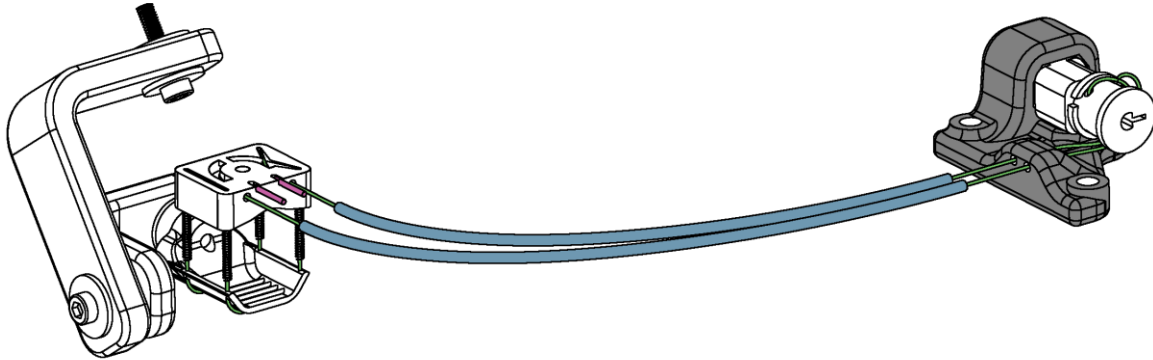


# Autogrip Assembly Guide

## Version 1.0



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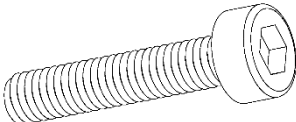
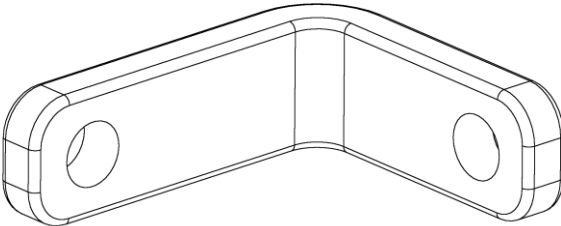
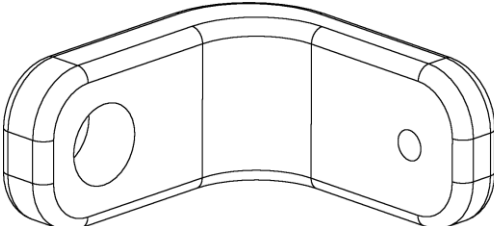
### Introduction:

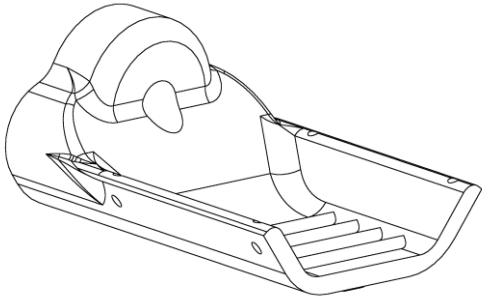
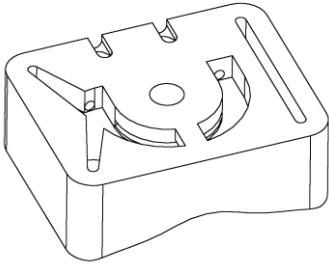
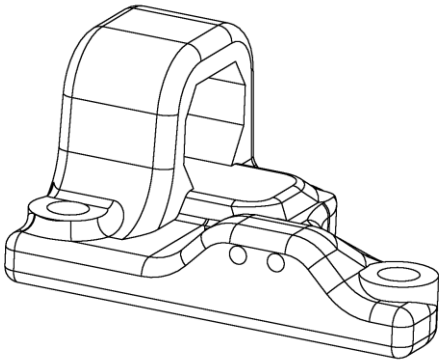
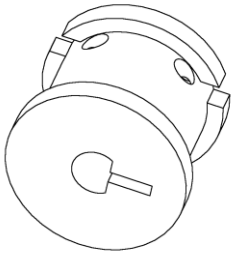
This document contains instructions for assembling Autogrip, an autonomously attaching thimble for haptic / force feedback devices.

The next section in this document is the part index. This lists all of the major components needed to assemble an Autogrip thimble. This is followed by sections of step-by-step instructions to assemble the parts.

## Part index:

Part reference	Description	Image
N20 Motor (30 RPM)	DC motor used for the actuator	
Nylon fishing line (~0.5mm diameter)	Used to connect the actuator to the thimble sections	
Electrical wire	Single core electrical wire for the capacitive sensor (remove insulation)	
PTFE Teflon tube (~1mm ID, 2mm OD)	Used as Bowden tubes to connect the thimble to the actuator	

Pen spring	<p>Quantity: 4</p> <p>Used to keep the thimble sections apart. Approx. 2mm diameter and 14mm length.</p>	
Flanged bearing (3mm ID, 8mm OD 9 mm flange)	<p>Quantity: 6</p> <p>Used for the gimbal sections</p>	
M3 15mm cap Bolt	<p>Quantity: 3</p> <p>Used for the gimbal sections</p>	
Gimbal part A	<p>3D printed (gimbal_a.stl)</p> <p>100% infill</p> <p>wider nozzle is better (0.6-0.8mm)</p>	
Gimbal part B	<p>3D printed (gimbal_b.stl)</p> <p>100% infill</p> <p>wider nozzle is better (0.6-0.8mm)</p>	

Thimble part A	<p>3D printed (thimble_a.stl)</p> <p>100% infill</p> <p>smaller nozzle is better (0.2-0.3mm)</p>	
Thimble part B	<p>3D printed (thimble_b.stl)</p> <p>100% infill</p> <p>smaller nozzle is better (0.2-0.3mm)</p>	
Actuator chassis	<p>3D printed (actuator_chassis.stl)</p> <p>medium infill</p> <p>wider nozzle is better (0.6-0.8mm)</p>	
Actuator spool	<p>3D printed (actuator_spool.stl)</p> <p>100% infill</p> <p>smaller nozzle is better (0.2-0.3mm)</p>	

## Assembly Guide:

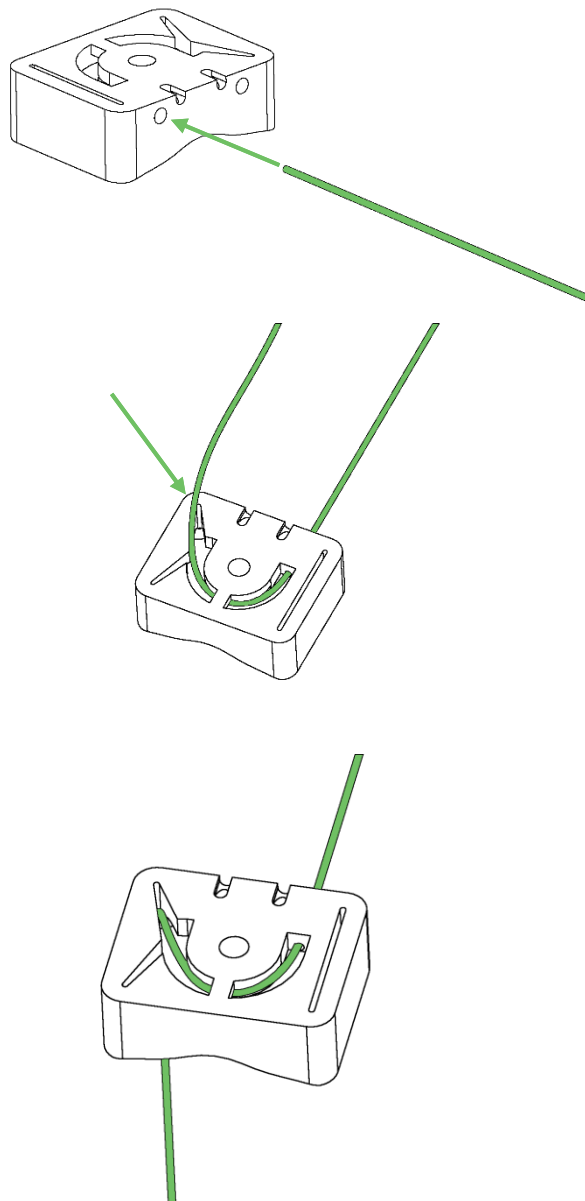
### Step 1, cut the bowden tubes to length

Decide how long you want the Bowden cables for your thimble. We advise mounting the actuator near the base of the haptic device to reduce inertia. (we used roughly 40cm for a phantom 1.5)

Cut two lengths of PTFE tube with scissors or wire cutters.

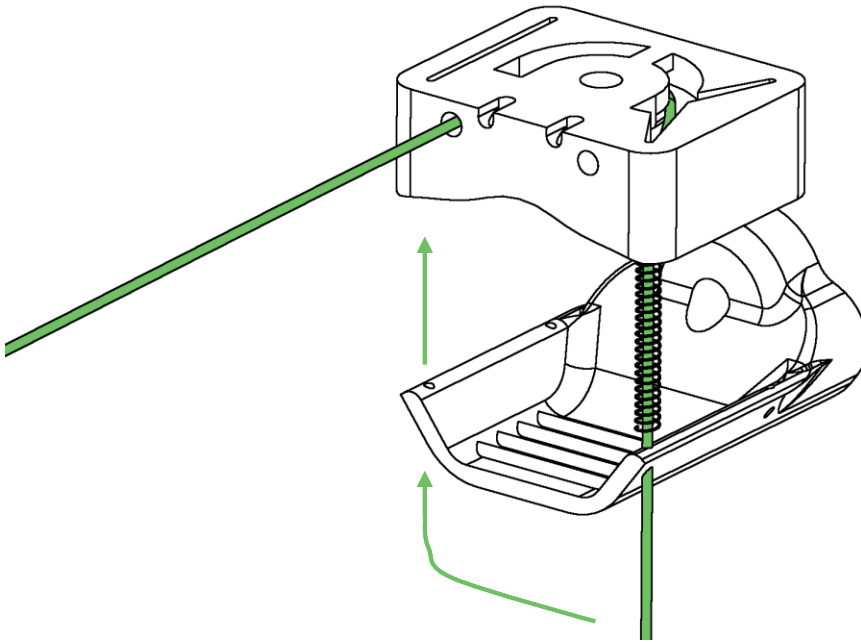
### Step 2, start winding the fishing line through the thimble

Take the end of the fishing line (do not cut it from the reel yet) and pass it through Thimble part B as shown:

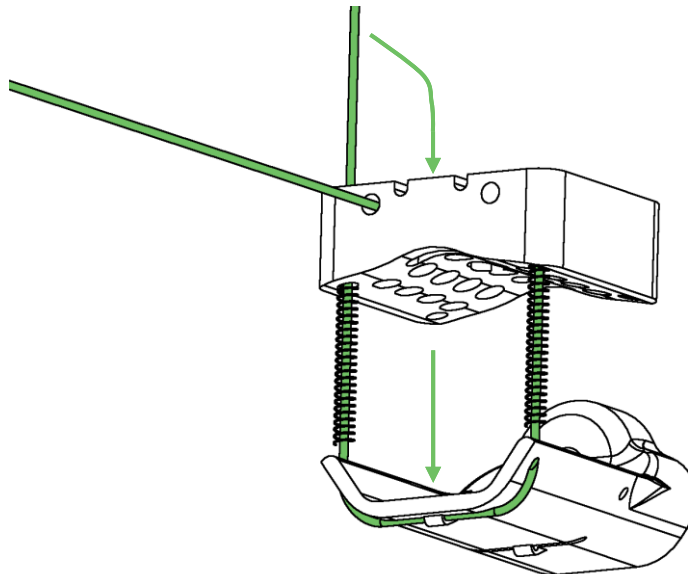


### Step 3, Attach Thimble part A

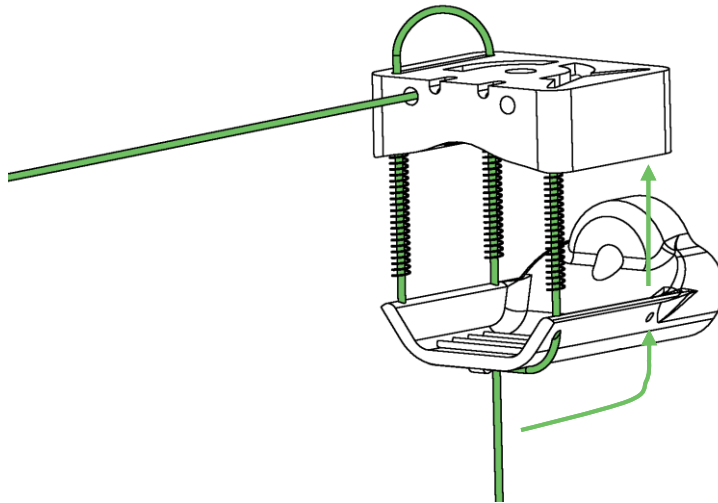
Pass the fishing line through a spring and then through thimble part A:



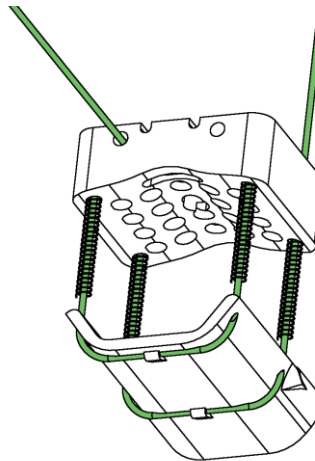
Wind around thimble part A, back up through a second spring and back into part B



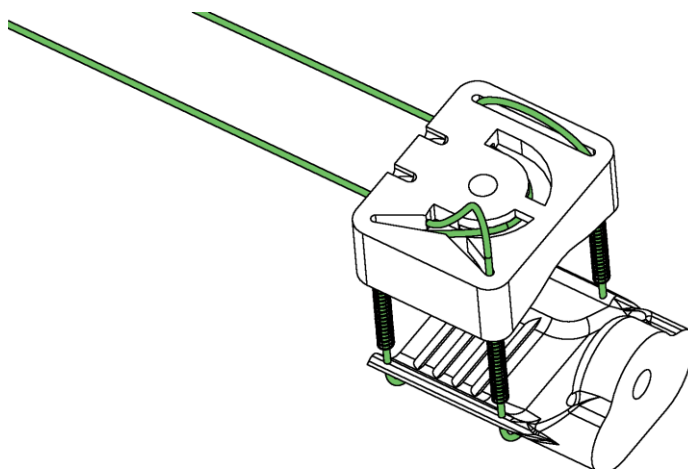
Wind back through part B, through a third spring and into part A



Wind around thimble part A, back up through the fourth spring into part B

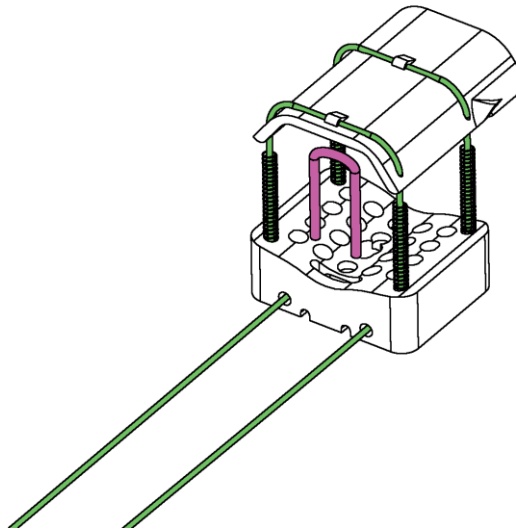


Finally, route back out the front of part B

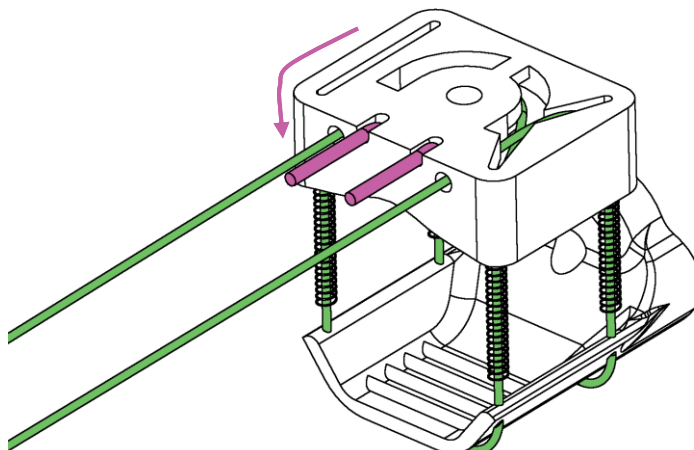
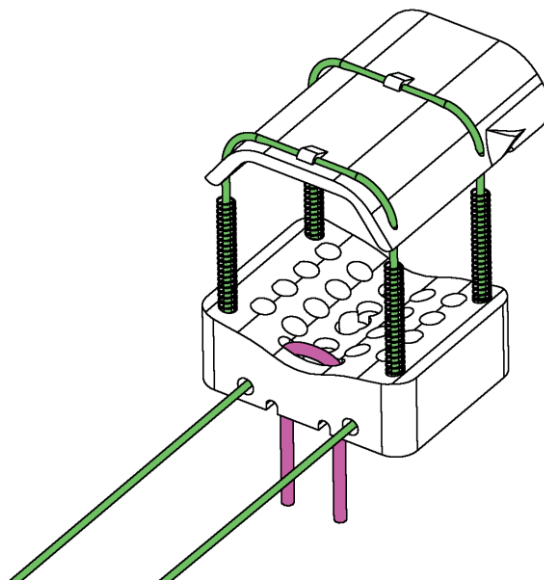


#### Step 4, Install the capacitive antenna

Cut a short piece of single core electrical wire and bend it as shown (pink):



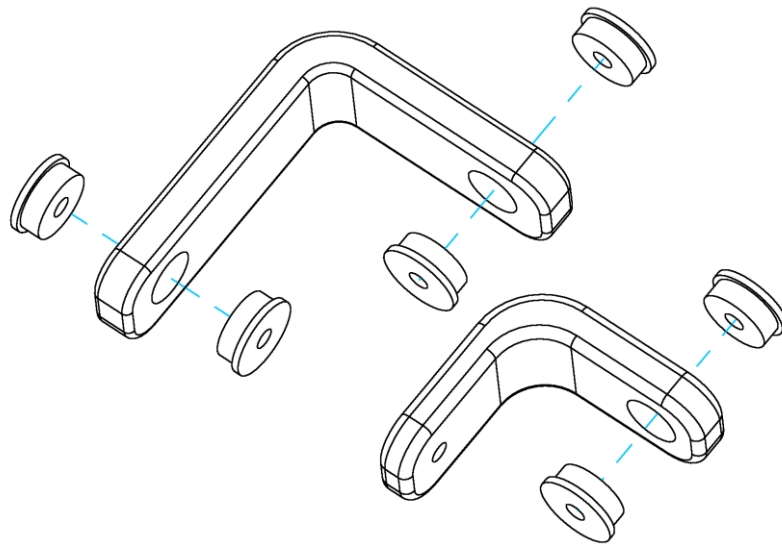
Press into thimble part B, and bend the ends



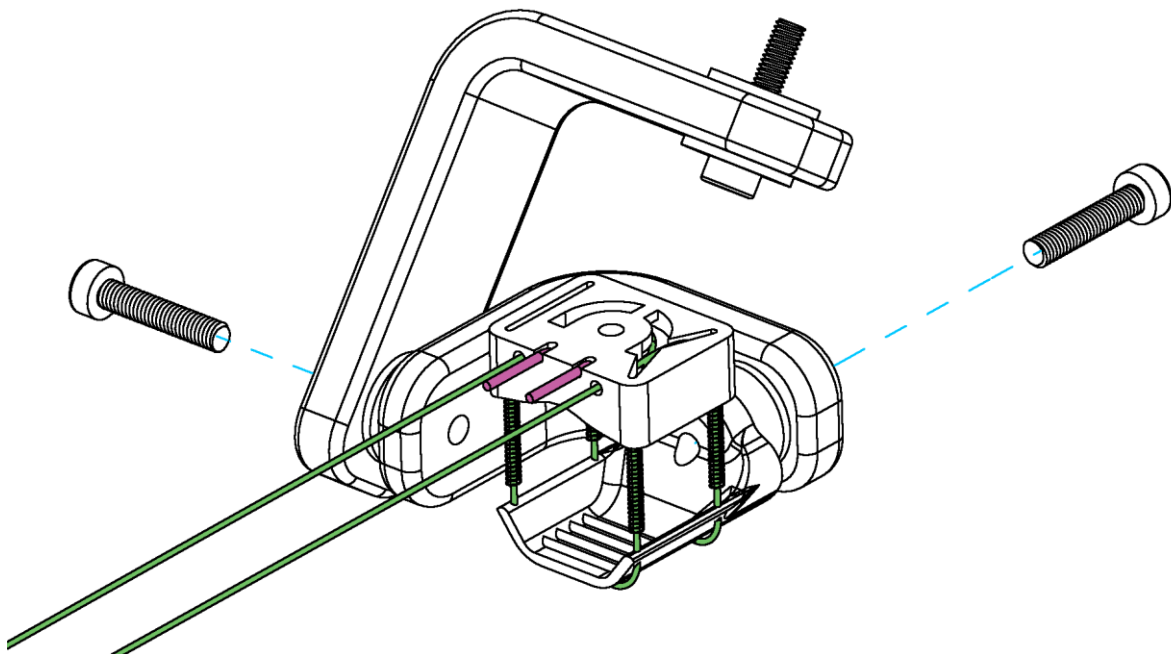


### Step 5, make and attach the gimbal

Press the bearings into the gimbal sections:



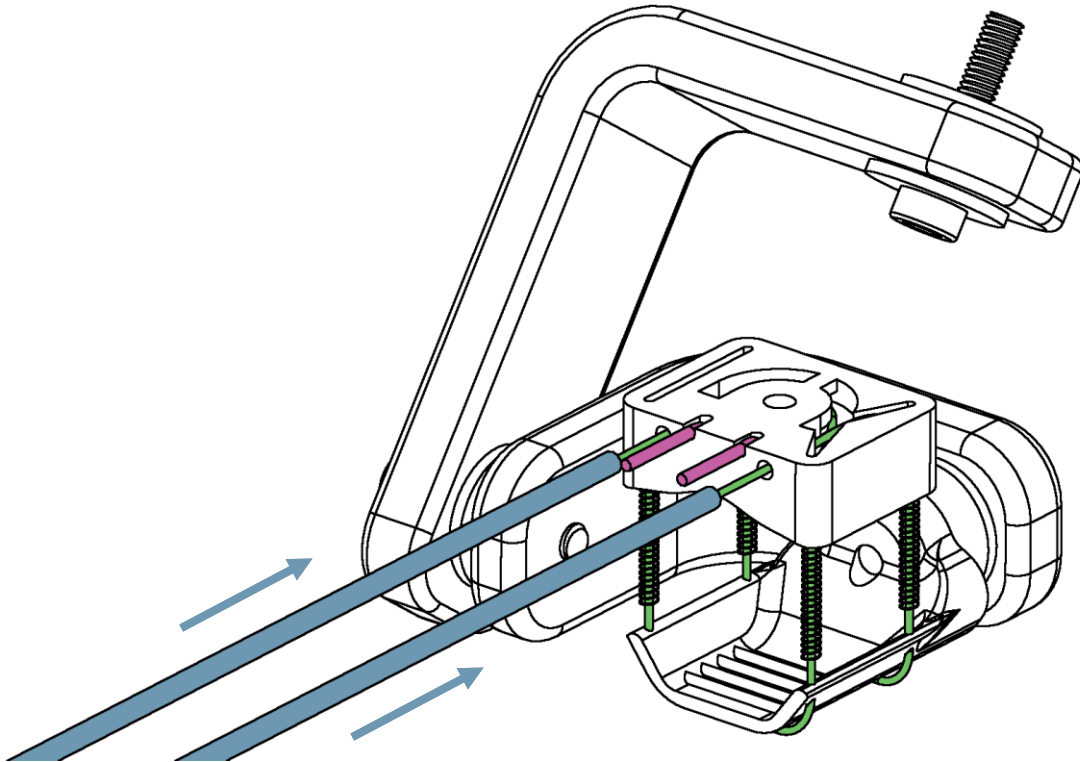
Screw the bearing and thimble sections together:



#### Step 5, install the Bowden tubes

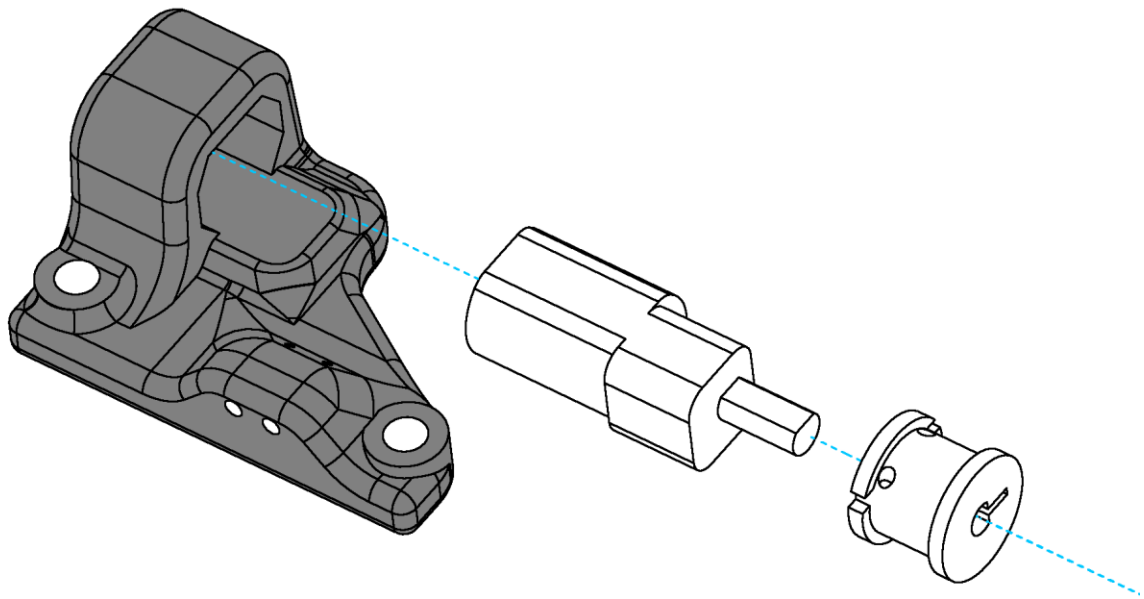
Cut the fishing line to length with scissors. Leave plenty of length to ensure both ends are long enough to pass through the Bowden tubes and tie onto the actuator.

Slide the fishing lines through the PTFE tubes from step1 (blue):

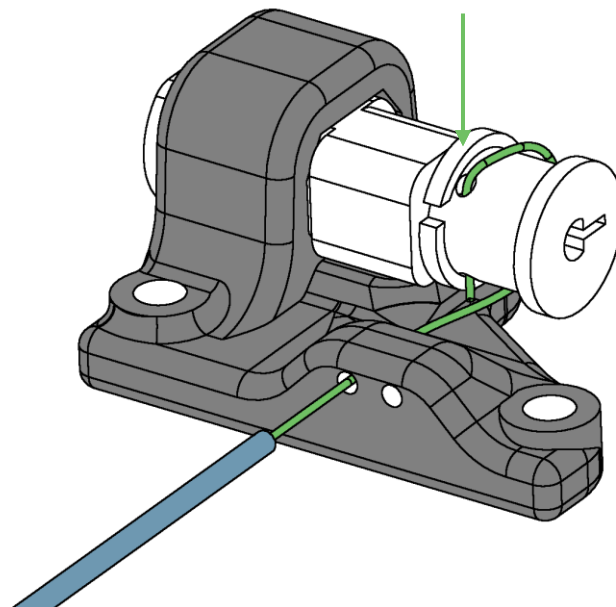


Step 6, build the actuator unit:

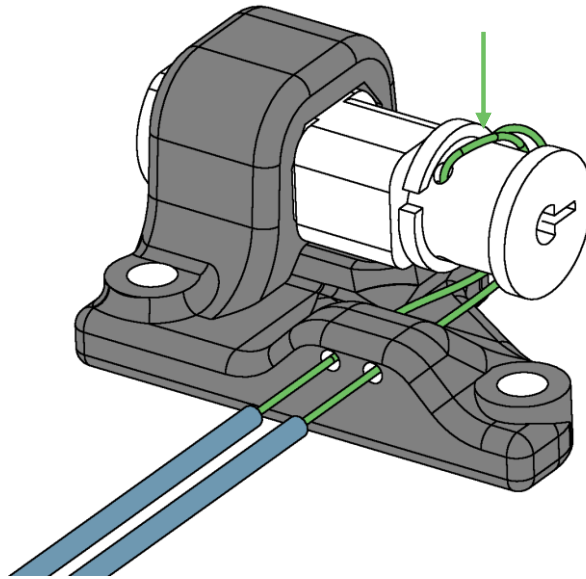
Press the spool onto the motor shaft and the motor into the chassis:



Take the first fishing line from the thimble, pass it through one hole as shown, under and around the spool and tie it through the hole so it can't pull out.



Repeat for the other end of the fishing line, tying it around the second hole in the spool:



Finished!

