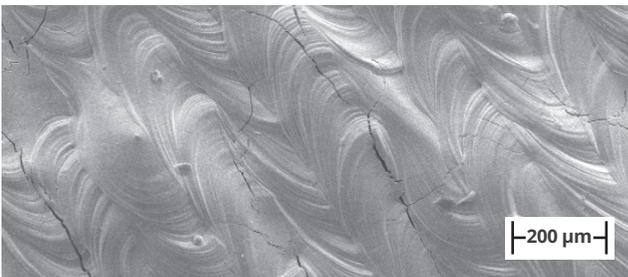
DMP pure tungsten arc slits yield excellent performance in high-temperature or plasma environments such as in ion generation equipment. The freedom of design in additive manufacturing offers a cost-efficient alternative to machined tungsten components.



**High accuracy** after support removal and sandblasting as measured by a 3D scan.



**Smooth surface** as measured by a Keyence microscope, with an Ra down to 5.7 µm.



DMP Flex 350 allows **fully molten tungsten** material. Additively manufactured pure tungsten does contain micro cracks and is brittle, limiting its use for mechanically loaded components.

**Superior part density** thanks to best-in-class vacuum technology.



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>



Tungsten powder with reference "TEKMAT™ W-25" can be purchased directly from Tekna: <http://www.tekna.com/spherical-powders/tungsten>

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