



3D Printing with NinjaFlex

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<https://learn.adafruit.com/3d-printing-with-ninjaflex>

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Overview

What is Ninjaflex Filament?

Ninjaflex filament is a TPU (thermoplastic polyurethane) based material that offers flexibility, elasticity and high strength properties. This rubbery material is great for projects that need to be both flexible and durable. It's ideal for making bumpers for protecting your devices. It's also great for making certain cosplay props such as horns, spikes and other wearables. If you're looking for a more "useful" approach, it can also be used for making seals, gaskets, plugs, and leveling feet.

Why Would I Want Flexible Filament?

There are some applications that can only be 3D printed with ninjaflex – Wearable wristbands being the most pronounced. This material can be printed flat on a printing bed and worn around a wrist, for example. This simply can not be possible with PLA, ABS or other hard class plastic. Ninjaflex is in a class of its own, making lots of things that weren't possible, now 3D printable!

How Do I 3D Print With Ninjaflex?

Most 3D printers on the market are equipped with spring-loaded feeders that are capable of extruding Ninjaflex filament. The best reliable being 3D printers with a direct drive setup. These are printers such as the Flashforge Creator Pro, and Type A Machines Series 1 Pro – But any machine with a similar extrusion setup is adequate.

Ninjaflex comes in two different types of diameters – 1.75mm and 2.85mm. Almost all FDM style 3D printer are one of these (some actually support both, such as the Sigma BCN3D 3D printer).

Slice Settings

Below are some settings we've personally found to work reliably on a wide range of parts. These settings slightly differ than the recommend settings from the manufacturer, but should be acceptable with most 3D printers. You should use these as a base to start from – We encourage you to adjust them however you see fit.

- 235C-240C Extruder Temperature
- Non-heated bed – Blue Tape or PrintInZ Skins / Plate

- 30mm/s default printing speed
- 50% first layer speed
- 50% outline speed
- 80% infill speed
- 1mm retraction distance – 30mm/s retraction speed

Bowden 3D Printers

3D printers such as the Ultimaker 2+ are capable of 3D printing the Cheetah type Ninjaflex. This type of material is a special blend of Ninjaflex that is optimized to 3D print with bowden type extrusion setups. It's not as elastic as regular ninjaflex, but still very flexible and durable.

The only difference in settings will most likely be in the retraction distance.

- 235C-240C Extruder Temperature
- 30mm/s default printing speed
- 50% first layer speed
- 50% outline speed
- 80% infill speed
- 2mm retraction distance – 30mm/s retraction speed

Disclaimer: Please check with the Ninjaflex safety data sheet if you're concerned with thermal decomposition when printing above 230C

[Ninjaflex Safety Data Sheet](#)

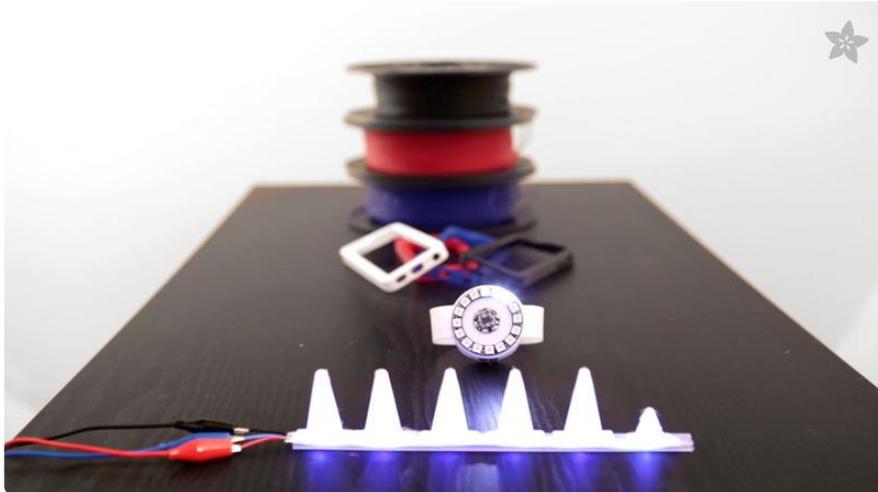
Ninjaflex VS SemiFlex

What's the difference between regular Ninjaflex and Semiflex? In our comparison video, we take a look at both and see how they're different and similar.

What about Cheetah filament?

Our comparison video was created before Cheetah filament was released. Having said that, SemiFlex and Cheetah are pretty similar. They're slightly different in their shore hardness and elongation. Because they're slightly different, we've decided to only offer Cheetah filament – It can be printed faster (60mm/s) and performance better with overhangs.

The Original NinjaFlex

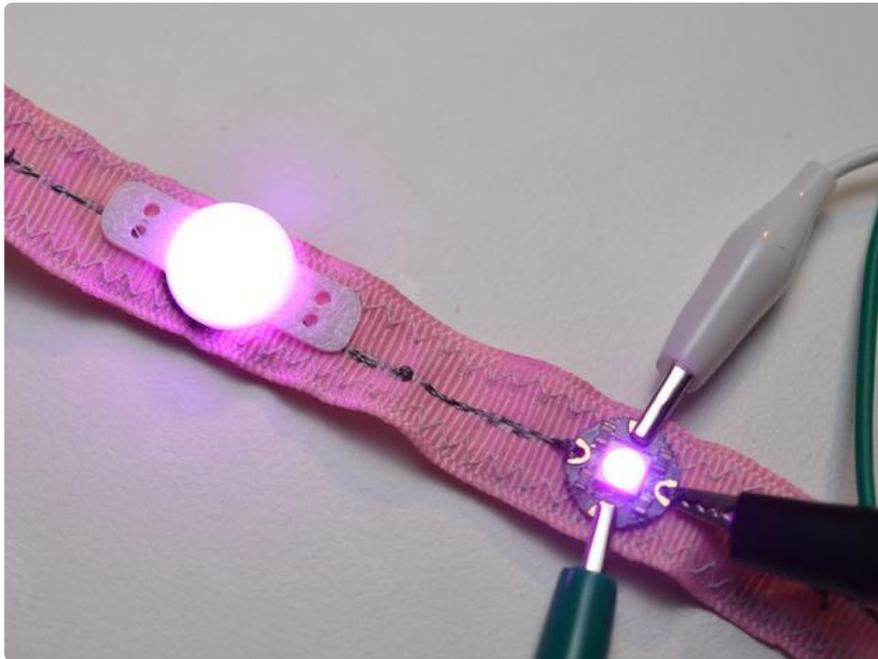


Wearables, LED Diffusers

It's great for wearable projects like our [FLORA wrist band \(\)](#) and makes great sewable diffusers for our NeoPixel LEDs like on our [Chemileon Scarf \(\)](#).

Looking for a way to soften the super bright glow of a NeoPixel? Ninjaflex works great as a [diffuser \(\)](#). We made [round domes \(\)](#) and spiky caps that nicely fit over our sewable NeoPixels.

During the holiday break, we made a hallow snowman and a pumpkin to test how well the material handles geometry. Not only did the parts retain surface detail and shape, they lit up quite nicely. We're definitely working on incorporating this material in more wearable projects!



Bumpers, Stoppers, Insulation

Perfect for protecting objects against impact, you can make custom stoppers, gaskets for sealing junctions, insulation between two surfaces or even add non slip feet for projects.



Stretching our [iPhone Bumper design](#) (), you can see just how elastic this material is. Using our bare hands, we couldn't quite rip it apart. With enough thickness, you can design some really tuff stuff!

Grips, Buttons, Buoyancy

Customize a comfortable handle for all uses. Great for replacing missing rubber buttons or even small tires. Keep that camera afloat and eliminate sinking, Ninjaflex floats!

NinjaFlex Filaments

Colors, Diameters and Shore Hardness

We carry a wide range of ninjaflex filaments in the Adafruit shop. We carry several colors, filament diameters and types (Cheetah and regular Minjaflex). You can see all them by clicking on the shop category link below.

[See Flexible Filament Category](#)

What Is Shore Hardness?

The different types of Ninjaflex list Shore Hardness as a way to reference how hard the material is. It's basically a unit of measurement for hardness. The lower the value, the "softer" it is.

Regular Ninjaflex has a rating of 85A, while Cheetah Ninjaflex is rated at 95A.

From [Wikipedia \(\)](#)

The durometer scale was defined by Albert Ferdinand Shore, who developed a device to measure Shore hardness in the 1920s. The term durometer is often used to refer to the measurement as well as the instrument itself. Durometer is typically used as a measure of hardness in polymers, elastomers, and rubbers.

Painting on Ninjaflex

We've found it is possible to air bush on the surface of 3D printed Ninjaflex parts. It's not prone to bleeding, so you can achieve details to create intricate shapes and patterns.

NinjaFlex vs SemiFlex

The newest addition to the NinjaFlex family, SemiFlex 3D Filament is now available! Just like the original NinjaFlex 3D Filament, SemiFlex material boasts flexibility, strength and reliability for your 3D printing projects, and is slightly more rigid to expand your printing possibilities.

SemiFlex is best for the following types of projects:

- High level of detail
- Contain intricate parts
- High resolution text
- Unsupported vertical printing
- Shock-absorption needed
- Requires less flexibility than NinjaFlex Original 3D Filament

NinjaFlex is best suited for:

- Fused Deposition 3D printers that use 1.75mm or 3mm filament
- 3D printers that accept other types of filaments such as ABS and PLA

To determine which NinjaFlex 3D Filament is best for your next project, use the quick reference chart below.

	NinjaFlex	SemiFlex
Pull Strength	 	  
Flexibility	  	 
Elongation	  	 
Retraction		 
Print Speed		 
Shock Absorption	 	  
Unsupported Vertical Printing		 
Print Resolution		  
Available Colors	11	4
Hardness	85A	98A (50D)

 Suitable   Good    Excellent

Usage

Processing Guidelines:

- Recommended extruder temperature: 240°C
- Recommended platform temperature: 50-65°C

- Recommended Print Speeds: 30 mm/s
 - Simple parts with direct drives can print faster at 60 mm/s

Features:

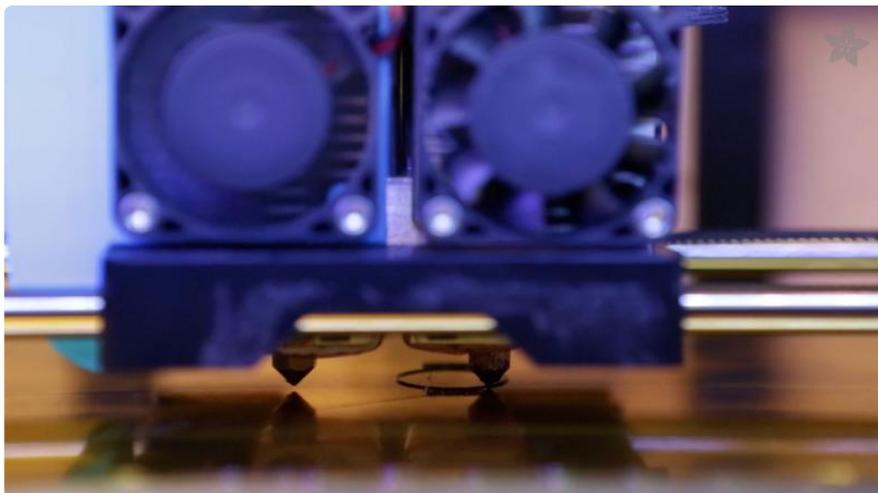
- High elasticity and excellent abrasion resistance
- Excellent build platform adhesion and bonding between layers
- 1.75mm filament spool = .50 kg

Flashforge Cretaor Pro Simplify3D
Profile

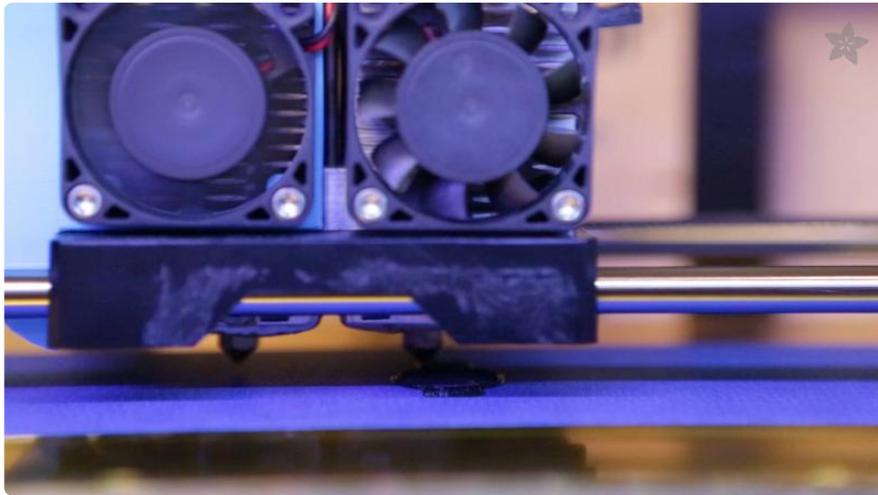
Build Plate

Prints without heat!

Removing flexible parts from the build plate is easy and well, quiet pleasing. Most 3d printing operators know how fun it is to remove ABS and PLA prints. With Ninjaflex, It's both fun and scary to remove because its so flexible and elastic. The first test prints we couldn't help but feel like we were deforming the shape or going to tear it apart. No need to scratch up that build plate with a scrapper when your part is strong and flexible, just pull and peel!



If you need a print with a glossy flat finish, Ninjaflex sticks great to Kapton tape without a heated platform.



Ninjabflex also has great adhesion to blue painters tape as well as acrylic and glass build plates.

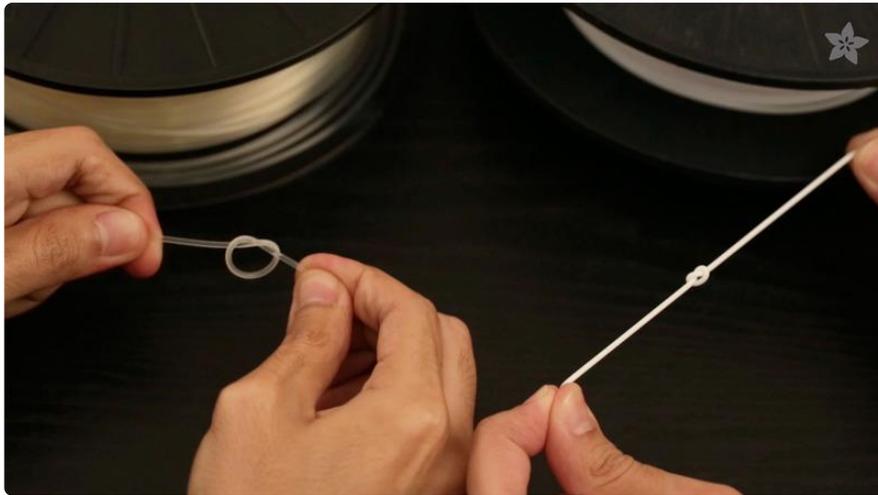
Properties

Very flexible. Almost silicone-like. It stretches, bends, twists and folds without deforming the printed objects original shape. Sturdy enough to hold it's own shape and doesn't flop over with a minimum wall thickness of 2mm.



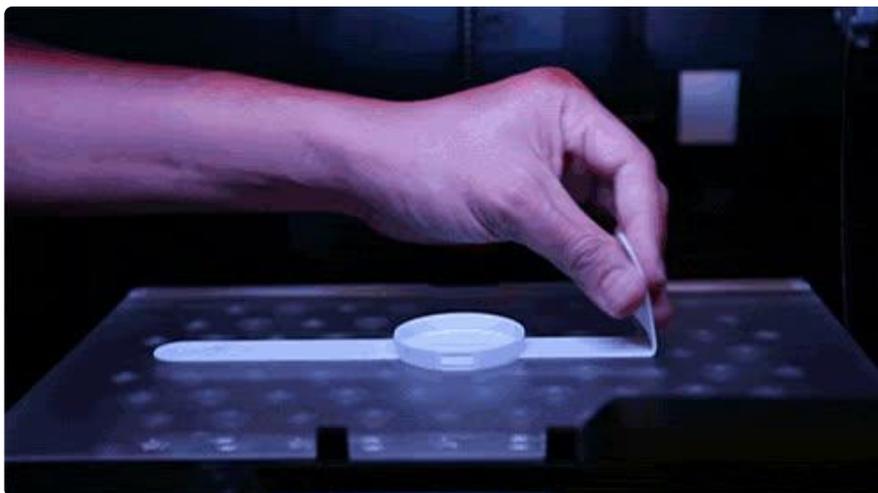
Strength

The stress test in the photo above shows our iPhone bumpers holding 10 pounds of weight. The bumper retained its weight and didn't stretch itself out of its original shape.



Flexibility

In the flex test above, we see the filament can actually be tied in a knot without breaking like PLA and ABS.



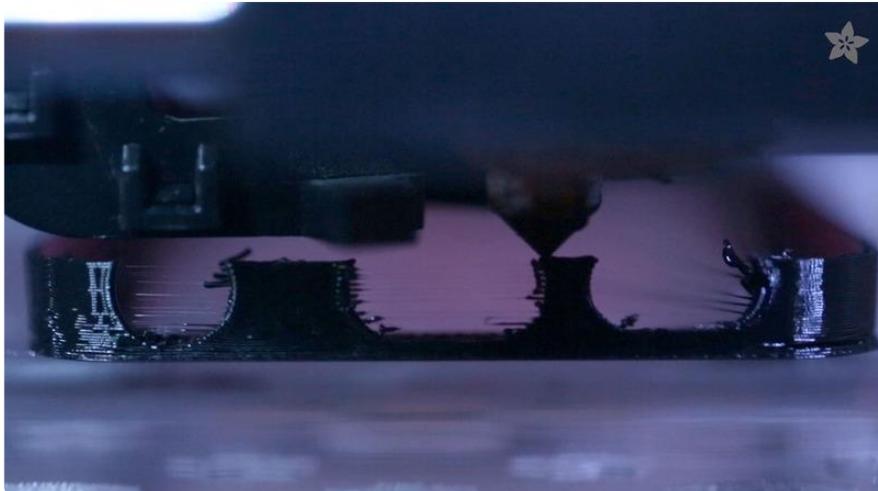
Removal is easy with no spatulas required! Just pull and peel your object right off the build plate!

Tips



Cleaning Prints

Use [flush diagonal cutters](http://adafru.it/152) (<http://adafru.it/152>) or scissors to remove the excess material left behind during the print. You can bend your prints excessively to get in between crevasses and remove tiny artifacts. To remove random tiny leftovers, stretch out the small piece and cut close the surface.



Optimizing Parts

Objects with geometry that make the head move across multiple islands are going to have considerable artifacts that may require clean up.