1- Zetamix General guidelines Stainless Steel 316L

Zetamix filaments are on a fine powder (5-20 µm) and a thermoplastic binder system for the FDM process. Green parts need a binder removal in a two-stage debinding process before being sintered. First debinding step is dissolving the binder in a solvent bath. In the second debinding step the remaining binder is thermally removed. These general guidelines are based on the processing of test parts with a wall thickness of 2 to 4 mm.
The recommendations are considered to work as a standard guideline and must be adapted to individual wall-thickness and part-design.

Typical material properties	
Product	Filament for FDM process
Binder basis	Polyolefinebased binder system
Appearance	Dark grey filament

Typical processing properties	
Printing temperature	120 - 130°C
Plate temperature	40 °C
Nozzle size	0.4 mm to 1 mm
Layer thickness	0.20 mm (possibility to go from 0.1 to 1mm, need to ajust printing speed)
Printing speed	20 mm/s (recommended)
Debinding process :	Two-stage debinding process
1st step : chemical debinbing	24 hours in an acetone bath at 40°C (it depends on the geometry of the part), stop the heat a couple of hours before removing it from the bath → Mass loss > 4% 2 hours drying in ambient atmosphere
2nd step : thermal debinding	Thermal debinding From 50 °C to 650°C at 10°C/h in an argon mixture with 2.5% hydrogen atmosphere
Sintering process	In a high temperature furnace Up to 1350°C at 50°C/h, holding time 2h in an argon mixture with 2.5% hydrogen atmosphere.
Sintering shrinkage rate	In x,y direction = 13.0% ±1% In z direction = 13.0% ±1%
Oversize factor	In x,y direction = 115.0% In z direction = 115.0%

Printing instructions:

The filament is softer than plastic filaments. Therefore, it is preferable to use a driving gear which is not too much aggressive and will not crush the filament (ideally a grooved driving gear). The filament can be grinded by the extruder, that's why it should be cleaned before a long print. To make sure that the printer is ready we recommend preheating the system and start extruding some material. If nothing come out of the nozzle there might be a clog. Therefore, the nozzle must be replaced or cleaned.

We recommend the use of a wear resistant nozzle, for instance with a ruby or ceramic tip. In order to avoid filament grinding, we recommend to load the filament without any pressure at all and then delicately increase it until the filament just gets pushed through the PTFE tube.

We recommend printing the piece on flexible plate. The part can be detached by binding it.

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Printing parameters:

Printing speed: from 5 to 30 mm/s depending on the shape of the part
Layer height: from 0.1mm to 1mm
Retraction: Yes (but not necessary)
Fan speed: 100% from the second layer (the higher the better the print quality)
Wall line count: 3 recommended (at least two)
Infill: any 2D pattern (triangles, grid, honeycomb, rectilinear)
Infill density: from 100% down to 20% (the top surfaces above the infill depends on the pattern infill density)
Top/bottom surface number:

- for a 0.1mm layer height: 10
- for a 0.2mm layer height: 5

Post processing instructions:

316L cycle are performed in an argon mixture with 2.5% hydrogen atmosphere.
The flow and the pressure must be adjusted.

- Flow: 0.5 LPM
- Pressure: 0.2 bar

After every two treatment (only for metal), run a “cleaning cycle” under ambient atmosphere (inlet and outlet valves open)

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