Openpump

Building the syringe pump

In this guide you'll learn how to build the linear actuator designed by Michigan University's Open Sustainability Technology Lab (MOST).

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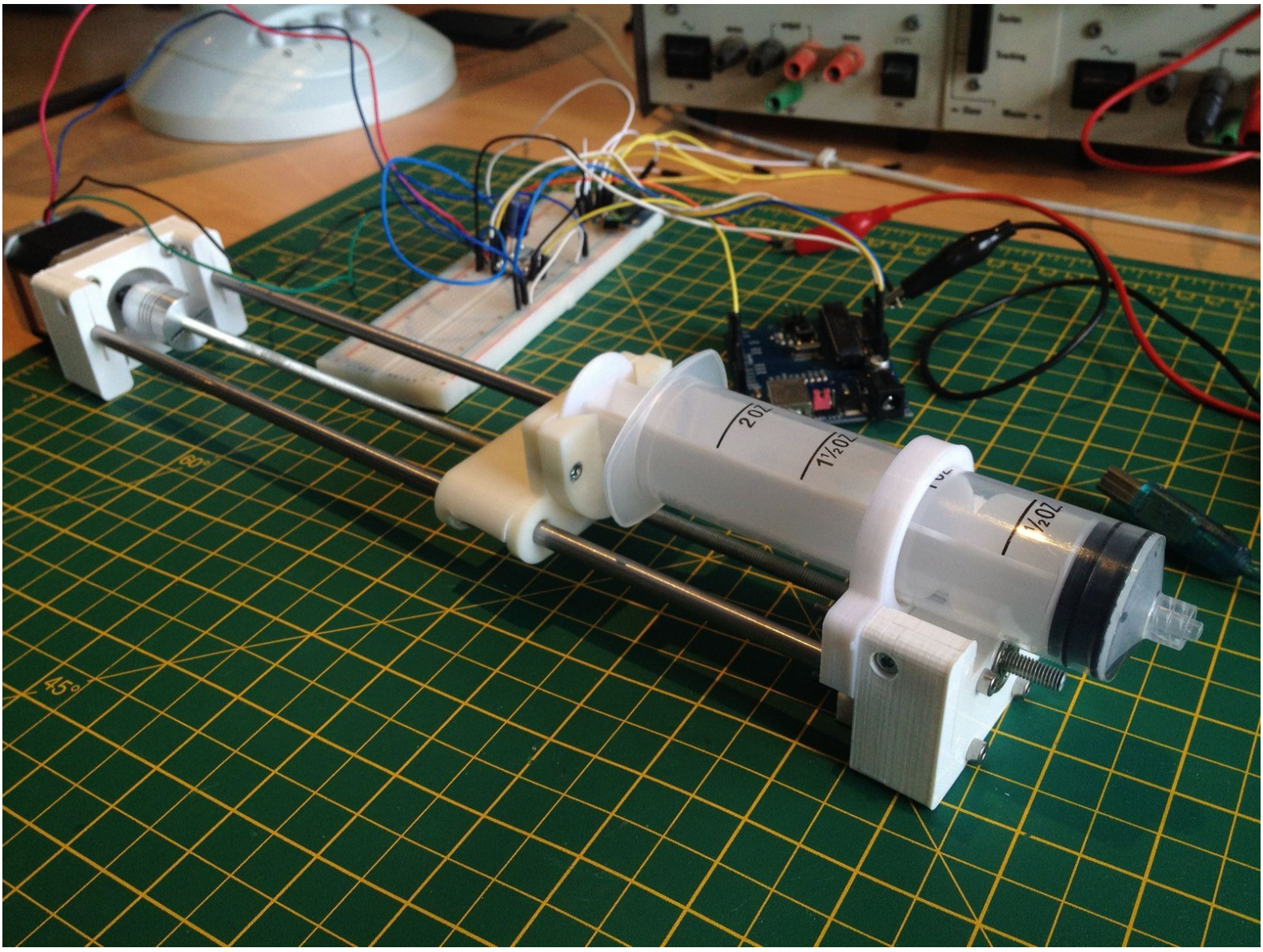


INTRODUCTION

The mechanical part of the pump that drives the syringe is called a linear actuator, and the MOST research group designed one made from mostly 3D-printed parts.

This guide contains the step-by-step instructions for building your own linear actuator.

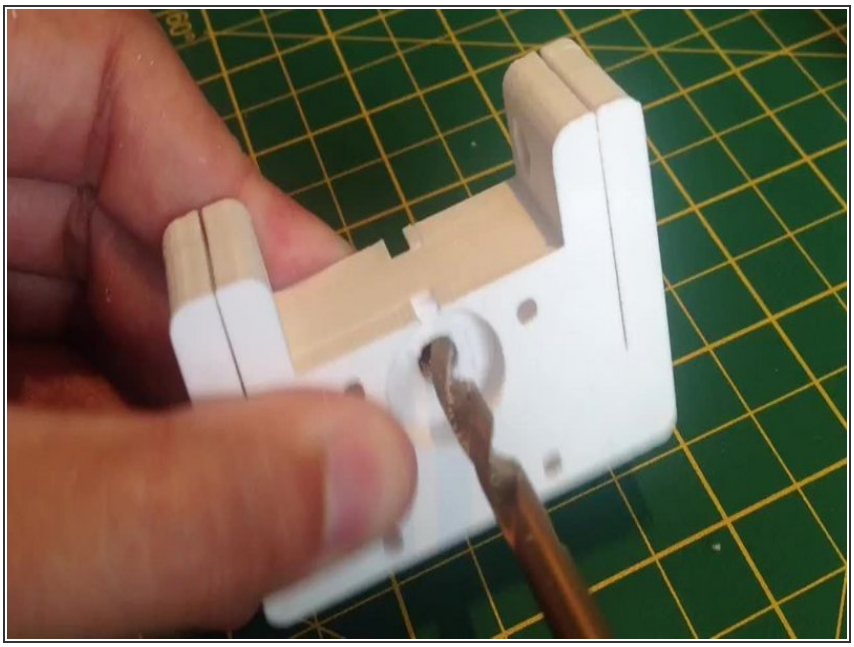
TOOLS:

- Allen key (1)
  2.5mm
- Drill bits (3)
  3mm, 5mm and 6mm
- Utility knife (1)

PARTS:

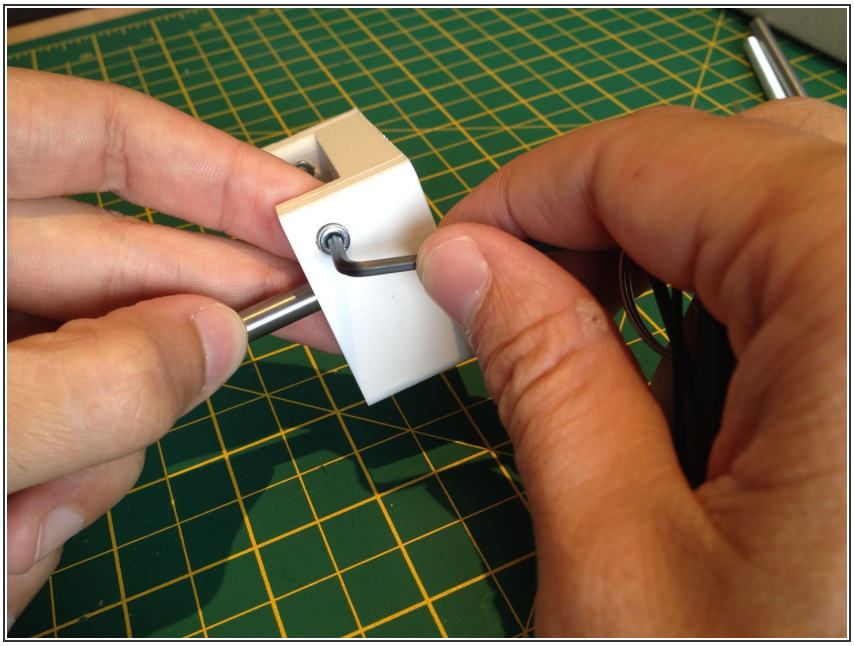
- Smooth rod (2)
  6mm
- Threaded rod (1)
  M5
  Cut to same length as your smooth rods
- Linear bearings (2)
  LM6UU
- M5 Nut (1)
- Ball bearings (2)
  625ZZ
  5x16x5 mm
- Stepper motor (1)
  NEMA 17
- Allen bolt cap screws and nuts (14)
  M3
  8mm x 4, 10mm x 2, 16mm x 4, 40mm x 4
- Flexible coupling (1)
  M5

Step 1 — Building the syringe pump



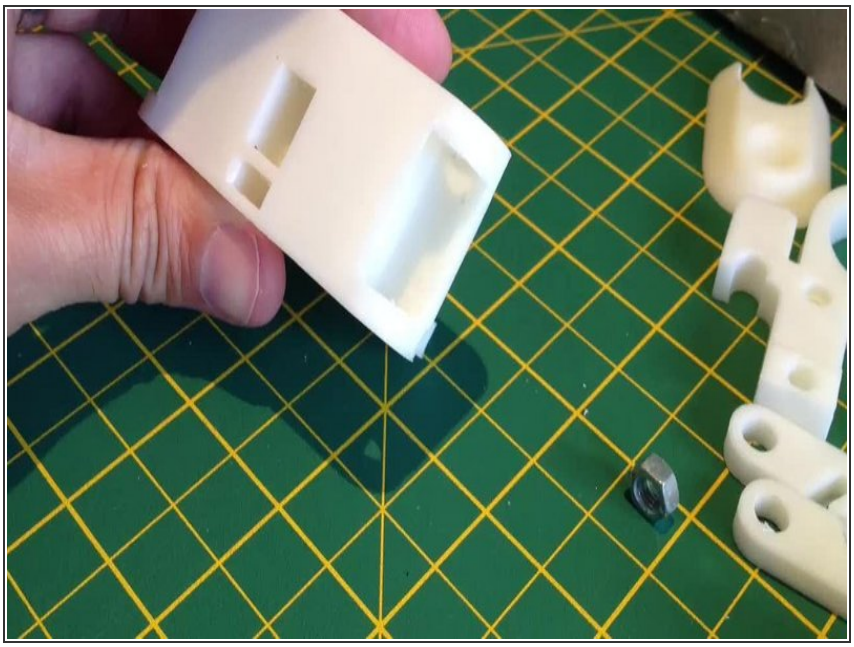
- Clean the 3D printed holes using 3mm, 5mm and 6mm drill bits.

Step 2



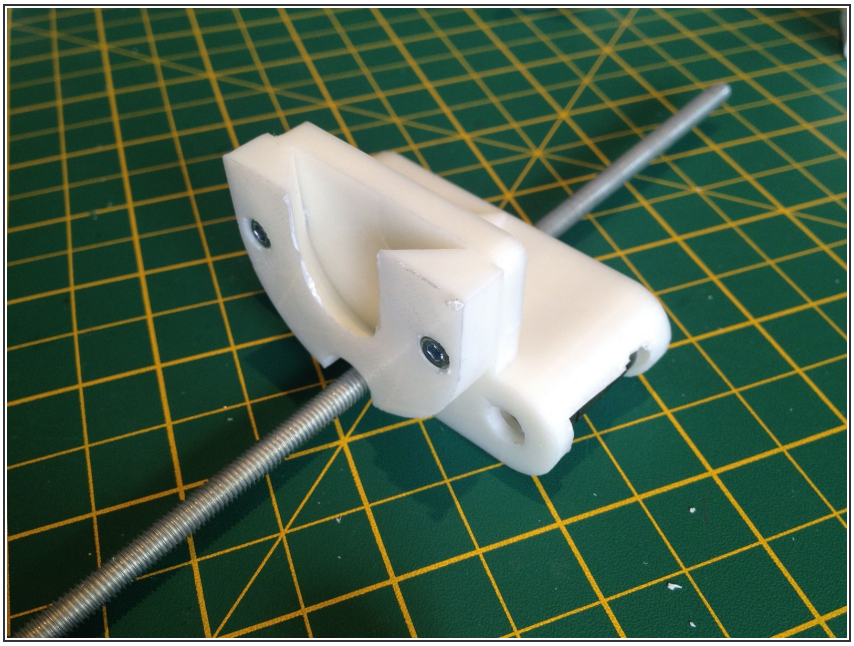
- Use two M3 8mm bolts and nuts to clamp the smooth rods into the motor end.

Step 3



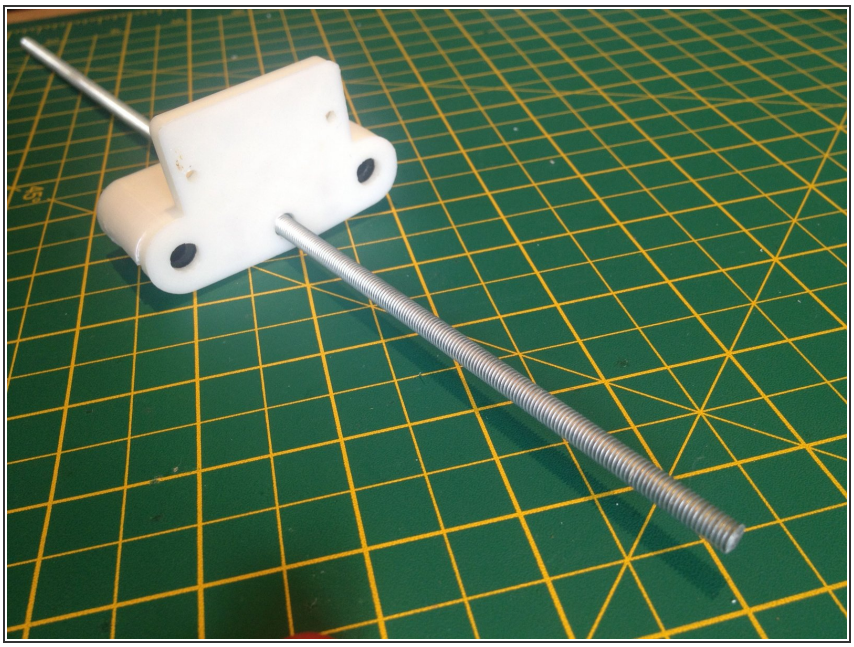
- Insert the LM6UU linear bearings into the syringe carriage, after cutting out the holes using a utility knife.
- Insert one M5 nut into the syringe carriage.

Step 4



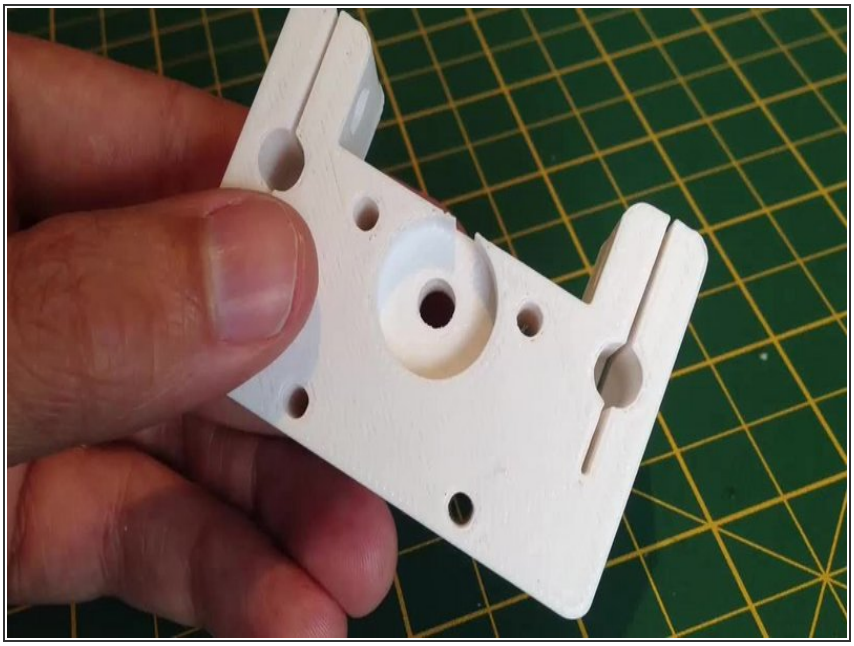
- Use two M3 10mm bolts and nuts to attach the syringe plunger retainer to the syringe carriage.

Step 5



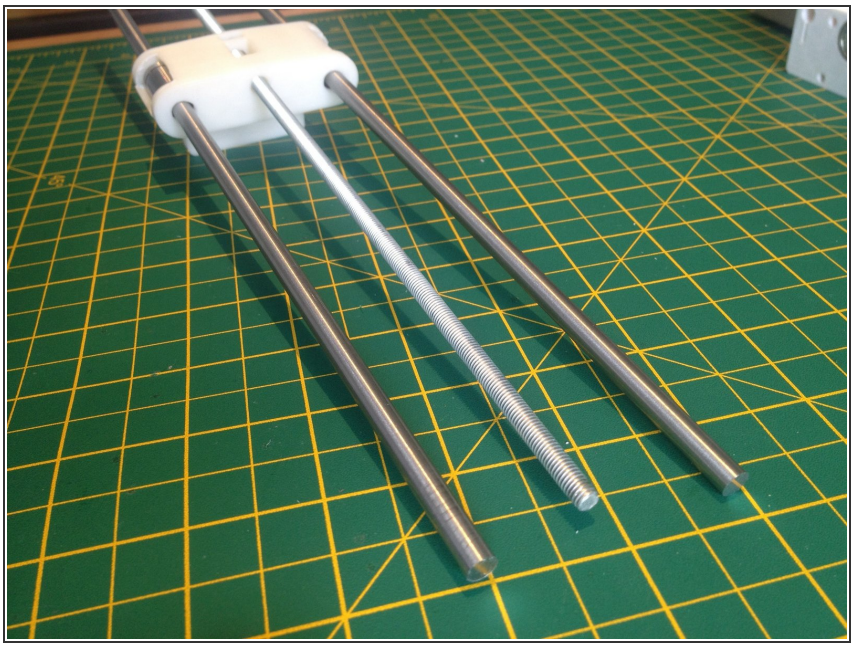
- Insert and screw the threaded rod through the trapped M5 nut.

Step 6



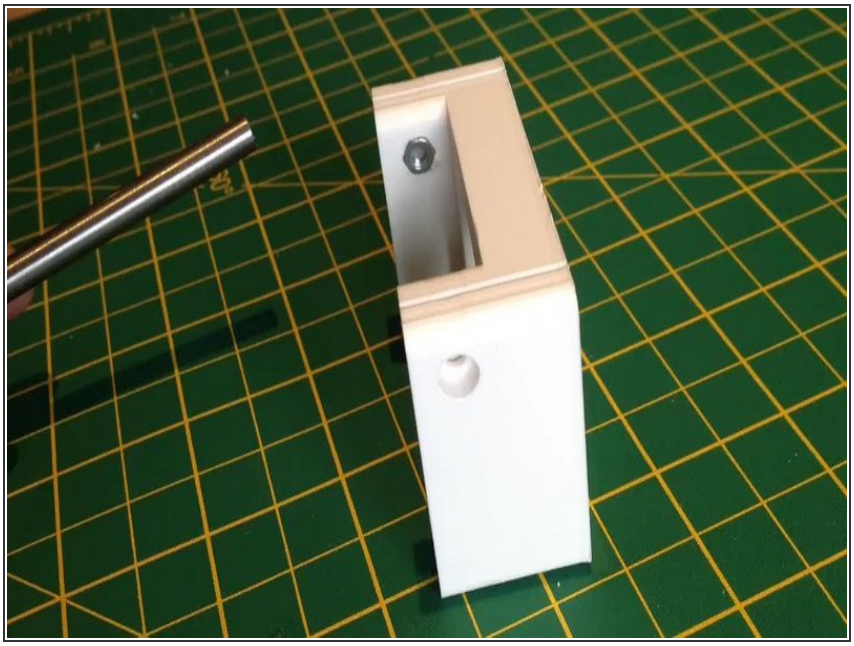
- Insert the two 625ZZ bearings into the idler end.

Step 7



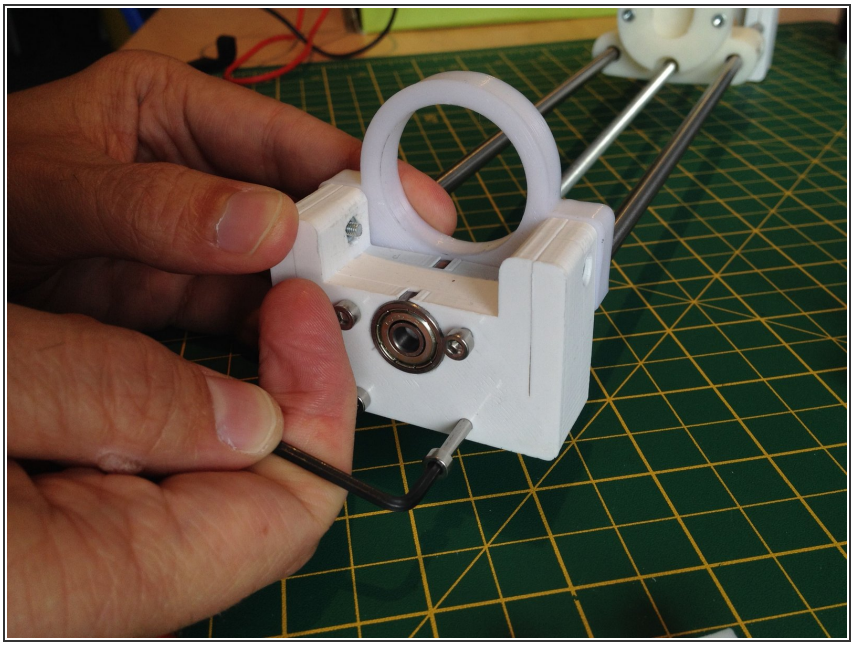
- Slide the two smooth rods through the LM6UU linear bearings.

Step 8



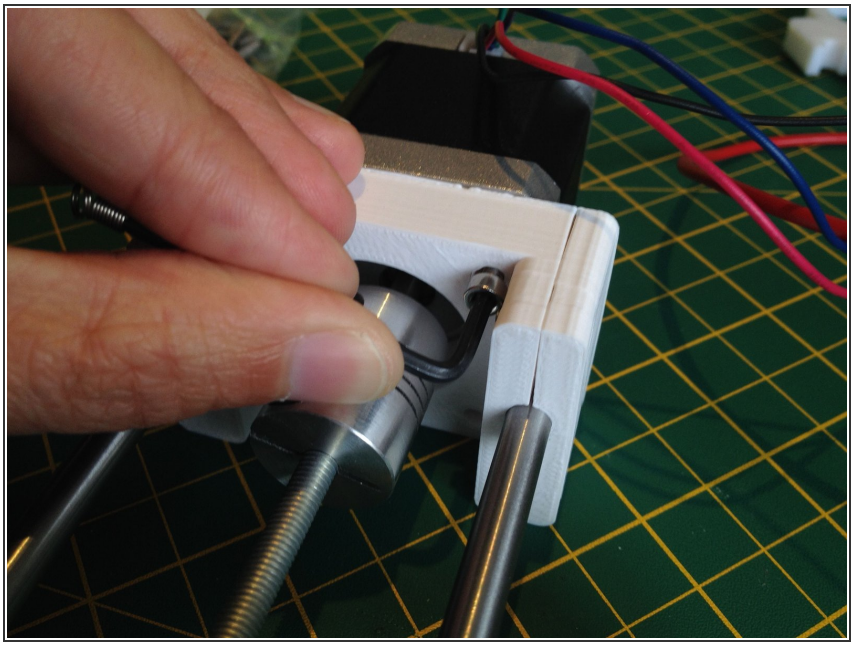
- Use two M3 8mm bolts and nuts to clamp the smooth rods into the idler end. The threaded rod should slide through the 625ZZ bearings.

Step 9



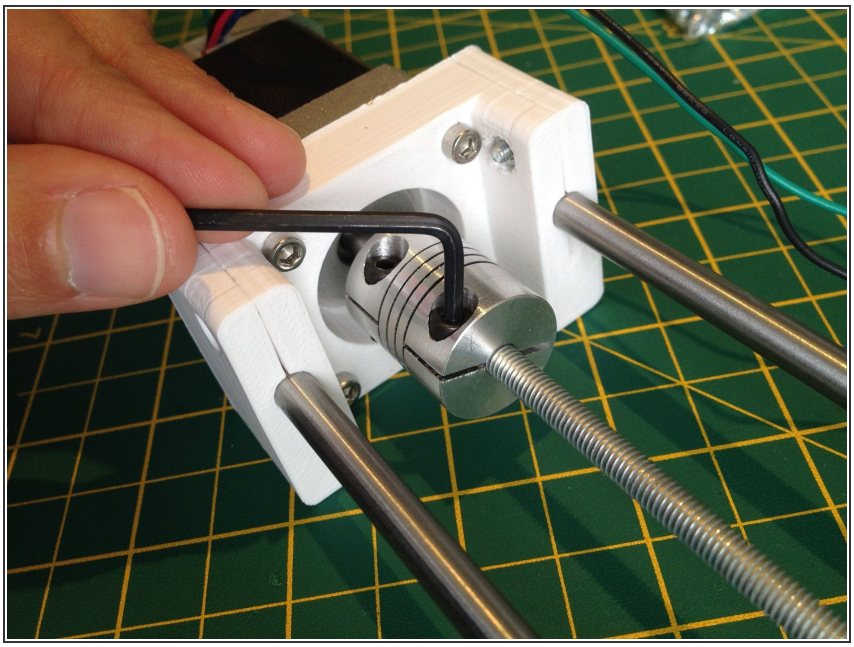
- Insert four M3 nuts into the syringe clamp.
- Take four M3 40mm bolts and attach the syringe clamp to the idler end.

Step 10



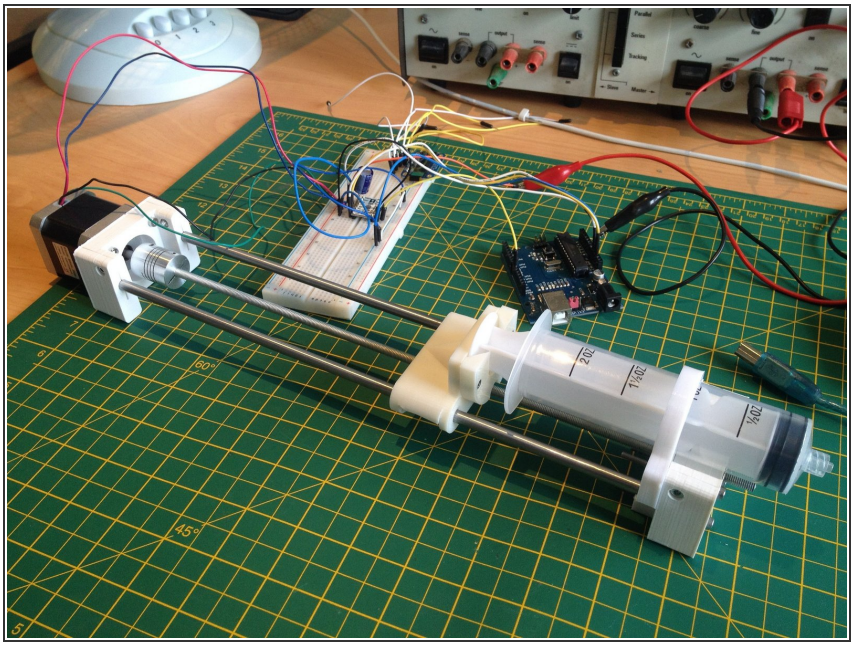
- Use four M3 16mm screws to attach the stepper motor to the motor end.

Step 11



- Attach the flexible coupling to the stepper motor and the threaded rod.

Step 12



- You can now connect your electronics to the stepper motor.

ⓘ To ensure the construction is properly aligned and straight:

- Loosen the bolts on the idler end and motor end slightly.
- Slide the syringe carriage along the rods to align them, and then tighten the bolts one by one, sliding the syringe carriage back and forth to check alignment. (thanks to Ceri Clatworthy for the tip!)

