Cyclops

D3vil Design x LDO

D3VIL DESIGN BY OMRANELLO

LDO MOTORS

Introduction

The D3vil Designs "Cyclops" extruder was specifically engineered to address issues associated with the stock Creality K1 / K1 Max extruder. Not only is the Cyclops a seamless direct drop-in upgrade, but it also draws on proven technology from the Orbiter 2 project. This integration enables the Cyclops to inherit superior functionality and performance improvements, including but not limited to:

- Retraction speeds up to 120 mm/s
- Acceleration up to 3000 mm/s^2
- A powerful LDO Motor
- Large precise drive wheels for increased filament grip
- Improved and direct filament path to meet your needs (PLA, PETG, ASA, ABS, TPU, etc.)

This document serves as a reference guide. For optimal results, users must exercise care and attentiveness during the assembly and installation processes. Neglecting to adhere to the provided instructions may lead to suboptimal performance.

Note: This extruder requires root access to your printer.cfg in klipper.

What's in the box?

Purchase the kit: US EU Other

Bag #	Quantity	Item
N/A	1	LDO-36STH20-1004AHG
1	1	Orbiter cammed shaft
2	1	POM bushing (ID 4.0mm x OD 8.0mm x 11mm)
3	2	Orbiter filament dual drive gear set
4	3	Delrin orbital gears
4	1	Orbital Gearbox Housing
5	3	Orbital MR85 bearing (ID 5.0mm OD 8.0mm x 2.5mm)
5	1	MR128 bearing (ID 8.0mm x OD 12.0mm x 3.5mm)
5	1	MF148 bearing (ID 8.0mm x OD 14.0mm x 4.0mm)
6	1	Tensioner arm pivot pin (OD 3.0mm x 17.0mm)
6	1	Idler gear pin (OD 4.0mm x 16.5mm)
7	4	M3x5x4 Threaded Insert
7	1	Stainless steel filament guide
7	1	Tensioner screw/spring assembly
7	1	M3x16mm SHCS
7	1	M3x30mm SHCS
7	1	M3x18mm BHCS

Assembly

Prepare yourself, we are about to turn the lights on!

Fire up your Printer!

The Cyclops extruder consists of the purchased hardware kit and 2 printed parts shown below:

Suggested Print Settings:

- ABS, ASA, Nylon, or Polycarbonate
- 0.4mm nozzle with 0.1-0.2mm layer height
- Minimum 4 Wall Loops
- Minimum 4 Top and Bottom Layers
- ~25% Gyroid Infill

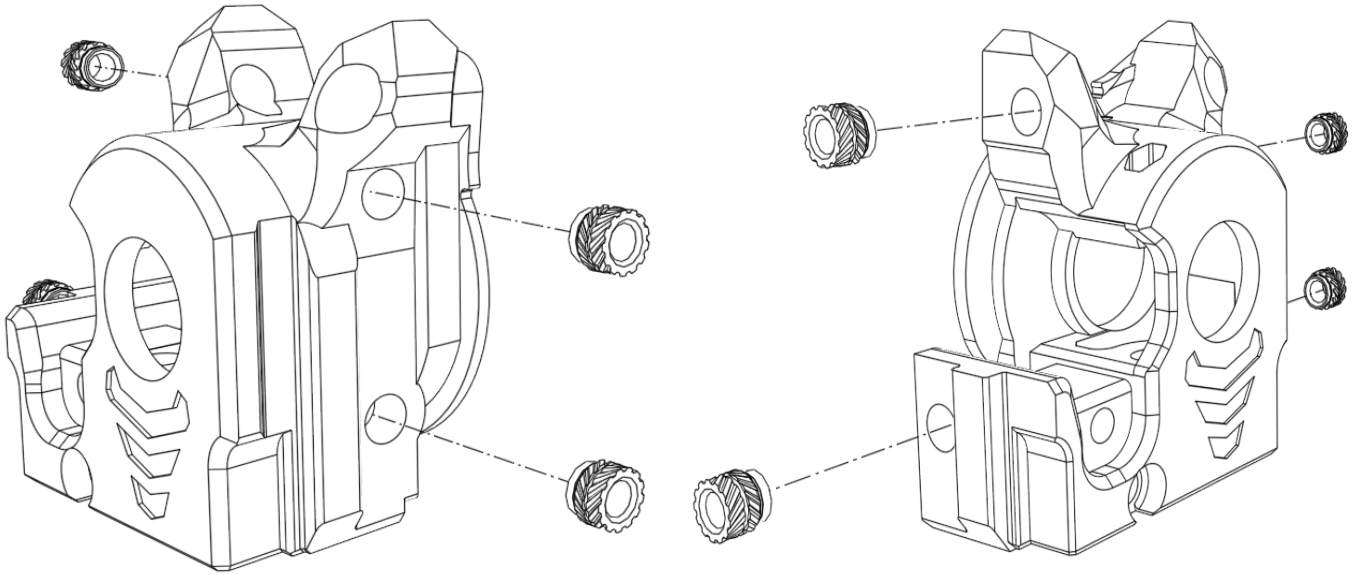
Cyclops Main Body

Cyclops Tensioner Arm

Gather your Tools!

- Soldering Iron
- 100mm of filament
- H2.5 Allen Key
- H2.0 Allen Key
- H1.5 Allen Key
- Flathead Screwdriver

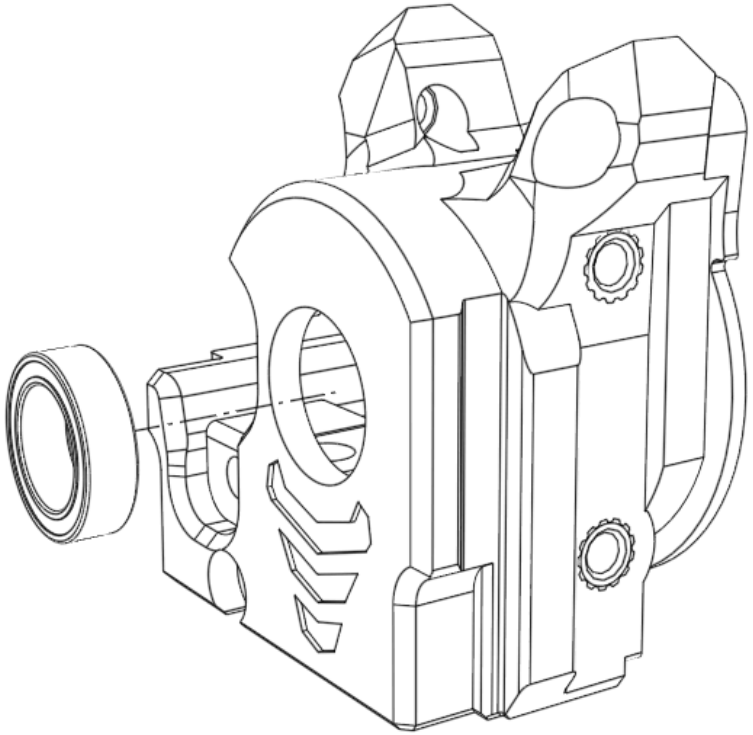
Step 1



Using a soldering iron, carefully place the threaded inserts until flush as shown above.

For best results and to prevent bulging of material use constant pressure at a lower heat around roughly 200-250 °C. It is best practice to use either an additional M3 threaded insert as a spacer or to use a threaded insert specialty tip like the CNC Kitchen sets.

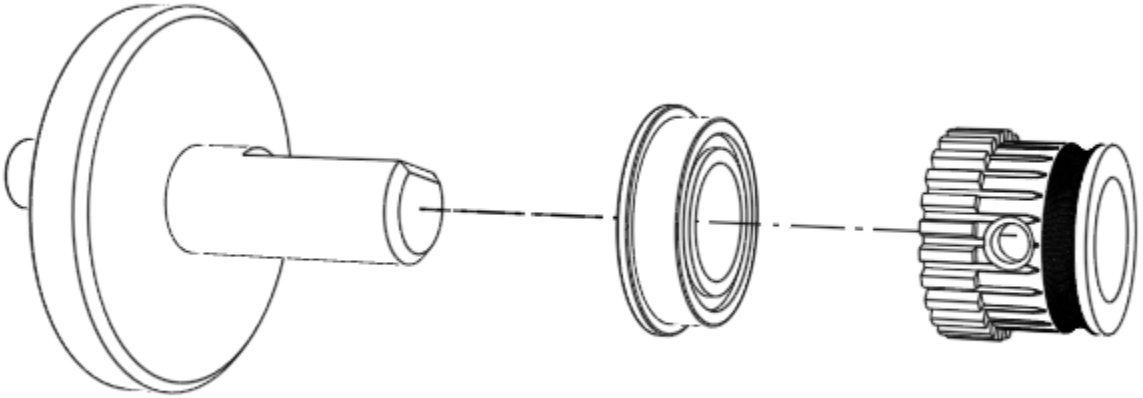
Step 2



Insert the MR128 bearing into the front opening till it is flush with the front face.

This may be a tight fit as it is meant to be press fit into this opening. If you cannot get it to fit properly, use a 12mm reamer or deburring tool to incrementally remove material till fitment can be achieved (be careful it may not take much).

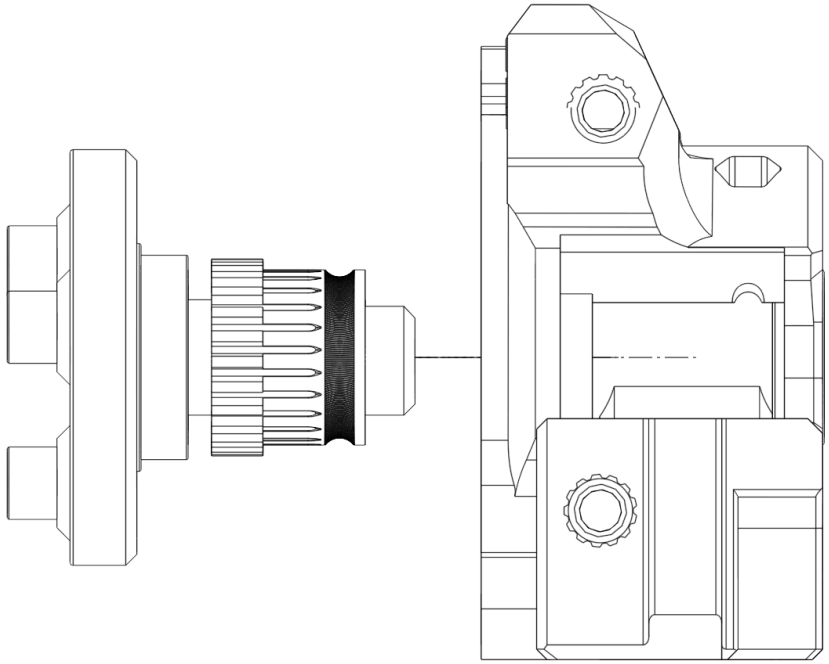
Step 3



Assemble the drive shaft as follows using the Orbiter cammed shaft, the MF148 bearing, and one of the filament drive gears.

This will make alignment and install of all 3 components easier.

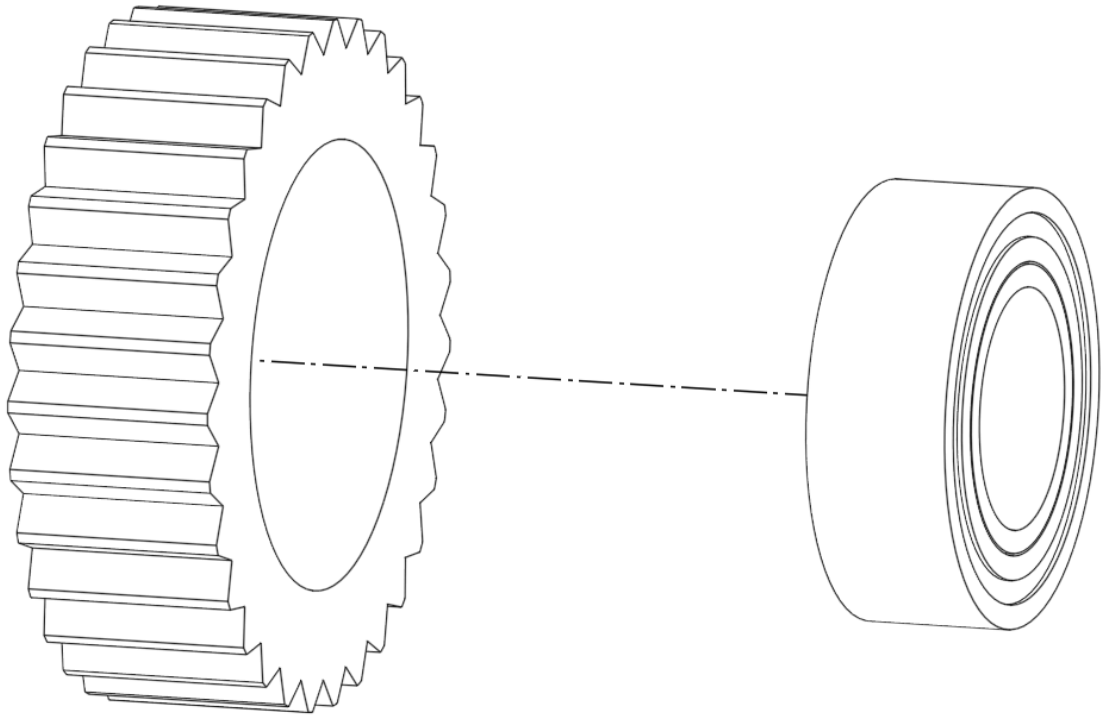
Step 4



Insert the newly assembled drive shaft stack from Step 3 into the rear of the housing, carefully feeding the shaft through the MR128 bearing installed in Step 2 at the front.

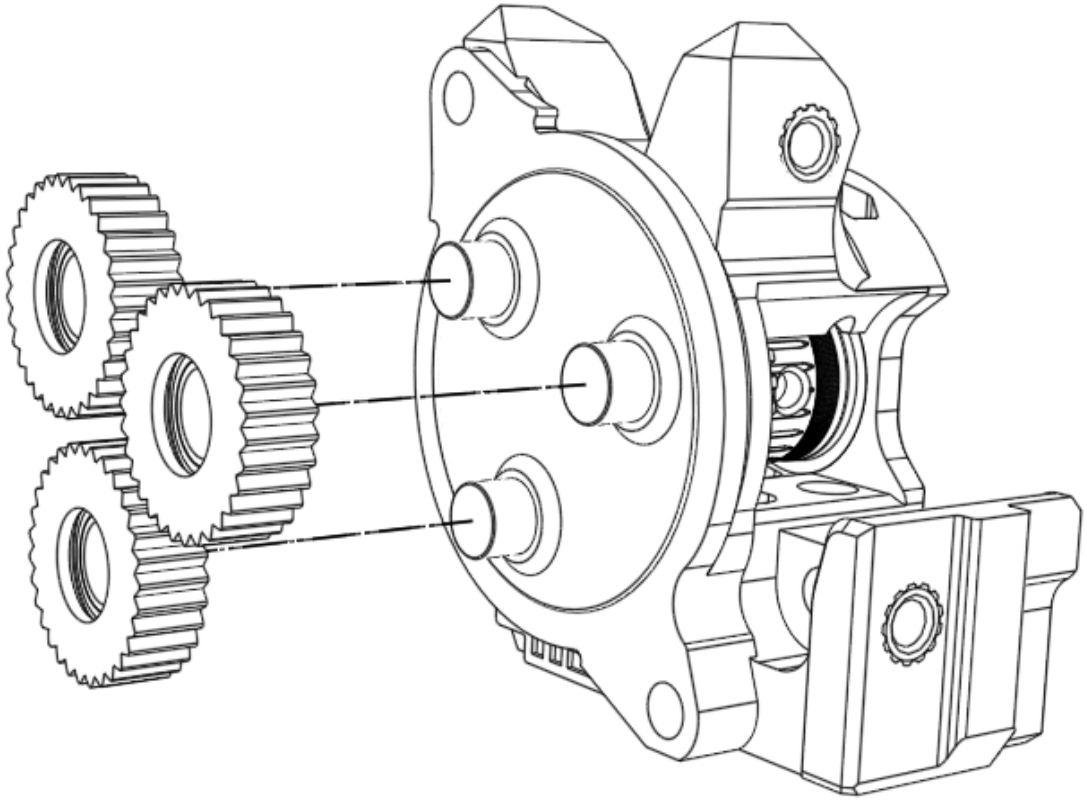
Once seated apply pressure from the rear till the flanged MF148 bearing seats itself into the rear of the housing.

Step 5



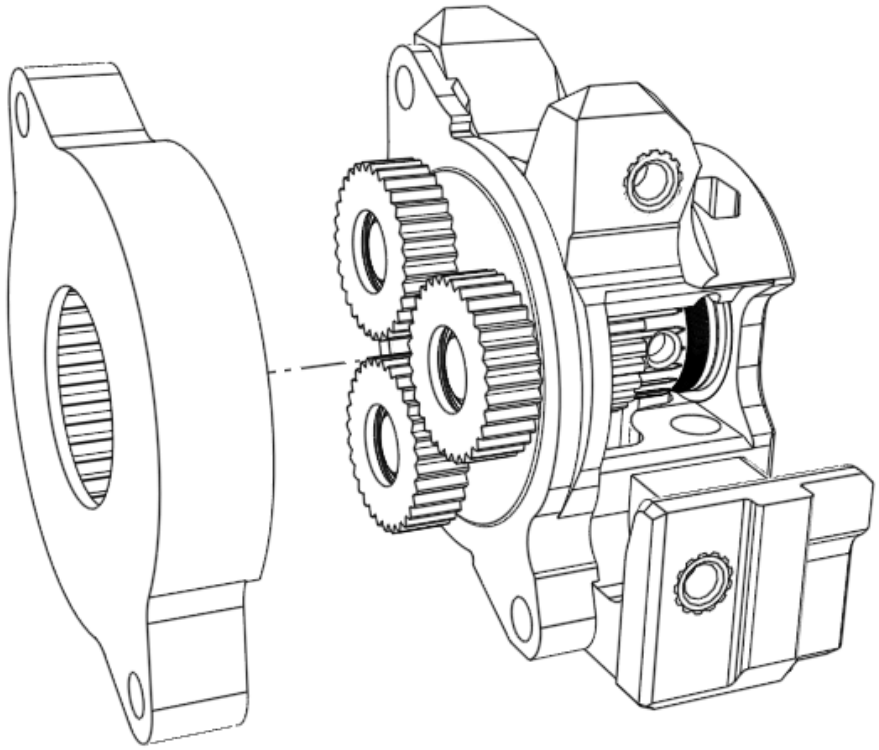
Insert all 3 of the provided MR85 bearings into all 3 of the Orbital gears.

Step 6



Place all 3 of the orbital gear assemblies made in step 5 onto the shafts of the backside of the cammed shaft.

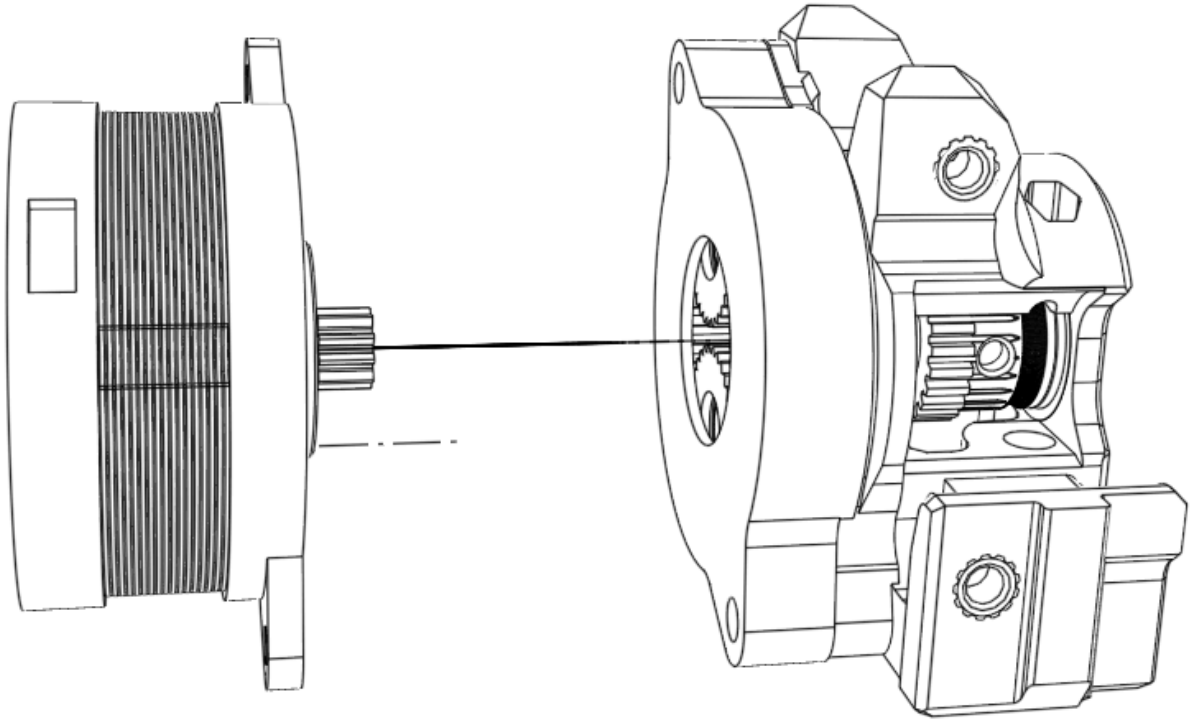
Step 7



Clear out any debris and add a generous amount of lubricating grease around the gears, then place orbital gear housing over the orbital gears, twisting clockwise and counterclockwise until the gears seat.

If they are seated correctly, spinning the housing should also spin the individual gears inside.

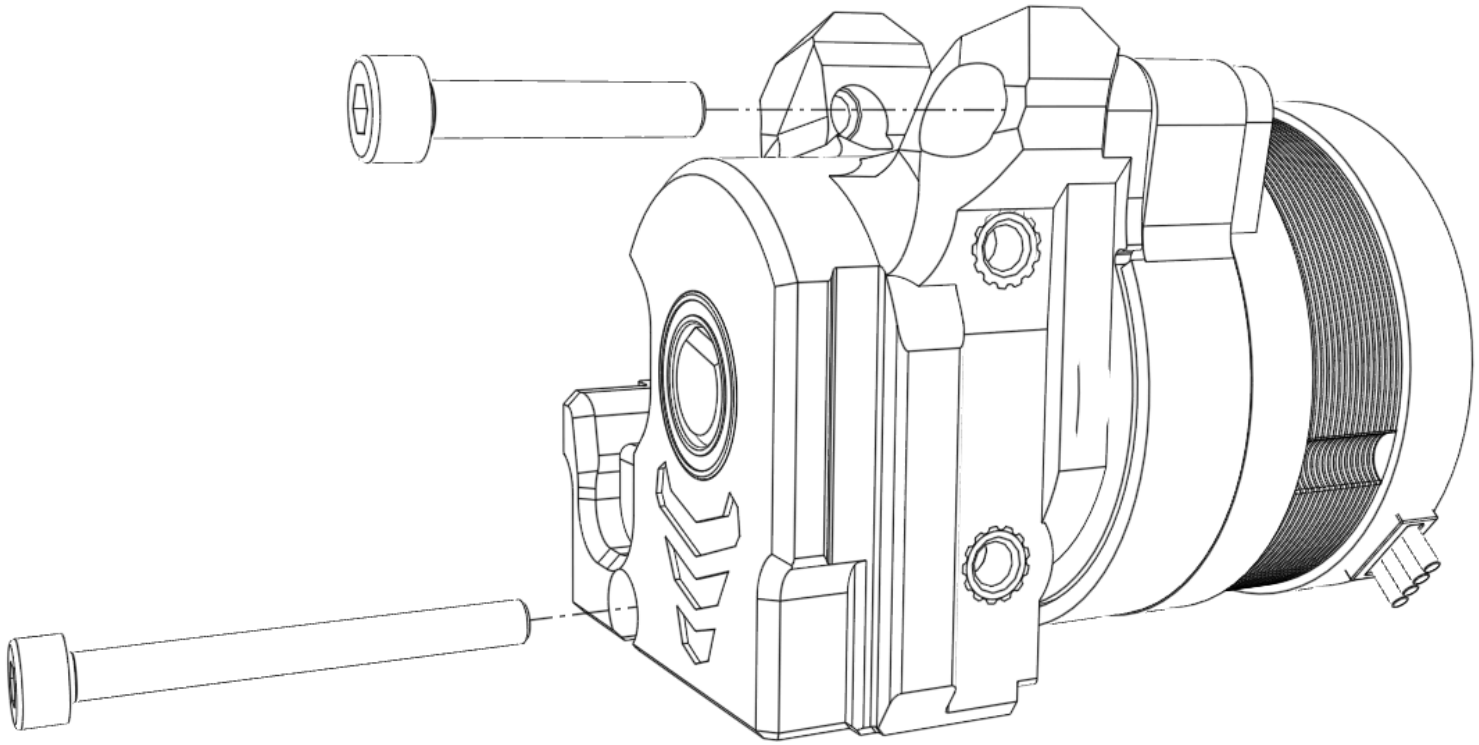
Step 8



Insert the motor into the rear of the assembly, being careful to get the 10T gear on the motor to mesh with 3 orbital gears in the orbital gear housing.

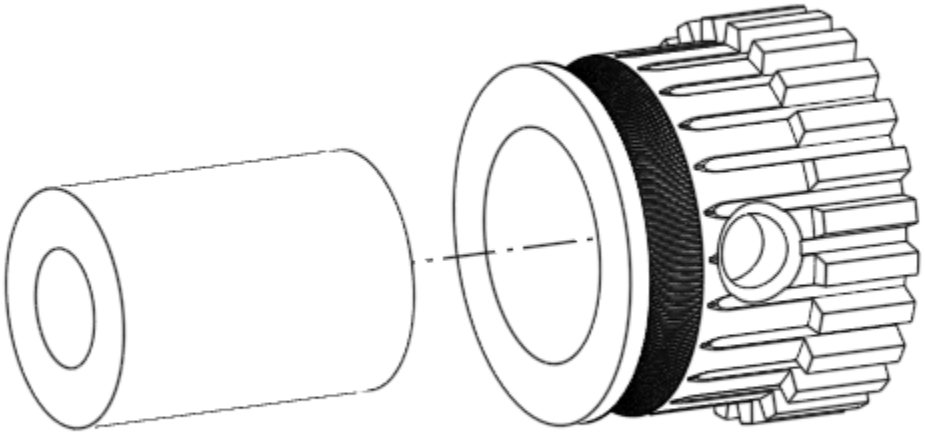
This may take some trial and error, so have patience.

Step 9



Insert the M3x30 and M3x16 SHCS through the front of the housing as shown and thread them into the motor on the backside. These should be snug, but be careful not to overtighten!

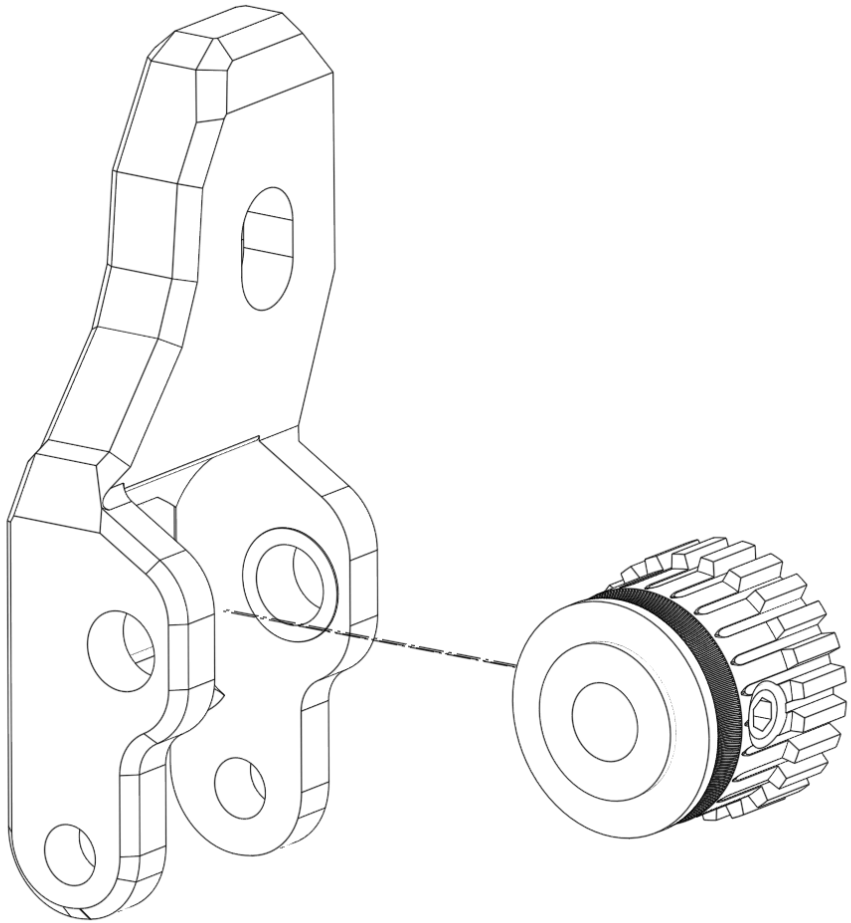
Step 10



Insert the POM bushing into the Idler drive gear.

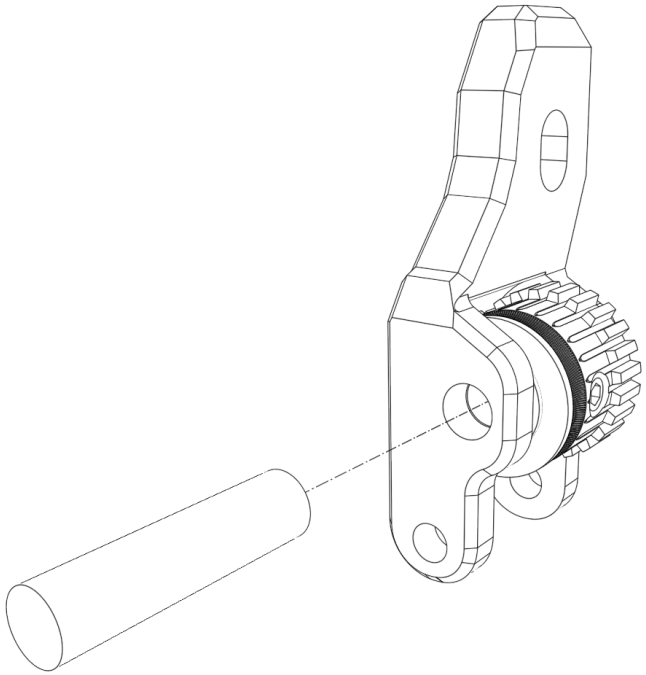
Note: A set screw was provided for this gear, ***do not use it*** *as it may cause binding on the idler side of the dual drive gears and make the motor work harder.*

Step 11



Insert the idler drive gear into the tensioner arm.

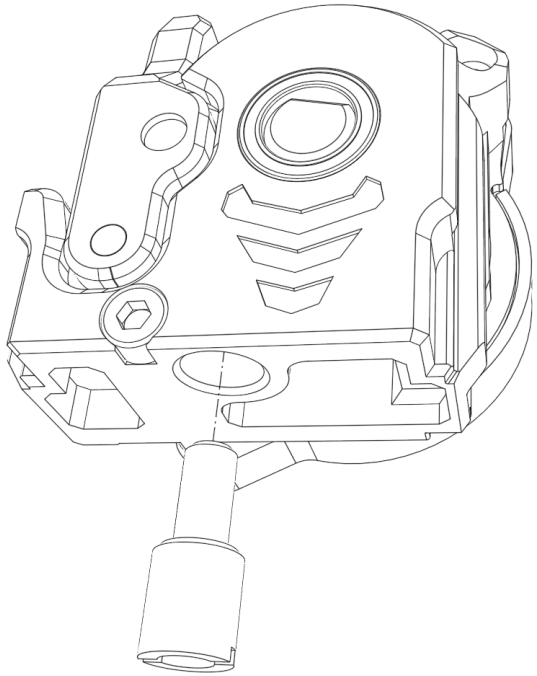
Step 12

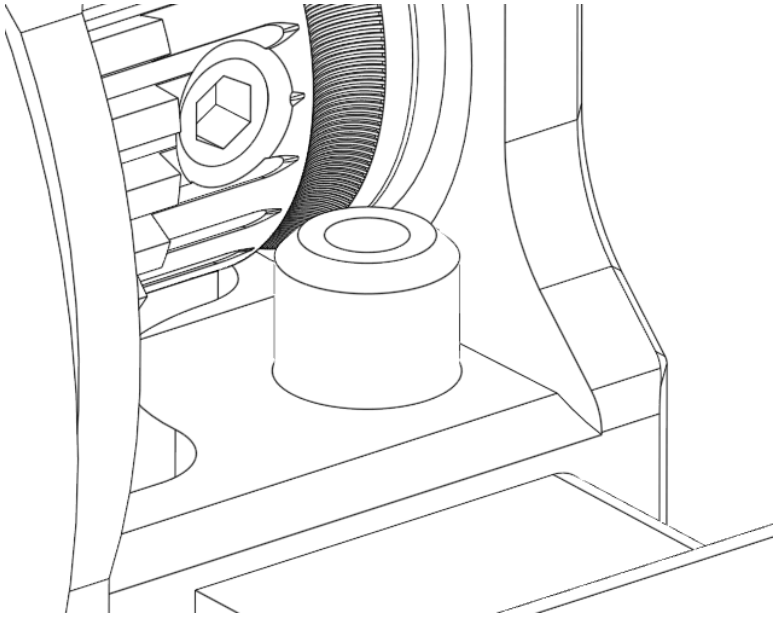


Carefully slide the idler gear pin into the tensioning arm assembly to retain the idler drive gear.

Fitment for this pin should be tight and be difficult to push in by hand. Start with the non spurred side of the pin inward to make it easier.

Step 13

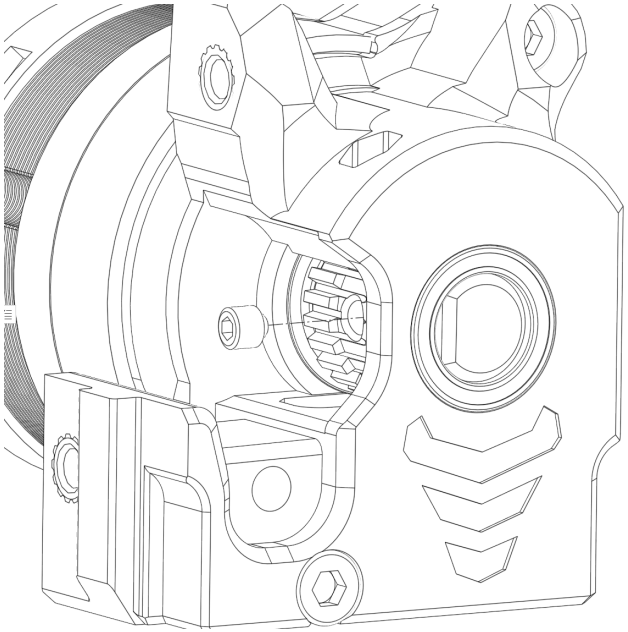




Thread the stainless steel filament guide until the top of the guide is less than 0.5mm from the drive gear.

The easiest way to achieve this if you don't have a feeler gauge is by threading until you make contact then backing it off a ½ or ¾ turn.

Step 14

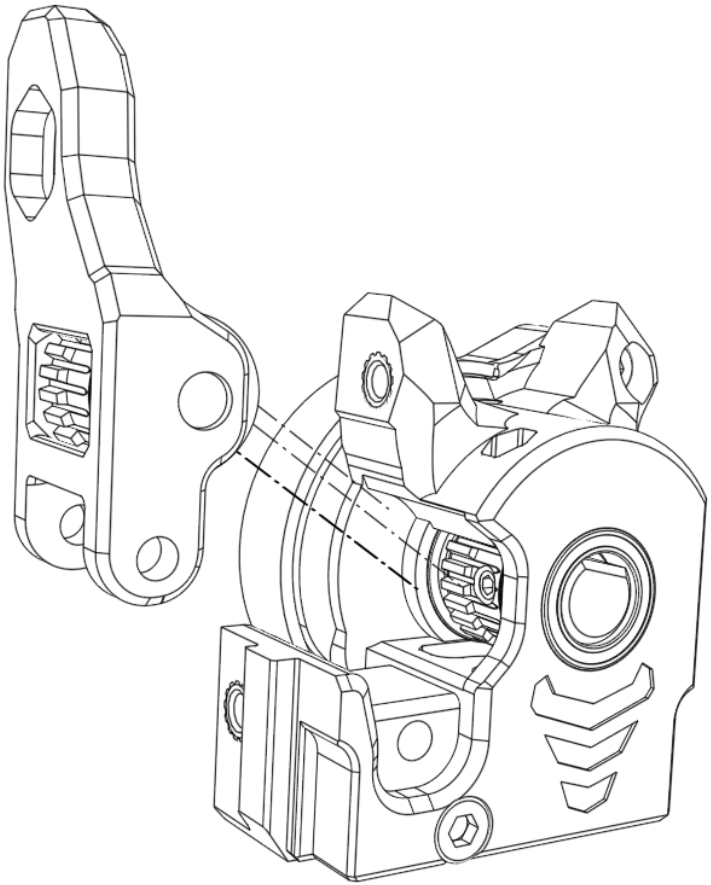


Feed a small length of filament into the top of the housing and through the stainless steel filament guide to help align the drive gear.

Secure the provided set screw for the filament gears into the drive gear onto the flat surface of the D-cut shaft as shown above.

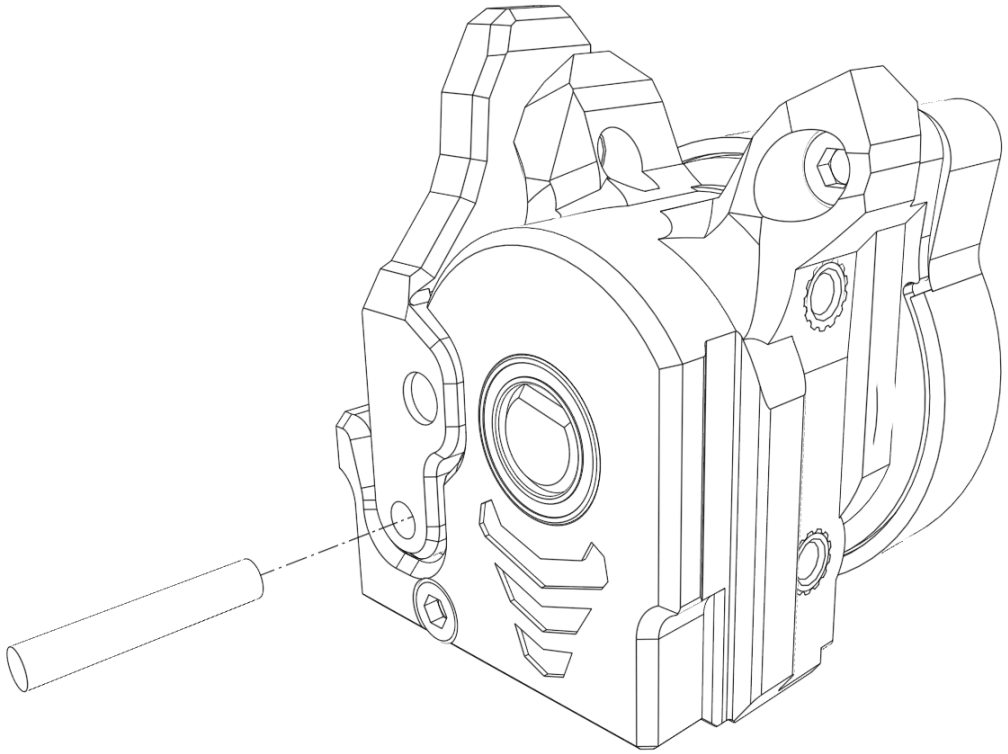
Note: Blue loctite is highly recommended here to ensure proper drive operation.

Step 15



Slide the tensioner arm into place.

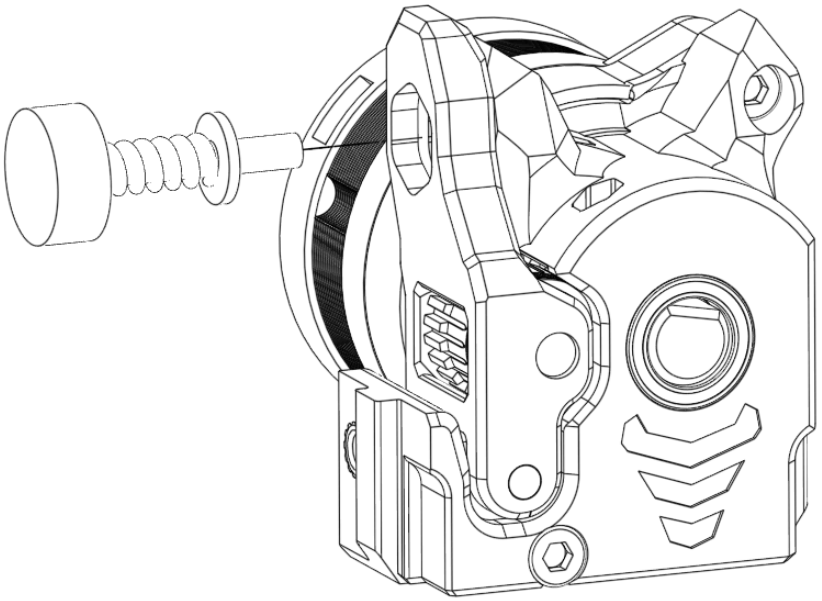
Step 16



Slide the tensioner arm pivot pin to secure the tensioner arm to the main cyclops housing.

Again as stated with the last pin, this should be difficult to insert by hand and to make the easiest insert smooth side first.

Step 17

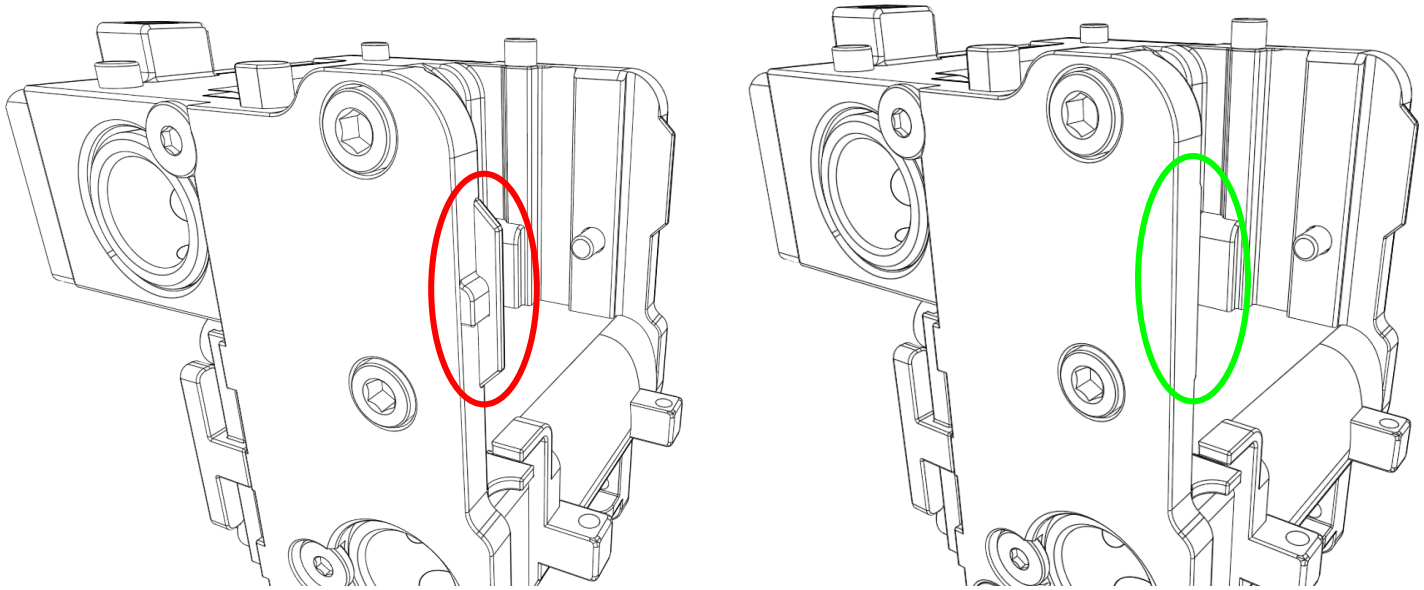


Thread the tensioner spring screw through the arm and into the threaded insert as shown above.

Be careful not to overtighten as it may cause your gears to eat into your filament and cause issues. If you are concerned that even a little engagement is too much, you can replace the spring with something softer like that of a pen spring or recycle the springs you may have replaced on your top bushing.

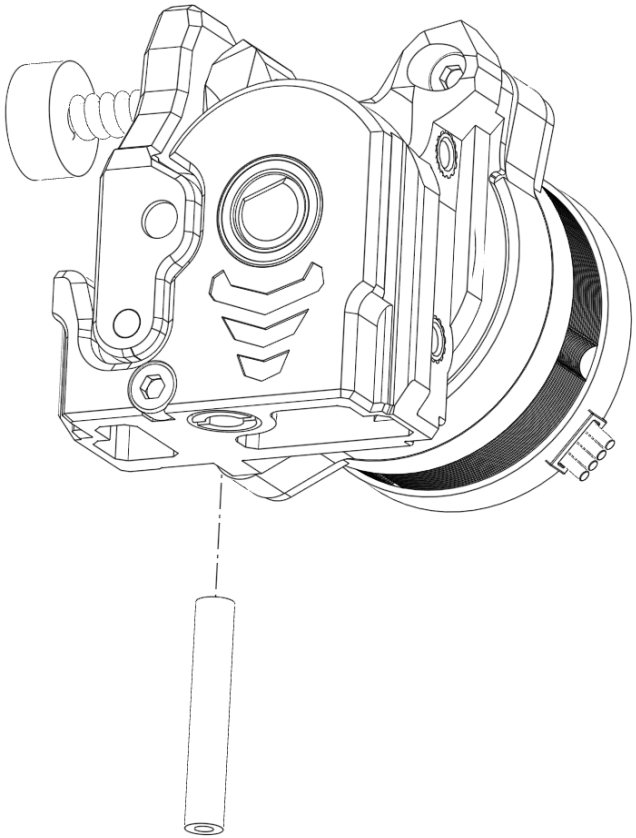
Installation

Prepare the Carriage:



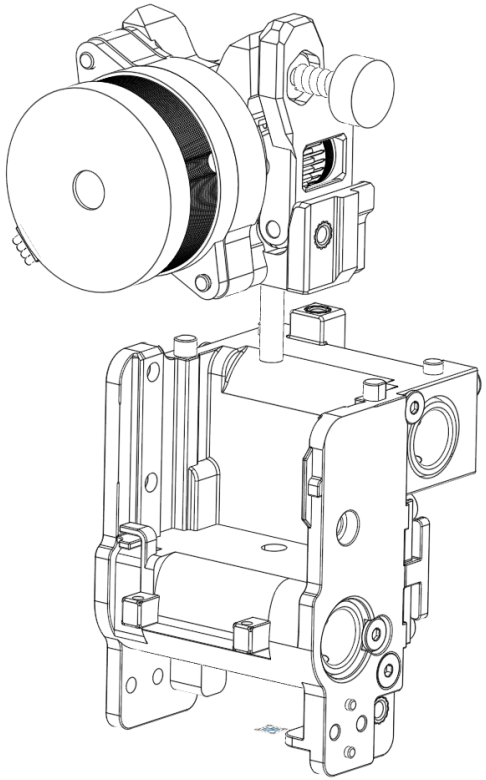
Remove the tab on the right side of the carriage usually used for the extruder motor cover, this will not me needed and interferes with the orbital gearbox

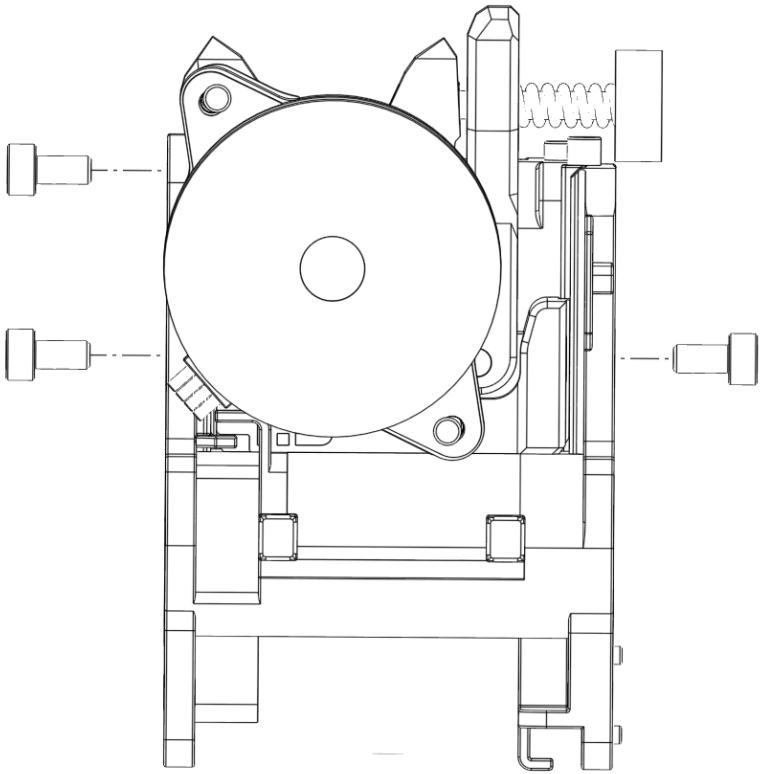
Cut and Install PTFE:



Cut a 24mm-25mm piece of 4mm OD 2mm ID PTFE tube and insert it into the bottom of the stainless steel filament guide until seated.

Slot Cyclops into place and secure.





Slot the Cyclops into place as you would with the stock extruder and secure with the 3 bolts shown being sure not to overtighten.

You are getting close!

Prepare yourself, we are going to shut the lights off!

Software

Under the section **[extruder]** in your **printer.cfg**, make the following changes:

dir_pin: nozzle_mcu:PB0 → dir_pin: !nozzle_mcu:PB0

&

rotation_distance: 6.9 → rotation_distance: 4.637

```
[extruder]
max_extrude_only_distance: 1000.0
max_extrude_cross_section: 80
step_pin: nozzle_mcu:PB1
dir_pin: !nozzle_mcu:PB0
enable_pin: !nozzle_mcu:PB2
microsteps: 16
rotation_distance: 4.637
nozzle_diameter: 0.400
filament_diameter: 1.750
heater_pin: nozzle_mcu:PB7
sensor_type: EPCOS 100K B57560G104F
sensor_pin: nozzle_mcu:PA0
pressure_advance: 0.04
pressure_advance_smooth_time: 0.040
control: pid
pid_Kp: 25.013
pid_Ki: 2.566
pid_Kd: 60.966
min_temp: 0
max_temp: 320
```

Under the section **[tmc2209 extruder]** in your **printer.cfg**, make the following change:

`run_current: 0.55 → run_current: 0.7`

```
[tmc2209 extruder]
uart_pin: nozzle_mcu:PB11
tx_pin: nozzle_mcu:PB10
uart_address: 3
run_current: 0.7
sense_resistor: 0.150
stealthchop_threshold: 0
```

Note: This higher run current will cause your stepper motor to become quite hot to the touch, but don't panic, the gearbox acts as an insulator to keep the heat away from your extruder housing and filament. Do not change this value as this was determined to the most conservative current to still achieve optimum performance from the Cyclops extruder.

Under the section [prtouch_v2] in your printer.cfg, make the following changes based on the machine you are upgrading:

K1	K1 Max
clr_noz_start_y: 221 → clr_noz_start_y: 219	clr_noz_start_y: 303 → clr_noz_start_y: 300

```
[prtouch_v2]
pr_version: 1
step_base: 2
z_offset: 0
noz_ex_com: 0.05
tilt_corr_dis: 0.03
tri_min_hold: 2000
tri_max_hold: 6000
pres_cnt: 4
pres0_clk_pins: leveling_mcu:PA5
pres0_sdo_pins: leveling_mcu:PA1
pres1_clk_pins: leveling_mcu:PA2
pres1_sdo_pins: leveling_mcu:PA0
pres2_clk_pins: leveling_mcu:PA6
pres2_sdo_pins: leveling_mcu:PA3
pres3_clk_pins: leveling_mcu:PA7
pres3_sdo_pins: leveling_mcu:PA4
show_msg: False
step_swap_pin: PC10
pres_swap_pin: leveling_mcu:PB1
g28_wait_cool_down: true
pa_clr_down_mm: -0.15
clr_noz_start_x: 95
clr_noz_start_y: 219
clr_noz_len_x: 40
clr_noz_len_y: 2
speeds: 2.5,1.0
tri_hftr_cut: 2,1
tri_lftr_k1: 0.70,0.30
tri_try_max_times: 10
tri_min_hold: 2000,20000
tri_max_hold: 6000,60000
```

```
[prtouch_v2]
pr_version: 2
step_base: 2
z_offset: 0
noz_ex_com: 0.09
tilt_corr_dis:0.05
tri_min_hold: 6000,10000
tri_max_hold: 13000,60000
pres_cnt: 4
pres0_clk_pins: leveling_mcu:PA7
pres0_sdo_pins: leveling_mcu:PA4
pres1_clk_pins: leveling_mcu:PA6
pres1_sdo_pins: leveling_mcu:PA3
pres2_clk_pins: leveling_mcu:PA2
pres2_sdo_pins: leveling_mcu:PA0
pres3_clk_pins: leveling_mcu:PA5
pres3_sdo_pins: leveling_mcu:PA1
show_msg: False
step_swap_pin: PC10
pres_swap_pin: leveling_mcu:PB1
g28_wait_cool_down: true
pa_clr_down_mm: -0.15
clr_noz_start_x: 130
clr_noz_start_y: 300
clr_noz_len_x: 40
clr_noz_len_y: 2
speeds: 2.5,1.0
tri_hftr_cut: 2,1
tri_lftr_k1: 0.50,0.15
```

Mission Accomplished!
Happy Printing!

Support

HOW TO GET HELP:

If you need assistance with assembly or software install. Head on over to our Discord community and post your questions under the Cyclops SOS. This is the most effective method in getting quick assistance from our great D3vil Design community.

REPORTING AN ISSUE:

Should you find an issue in the documentation or have a suggestion for an improvement, please consider opening an issue on GitHub. When submitting an issue please include as much pertinent information as you can. We will update the manual and design periodically based on feedback from the community.

D3vil Design Discord

D3vil Design GitHub

By listening to user experiences around the newest creality printers Omran Al Sayed (Omranello) pioneered an extrusion solution that promises to enhance printing across various platforms in the present and future.

Alongside the collaborative efforts of the exceptional team at D3vil Design, this project exceeded expectations, evolving into something truly remarkable. Without their collective dedication and expertise, this achievement would have remained a distant dream.

Special Thanks to:

Tyler (Booty) - Documentation, Future Product Development

Bryan (Haus) & Derrick Darrell - Extensive testing and support

Davit (Stoli) - Logistics and support @ WattsKraken.xyz Storefront

Muhammad (Hamyy) - Future Product Development

Isaac (Zimz) - Project Organizational Oversight

We also extend our heartfelt gratitude to all beta testers, and everyone who has contributed to the success of this project, directly or indirectly. Your support and efforts have been key in bringing this project to where it is now, and we truly appreciate each and every one of you. If we inadvertently missed anyone, please accept our sincere apologies.