1- Zetamix General guidelines Tool steel H13

Zetamix filaments are on a fine powder (< 1.0 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 mm.
It is recommended not to exceed a wall thickness of 6mm.
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	110 - 150°C
Plate temperature	40 °C
Nozzle size	From 0.2mm to 1mm 0.6mm recommended
Retraction	Yes (but not necessary)
Printing speed	Up to 200mm/s (very dependent on the printer)
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) → Mass loss > 5% 2 hours drying in ambient atmosphere
2nd step : thermal debinding	Thermal debinding Up to 600°C at 50°C/h in an argon mixture with 2.5% hydrogen atmosphere
Sintering process	In a high temperature furnace Sintering up to 1350°C, holding time 2h in an argon mixture with 2.5% hydrogen atmosphere.
Sintering shrinkage rate	In x,y direction = 14.5% ±1% In z direction = 14.5% ±1%
Oversize factor	In x,y direction = 117.0% In z direction = 117.0%

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 regularly.
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 bending it.
If the room temperature exceeds 25°C, we recommend using an air conditioner or an external fan.

The filament is advised to be used for one year.

An Ideamaker profile is available on the website for you to use or draw inspiration from.

2- Debinding and sintering Recommendations

First step: solvent debinding (acetone bath)

Step 1: Solvent bath

- It is recommended to debind the printed parts in an acetone bath at 40 °C for 24hours.
- The duration is depending on wall thickness and part geometry but takes at least 2 hours.
- At least 5% of the weight of the piece should be removed during the solvent debinding step (after drying).

Step 2: Drying

- Let the parts dry in ambient air for about 1 hour.
- The parts shouldn't be placed on an absorbent fabric to dry off.
- This step is essential to measure the mass removed by the solvent debinding step.

Second step: thermal debinding and sintering

Because of the shrinkage, there is a change of volume.
Please modify the scale in the slicer before printing, as it is mentioned in "Oversize factor".

Place the parts on a crucible inside the furnace for both thermal debinding and sintering.

Metal cycles 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

Thermal debinding cycle :

- 50°C/h ramp to 600°C
- 78°C/h cooling ramp to 50°C

Sintering cycle :

- 200°C/h ramp to 1200°C
- 50°C/h ramp to 1350°C
- 2 hours holding time at 1350°C
- 78°C/h cooling ramp to 50°C

It is highly recommended to carry out thermal debinding and sintering consecutively.

Check the "Furnace cycles guide" on the website for detailed cycle information of every Zetamix filament.

Nanoe SAS
6 rue des Frênes
91160, Ballainvilliers
France
Tel: +33 9 81 98 33 64
E-mail: contact@nanoe.com