

The Toranado Precision Geared 1.75mm Extruder

- Significantly lighter than NEMA-17 geared Extruders
- Removable Hot-end sub-assembly for EASY nozzle swaps!
- All-in-one
- All-Metal USA-Made 48p Precision Gears (~5:1 Differential)
- Uses Ultibot's High Performance MK7 Drive Gear
- Modular Design - All parts are easily printable without structure in your material of choice (PLA/ABS/PETG).
- Designed for use with E3Dv6 1.75mm Universal (Original and Clone versions).
- 30mm airflow is captured and directed away from print (prevents contamination with print bed).
- Extraordinarily Attractive (like the one who designed it*).

*Note: There is still some minor discussion as to the validity of the designer being attractive.

Why the Toranado?

We have discussed in our video a few reasons why we developed the Toranado Precision Geared Extruder. Here is some essential background info:

Starting Out with Your Typical Pack-in Kit

Like most hobbyists who choose to build a DIY 3D-printer, the process begins with ordering a frame and kit with the essential 3D-printed components. For popular printers based on the Prusa i3, these kits usually include a "Wade"-style NEMA-17 extruder with 3D-printed gears and a hobbed M8 bolt for driving the filament. This is where we started too!

Identifying the Problems

As we began using our "Wade" extruder, it wasn't too long before we noticed issues with our setup:

- We noticed that filament would sometimes slip or strip on the hobbed bolts from our pack-in kits.
- The options for integrating a 30mm heatsink fan with a 40mm bed cooling fan were limited and clunky - our setups ended up looking silly with large fan ducts hanging off to the side.
- We also had problems with the gear setup. Getting the 3D-printed gear concentric and true to the hobbed-bolt was problematic. And because 3D-printed gears typically have a large pitch between gear teeth, it was difficult to get an adequate gear differential to generate driving torque. To solve this, higher-torque NEMA-17s are typically used - but these motors are heavy (most NEMA-17s weighing in at over 300 grams). In the end, regardless of what we tried, our all-in-one solutions were heavy, bulky, and quite simply - ugly.

All-in-One or Bowden?

One solution was to remove the mass from the print head by pulling the motor and drive gear off to the side (a "Bowden" setup). This, however, introduced another problem we had to deal with - retraction accuracy and ooze from the nozzle. In the end, we were unable to get around this - this problem seems as inherent to the Bowden setup as weight is to an all-in-one. We decided to improve the all-in-one.

The Solution - An "All-in-one" with Balance and Appeal

- First, we decided to strike that perfect balance by using precision gears with a higher gear differential, coupled with a lightweight NEMA-14 motor. The results have been wonderful. We have both adequate torque to drive the 1.75mm filament and much less mass on the print head (some NEMA-17 motors weigh as much as our entire extruder!). The retraction accuracy with the precision gears has also been spot on.
- Since our precision gears also mount on a 5mm shaft, we have the added benefit of eliminating the hobbed bolt and replacing it with a precision drive gear. The MK7 drive gear for 1.75mm filament has been perfect, eliminating the issues with filament slipping or stripping.

- And since we integrated both the heatsink and bed cooling into the extruder assembly itself, we have a small and compact precision extruder with aesthetic appeal.

We feel that the Toranado Precision Geared Extruder strikes the perfect balance between weight and precision, making it a wise choice for hobbyists looking to improve their overall print quality and accuracy - and it is nice to look at too!