

P.Harmonic Gear Reducer



LoboCNC

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Summary

This gear reducer is a hybrid of a planetary drive and a harmonic drive....

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Tags: [planetary](#) [harmonic](#)

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This gear reducer is a hybrid of a planetary drive and a harmonic drive. It starts off with a conventional set of 5:1 planetary gears. The ring gear has 96 teeth. But then I've extended the planets and sun gears and added an additional flexible gear with 93 teeth, essentially creating a harmonic drive. The overall reduction 155:1.

It's no surprise that the estimable emmett has also designed a hybrid planetary/harmonic drive - <https://www.thingiverse.com/thing:219779> - but this one uses a significantly different structure. The flexible gear is coupled to the output ring with flexible fingers rather than with a flexible cup, and the output ring is supported by a ball bearing using 6mm dia airsoft pellets for balls.

I designed this to mount on a standard NEMA 17 stepper motor, although you can demonstrate by hand it without a motor, or the ball bearing, in fact.

Final note: This is mostly just a demonstration gear reducer not intended for extended use. I printed mine out of PLA and after about 15 minutes of high-speed use, the flexible gear cracked. Printing out of other materials may give a longer life, but really, any 3D printed gears are not really suitable for high speed or extended use.

Print Settings

Printer Brand:

MakerGear

Printer:

MakerGear M2

Rafts:

Doesn't Matter

Supports:

No

Resolution:

0.2mm

Infill:

15%

Notes:

The gear teeth on this model are pretty tiny and I printed them with a 0.32 mm line width. Although a 0.35mm line width would work as well. The conventional wisdom is that you shouldn't use a line width thinner than your nozzle diameter, but you can cheat on this a little bit. My Makergear printer has a 0.35mm nozzle, but even with a 0.4mm nozzle, you can get away with a 0.35mm line thickness.

Post-Printing

Assembly & Use

To attach the drive to your motor, you will need four M3 flat head screws, a 6-32 nut and a 6-32 set screw. To assemble the bearing, you will need 38 6mm dia airsoft pellets.
Start by screwing the rigid ring gear housing to the end of your motor. Next, place 3 of the 36t planet gears in the positions around the ring gear at the 3 fiducial marks. Carefully slide the

24t sun gear over the motor shaft to engage all 3 planets. Make sure that all 3 planets can still align with their fiducial marks. Add your nut and set screw to the sun hub and tighten onto the motor shaft.

The tricky part is stretching the flexible gear over the 3 planets so that it is exactly centered within the housing. Once in place, rotate the sun gear so that the cutouts for loading the bearing balls line up. Pop 38 balls into the opening and tease them around the perimeter of the bearing races with something pointy. You are now ready to roll.

Category: Engineering

Model files



sun24.stl



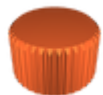
ring93.stl



ring96.stl



pharmonic.step



planet36.stl

[Find source .stl files on Thingiverse.com](#)

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