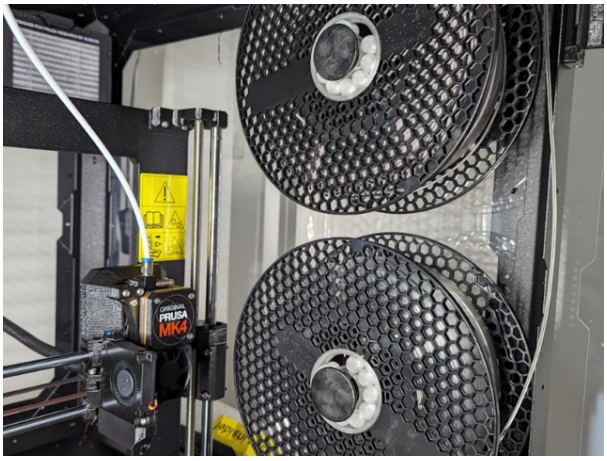
Printables by JOSEF PRUSA



Prusament roller bearing

b8trez

VIEW IN BROWSER

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Summary

Simple and smooth bearing design with minimal supports, waste and space. Perfect for Prusa Enclosure :-)

1.32 hrs	1 pcs	0.20 mm	0.40 mm	PET	15 g	Prusa MK4

3D Printers > Accessories

Tags: prusament bearing

Hello team,

I've only been printing for a very short time, but soon as I loaded a new spool of Prusament, I was not totally satisfied with the rocking / rolling motion of the spool within the Prusa enclosure. After watching a few prints I noticed it wasn't so much the friction causing the problem, but the small key way cut into the spool which occasionally grabbed on the provided spool holders, which are injected plastic.

I started searching for a solution and found a lot of cool designs but the majority relied on external setups to hold spools in various configurations in combination with real metal bearings.

After quite a bit of experimentation and several bearing designs, I settled on a combination of deep groove ball bearings and roller bearings inserted directly into the Prusament spool itself, rather than rely on an external apparatus. I placed a retaining rib through the centre of the inner and outer races, and a corresponding groove on the ‘ball’, which meant;

1. The bearing shoulders could be considerably shorter
2. The ‘ball’ could have a much better contact patch with the printer bed for stability and
3. The ‘ball’ would roll true and straight with a wide contact patch between the races.

To make use of the original troublemaker, I added a key to the outer bearing race to insert into the Prusament spool key way so that the outer bearing race would correctly rotate with the filament. I'm yet to see any other designs making use of this key way and I suspect Prusa themselves use it for winding the filament onto the spools at the factory, so we may as well follow their lead and use this design to our advantage.

Below is a short summary of my design process / testing:

Design 1: Spherical deep groove roller bearing

- Pro: Straight out of the box, fairly good rolling action
- Con: Spheres were troublesome to print on the lower surface which resulted in random “crunchy” feeling

Design 2: “Rolling pin” style deep groove roller bearing

- Pro: Better printing than spheres, but by no means perfect
- Con: Rolling pins immediately pirouetted in place rather that rolling true and jammed the bearing. In addition, the shoulders being ramps provided the ‘balls’ a means of spreading the bearing races, further adding to jams. I also found printing issues whereby the ‘balls’ would detach easily from the print bed, even with adequate support material.

Design 3: “Roller” style with inner / outer ribs and short shoulder bearing - **WINNER**

- Pro: Very smooth operation, immediate success and improved rolling considerably from standard, no more jerking / rocking motion and the spool spins very easily. Not like glass or metal bearings, but very smooth. Makes a nice ‘clink’ sound as it rotates which I enjoy :-)
- Con: Given it's troublesome with this design to add a bearing cage without adding friction, it seems there was an optimal number of 9 bearings. Inserting additional caused more friction; so for those who

like even numbers, this may be annoying, but trying 7, 8, 9 and 10 bearings, 9 was the clear winner :-)

I completed my prints in clear PETG with very minimal support material and they are very satisfying to remove from the bed as all the support material stays in place, lovely, no cleaning necessary on the part itself. I made use of the ‘slab’ to block support material for the majority of the bearing except for just a small amount near the base as per the attached photos.

With respect to all three designs I experimented with fillets Vs. chamfers to get the best mix of friction reduction and good printing quality, but I found a combination of the two was required to get it just right and print perfectly with **zero** excessive overhang. Very satisfying to get that last 5% working in the slicer. The print time is also a respectable 1 hour, 19 minutes with the following settings (attached Prusa slicer project for convenience):

- Filament: Prusa PETG (clear)
- Nozzle: 0.4mm
- System preset: 0.20 SPEED (Modified, see below)
- Support: Support on build plate only
- Support height: Please see image of support blocker slab height position
- Support style: Organic
- Fill density: 25%
- Fill pattern: Gyroid

A very interesting learning process and quite satisfying to solve the problem with a fairly simple design and minimal waste.

I chose not to use any glue on the bearings to attach them permanently to spools, but that would also be possible if you wanted to have a dedicated pair for each spool. I found during testing the bearings didn't fall out of the spools.

Hope you all enjoy,
Cheers from Australia :-)

Model files

prusamentbearingv3-9-roller.3mf

Print files

prusamentbearing-roller-v3-9-roller_04n_02mm_petg_m... .gcode

PET 0.40 mm 0.20 mm 1.32 hrs 15 g Prusa MK4

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