The motor I used is the DCH-6829F motor from JD power.

This is a good choice, it’s a bit expensive but works well.

Little coggy for my liking.

The best so far as of feb 13 2025 is the version 16 primary combined with version 10 secondary, and about 3-4 mm spacing between them. The version 6 frame can be used, the frame in the v10 or v16 files should also work fine, they are almost the same and should be compatible.

At 390 rpm with version 11 primary and version 10 secondary, with 4 mm spacing between them for ten minutes, the motor was 50 degrees C, so definitely a bit warm. Probably higher powers are not practical.

I tried a smaller one and it wasn’t abe to provide the torque. The higher the airflow for a given rpm the higher the torque of course since air power is similar, so we are generally looking at pretty high torque.

I used rubber orings, 3 mm silicone rubber (2.5 mm id 3mm thickness), and also tried rubber washers and some silicone gel pads (made for damping cymbals, easy to get on amazon, cut them up and poke a hole in the middle for a very squishy washer).

I chamfered the holes near the silicone orings with a drill bit, this also helps as it holds the bolt in the center of hte hole. An oring goes on either side of each through hole, so there would be 16 orings in total (2 on each side of 4 holes). There needs to be a washer under the head of the screw to contain the oring. They are M3 screws.

**\*\*do not use screws that are too long, if they go through and hit the coils of the motor it can break the coils and destroy the motor\*\*\*.**  Be very careful about this. The orings compress and the screws stick in to the motor more than first appears. Use washes under the head of the screw to shorten the stick out length if you have to.

Use the prusa slicer with adaptive layer slicing, and a 0.6 mm nozzle, I think 1.2 mm would work even better, the geometry is about right for that, in many areas a 0.6 has to do two roads, but a 1 mm could do only one road, and thicker layers in many areas. Could be a lot faster. I used 0.27 for the quality/speed tradeoff and that worked ok, for the adaptive slicing, with a 0.6 mm nozzle.

The high overhang areas benefit from thin layers, 150 microns is ok in my experience, for the first 5 mm or so of the primary, for instance.

Use a brim. I recommend bed weld it is a good bed adhesive.

Use an MPLA, not standard pla. Standard suffers from stress cracking and isn’t as strong. I use jayo MPLA white, it’s cheap and works well.

The driver is a B-G431-ESC1 board programmed in arduino. You neeed to install arduino, install simpleFOC and SimpleFOC drivers libraries (they might go together now) and then you can compile and upload it to the board with the arduino interface. The wiring is actually very flexible because the motor driver auto detects and compensates. If the fan goes the wrong way, switch two of the motor wires and two of the hall sensors. But they generally go in order, A is U   
B is V, C is W. I forget what they call them on the datasheet/manual of the board.

**Warning.: flaw discovered in motor driver program jan 25 2025, on rare occasions it doesn’t read the hall sensors quite right on startup, and as a result the magnetic field does not produce torque, thus the motor just sits there getting hotter and hotter, beware. Again this stuff is all just a prototype at this stage!**

I recommend pluggable screw terminal connectors 3.81 mm pitch.

Note on actually using the fan dec 9 2024: The driver is made so that it does a sensor align, and if all is good it will start ramping up the motor to full speed. As of jan 18 2025 the voltages are about right, they can be adjusted in the program, 300 rpm is reached at about 18.6 volts input.

If the voltage is too low it will fail the sensor align because there isn’t enough torque. The B-g431-esc1 board does not operate at less than about 7 volts so don’t do that or it will fritz out and restart repeatedly etc.

The v6 fan with the spacing between the primary and secondary of 3 mm gets about 1980 CFM at 2.86 pascals, so probably about 2200 free flow, with only 15.6 watts of input power. The motor seems to be pretty efficiency and does not even get warm, if it’s 80 percent efficient then only 20 percent of that 15.6 watts goes into heating the motor. The latest as of jan 27 2025 is the v11 primary with v10 secondary, 4 mm spacing, it gets about 3.8 pascals. Hoping to up that to 4 by increasing the thickness of the blades by extending the low angle of attack region of the primary.

You could measure the coil resistance by monitoring the voltage minus back emf (have to know the KV rating of the motor precisely) to current ratio and try to detect if the motor is getting too hot. Or a sensor glued to the casing. The rubber orings also protects the plastic some. The first thing to fail when the motor gets warm would be the plastic, that would probably be the limit for long term average power.

I plan to use a ptc thermistor with a critical temperature of 60 degrees and a 5 kohm resistor across the motor driver terminals to provide protection against motor overheating in the future. Also the motor drive will include stall and overload detection (simple rpm monitoring, if the rpm gets too low it cuts power till rebooted)

I have included several .3mf files. These files are for Prusa Slicer, they contain the settings for speed and the various things like z-hop and retraction that I have found to work reasonably well. They are all similar, with only minor variations as I continue experimenting, The z hop is currently causing problems because small blobs are left which the nozzle runs into, eventually breaking the heat break and causing damage and a print failure. Without z hop it can snag on things though, the curved blades will stick up above the printing plane slightly due to thermal contraction. Unfortunately the variable layer height is not included in the files which is kind of silly.