

How to print complex metal parts using Ultrafuse[®] Support Layer

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Ultrafuse[®] Support Layer

Debinding and Sintering (D&S) of complex geometries may not be easy. For decades, MIM companies benefited from 'Live Setters' or 'Sintering Supports' to carry the critical design areas of MIM parts during D&S. A sinter-inactive coating is applied between live setters and MIM parts to facilitate separation after sintering. Inspired by this, Ultrafuse[®] Support Layer was developed.

Ultrafuse[®] Support Layer should be printed as thin layers between printed support and the printed part. Please see in Table 1. below the recommended printing parameters. Ultrafuse[®] Support Layer causes higher degree of nozzle wear than metal filaments. Therefore, it is recommended to use abrasion-resistant nozzles like Ruby.

Table 1. Suggested Printing Parameters for Ultrafuse[®] Support Layer

Parameter	Value	Comment
Layer height	-	This value is prescribed by layer height of part
Support Interface Line width	Max -20% Nozzle size	Distance between printed lines must be minimal to ensure overlap that enable higher surface quality of supported structures
Printing speed	15-20 mm/s	Ensure higher surface quality of supported surface
Printing temperature	245 -260°C	Recommended
Support interface Flow	100-105%	Recommended
Interface Thickness	0,2 - 0,45 mm	At least 2 consecutive support layers are advised
Support Interface pattern	Lines	Freely choose to what suits your design the best
Minimum Support XY Distance	1 mm	Recommended



Figure 1 Green part with support structures and Ultrafuse Support Layer and sintered part with support structure

Supports “Not Just for Printing”

Ultrafuse® Metal Filament printing requires a greater amount of supports compared to typical plastic FFF because parts may distort or collapse during D&S. Therefore, it is recommended to use supports for parts with overhang angles under 45° as seen in Figure 2 below. Minimum 50% of Support density is required to maintain stable behavior during D&S.

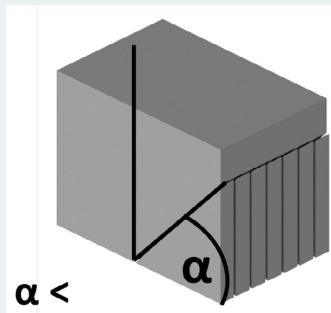


Figure 2 Overhang angle



Figure 3 Green part with support structures

After debinding structural stability of the parts is at its minimum. Smart part orientation and the use of support structures in printing, reduces significantly the risk of failure in debinding and sintering. It is recommended to print the parts as flat as possible with sufficient amount of supports Please see in Picture 4 below an example for required supports.

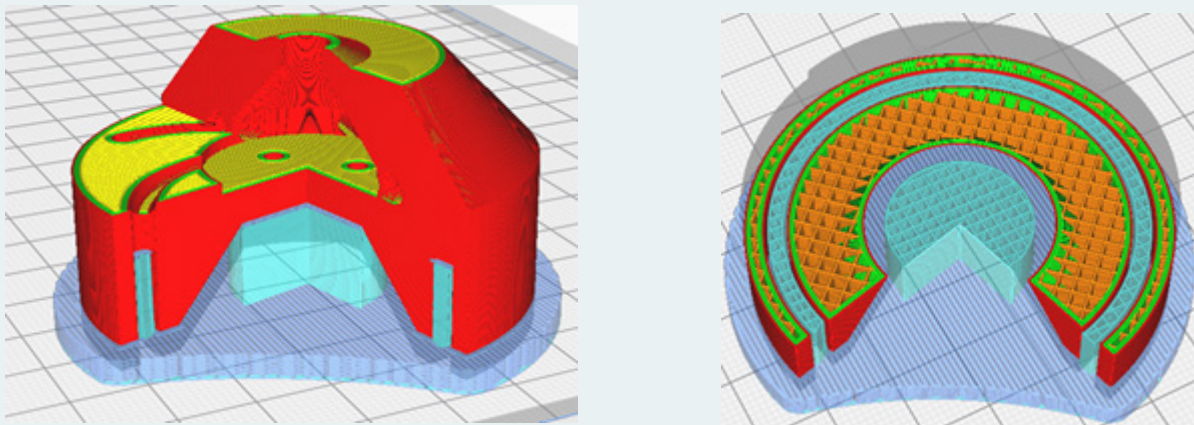


Figure 4 Side and top view Supports structure by slicing in Cura