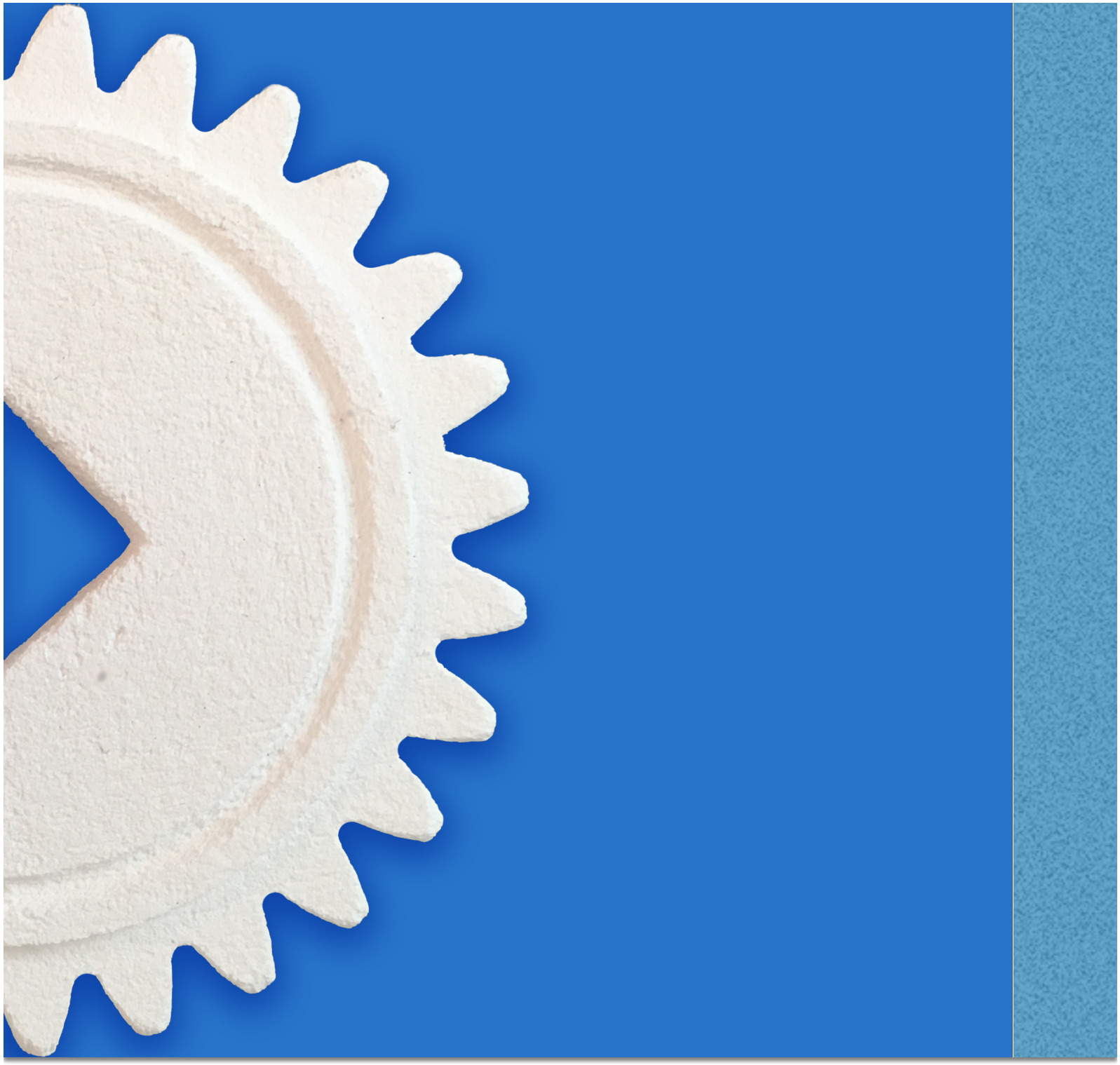


Tethonite®

High Alumina (96%)

TĒTHON 3D

Tethonite High Alumina

Tethonite® is an authentic ceramic powder for use in powder/binder jet 3D printers. Tethonite powder and companion Tethon 3D ceramic binder is recommended. Tethonite is offered in four formulations: earthenware (terra cotta), stoneware, porcelain, and 96% Alumina. Objects printed with 96% Alumina must be fired to 1700*C. Sintering lower is possible, however the parts will be less vitrified and more porous with lower temperatures.

Recommended Printing Tools

Wooden board for build plate

Fine brush to remove lose powder

Kitchen Strainer to sift used Tethonite

Wear respirator when handling unfired Tethonite

Drying Oven

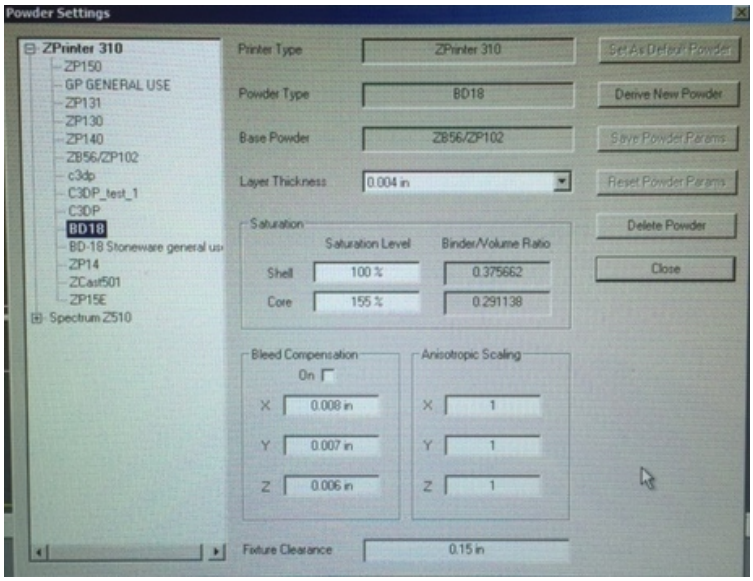
Wear safety glasses when handling unfired Tethonite

Binder and Powder Settings

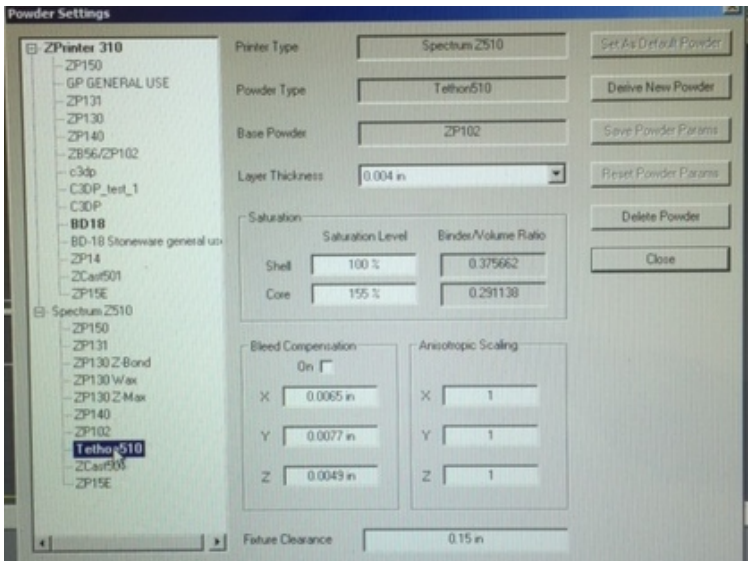
Binder Settings: High Alumina Tethonite must be fully saturated with binder in the core and the shell of the print. The more binder that is saturated into the print the stronger the object will be. Use the settings shown at right on the Zcorp 310 and 510.

Zcorp 510 binder settings derived from ZP102
Shell 100% Core 155%

Zcorp 310 binder settings derived from ZP56/ZP102
Shell 100% Core 155%

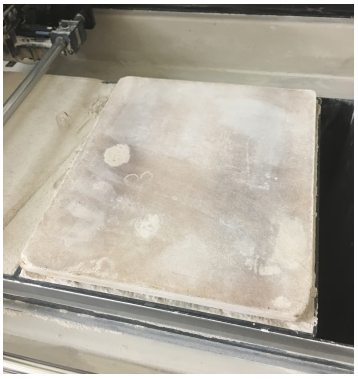


Powder Settings: High Alumina Tethonite can be printed in very tiny layers. This results in few visible print layers. The most common print layer is just .004 inches thick.



Printing

1. Load printer with powder and binder as directed by manufacturer.
2. An additional build plate is required, such as a 3/4 inch wooden board of the same dimension as the printer plate. The 3D print will be created on this and used later to remove printed objects. (A ceramic kiln shelf can be used if objects are too fragile to handle in green state).
3. Select Tethonite binder and powder settings.



wooden board used for build bed

Removing Part from printer

1. Lower feed bed.
2. Raise build bed to gain access to print.
3. Carefully remove excess powder using a soft brush. Do not touch the object at this point. It is better to leave excess powder around the object.
4. Remove board and print from printer. Set in a warming oven.

Post Print Processing

Drying Prints

Dry in a regular or convection oven at 210 degrees F (98C) for 1-12 hours. Drying time can be the same as printing time.

The printed object should be warm to the touch when finished drying. (Cool surface = wet powder). The parts will be very soft before drying in an oven. Do not try and pick up or touch the parts before they are dry. Printed objects gain strength while drying. Once they are dried you will be able to pick up most objects by hand.

Removing powder after drying

Work in a hood and wear protective gear.
Use caution while removing excess powder. Remove slowly.
Brush gently to remove large areas of powder. Soft brushes will not damage Tethonite after it dries.
When using compressed air use a large tip for larger areas of powder and a smaller tip for finer details.
40 PSI will clean Tethonite well when it is fully dried.
If after, or while you are removing powder, the print feels wet or cool to the touch, place back into oven to dry further.
Remove powder in several stages to promote uniform Tethonite drying.

High Alumina Tethonite Sintering Schedule

70-900F (21-482C) at 300F (150C) / hour
900-2000F (482-1100C) at 400F (200C) / hour
2000-3090F (1100-1700C) at 270F (132C) / hour
Hold 2 hours at 1700C

Troubleshooting

Binder looks streaky or missing spots

- Check printhead for powder buildup.
- Check binder lines for blockage. Clear with bleach to remove possible bacteria buildup.
- Check to make sure the printhead has enough binder in it. Refill if necessary. Use this tool for refiling print heads http://www.inkowl.com/index.php?S=19&B=8&product=5668&p=product
- Inspect the 3D file for non-manifold geometry.

Printed object is weak and breaks in the green state

- Allow print to dry longer in over after printing.
- Increase wall thickness of the object.
- Check Binder Saturation settings in your 3D printing software. Increase if weak.

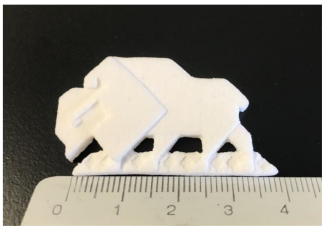
Cracks form during firing

- Make sure your following the print guidelines.
- See Ceramic 3D Print Design Guideline document.
- Increase wall thickness.
- Add additional supports to your object.
- Use bisque repair medium to fill in any cracks formed during firing.

High Alumina Tethonite Technical Data

Optical photos of 3D printed alumina samples after sintering

Sample 1



1700 °C for 1 hour

No.	Overall density (g/cm³)	Relative density(%)
1700-1	3.43	86.1

Sample 2

1700 °C for 2 hour

No.	Overall density (g/cm³)	Relative density(%)
1700-2	3.74	93.8

The density is determined by the Archimedes method, which may be a little higher than the real density, due to open pores.