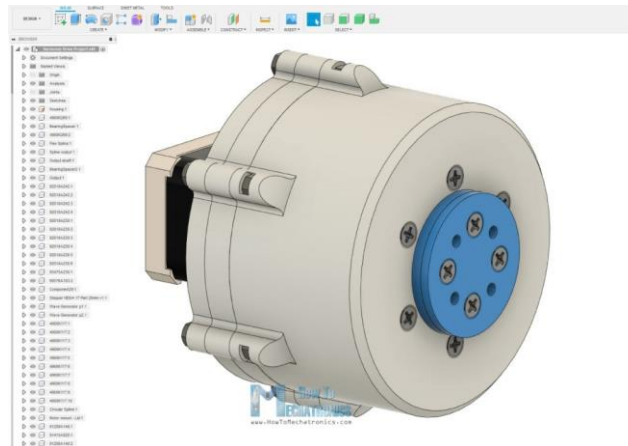
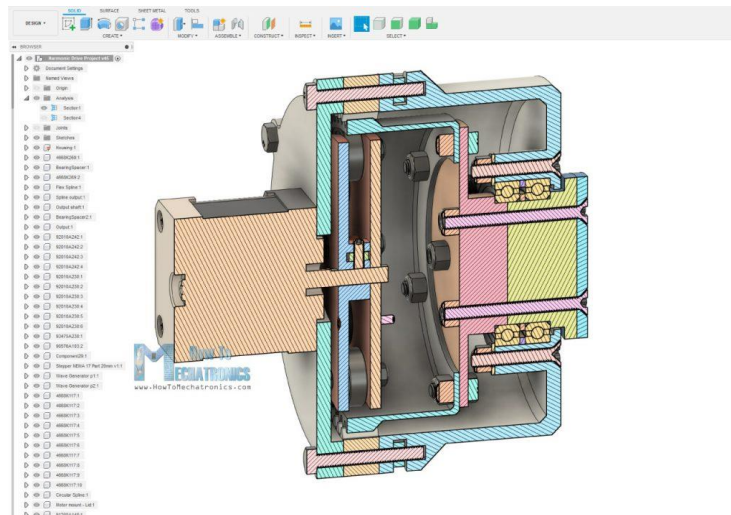


## Strain Wave Gear – Harmonic Drive 3D Model

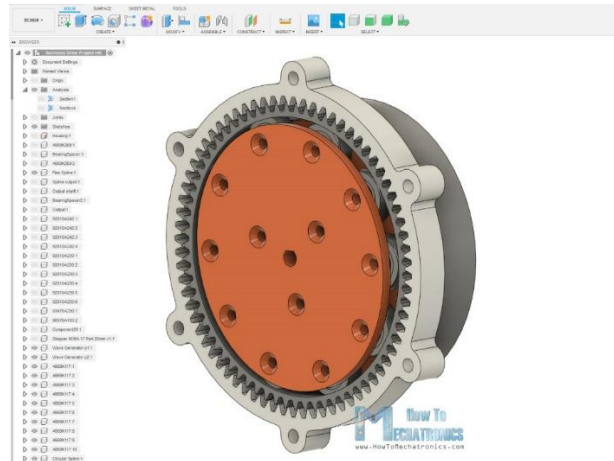
Ok, so now as we know the theory behind the Strain Wave Gear, let me show you how I designed one so we can build it with just using a 3D printer.



I designed this model of Strain Wave Gear using Fusion 360. All of these parts can be 3D printed, so we just need some bolts and nuts and some bearings to complete the assembly. As for input I chose to use a NEMA 17 stepper motor.



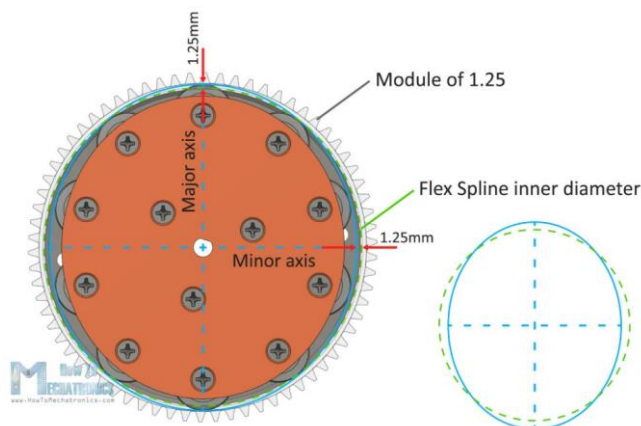
Here's how I designed the 3 key elements of the Strain Wave Gear, the circular spline, the flex spline and the wave generator. As 3D printers have their own limitations how good, accurate and precise can print, the first that I had to decide was the module of the gears or how big or small the teeth will be. I chose a module of 1.25 and 72 teeth for the circular spline.



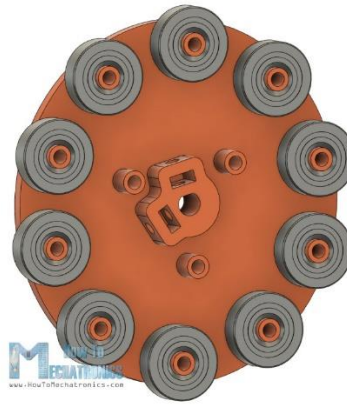
Of the course, the flex spline needs to have 2 teeth less, or that's 70 teeth. That will result in 35:1 ratio while having a relatively small size of the gear set.

As for the wave generator, we cannot really use those special type of thin wall bearings mentioned earlier, as they are not easy to find. Instead, we will use normal ball bearings arranged around a circumference of an ellipse. The dimensions of the ellipse should be made according to the dimensions of the inner wall of the flex spline.

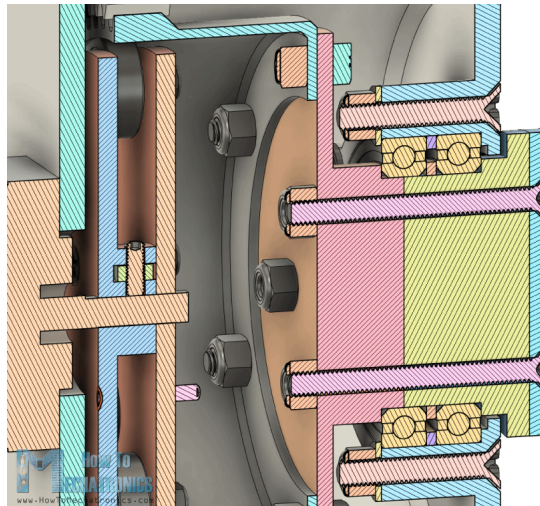
I made the major axis radius of the ellipse to be 1.25mm bigger that the radius of the inner wall of the flex spline. On the other hand, the minor axis radius of the ellipse is 1.25mm smaller.



The wave generator will be made out of two sections on which the 10 bearings can be easily attached. One of these sections also features a shaft coupler suitable for securing the NEMA 17 stepper motor.



The rest of the parts are designed around these 3 key components. On the output side of the housing we will insert two bearings with 47mm outer diameter, and we will secure them with the help of some bolts and nuts.



The output flange is made out of two parts connected with bolts and nuts so we can easily secure it to the two bearings.