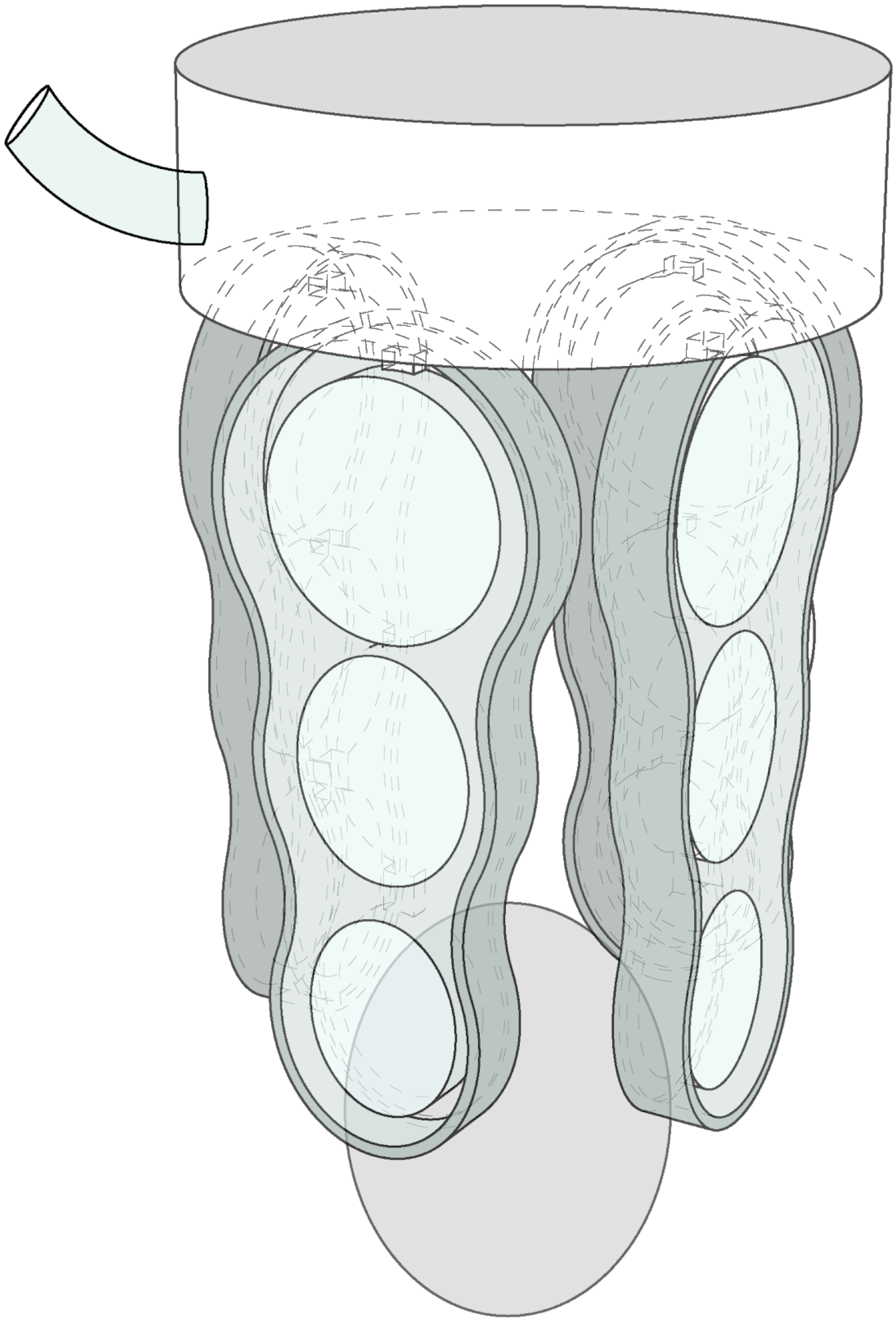
KRAKEGG / Stage 01 Final Prototype

Build process

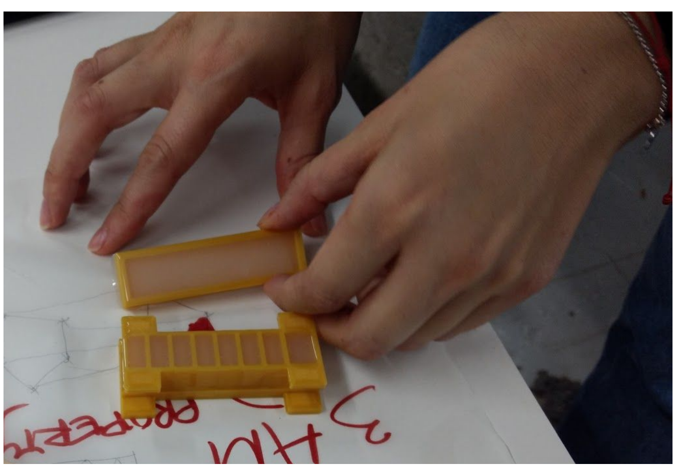
01. SOFT ROBOTICS FINGERS



1. Design your mould using the attached grasshopper file, or download the 3D printing-ready files from the attached Rhino file.

Make sure to add a T-shaped end to the beginning of your air channel in order to later attach the fingers to the robot connection module.

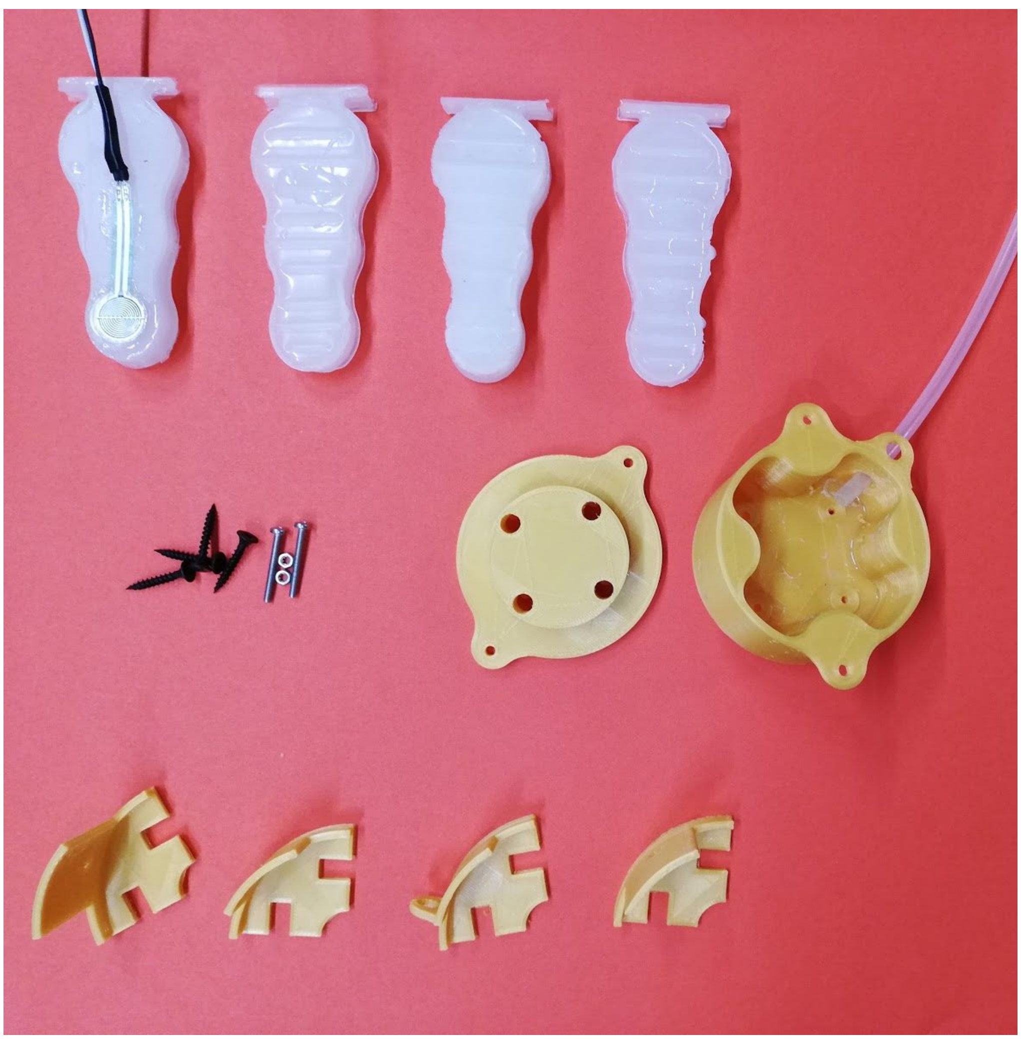
2. 3D print your mould (photo above)
3. Mix the two parts of Eco-flex 00-50 silicone according to the instructions on the packaging.
4. Pour the silicone in the bottom mould, up to the lip.
5. Pour the silicone in the main body mould, up to the lip. Then, place the spacer mould on top, making sure the indents are sunk in the silicone poured in the main body mould.



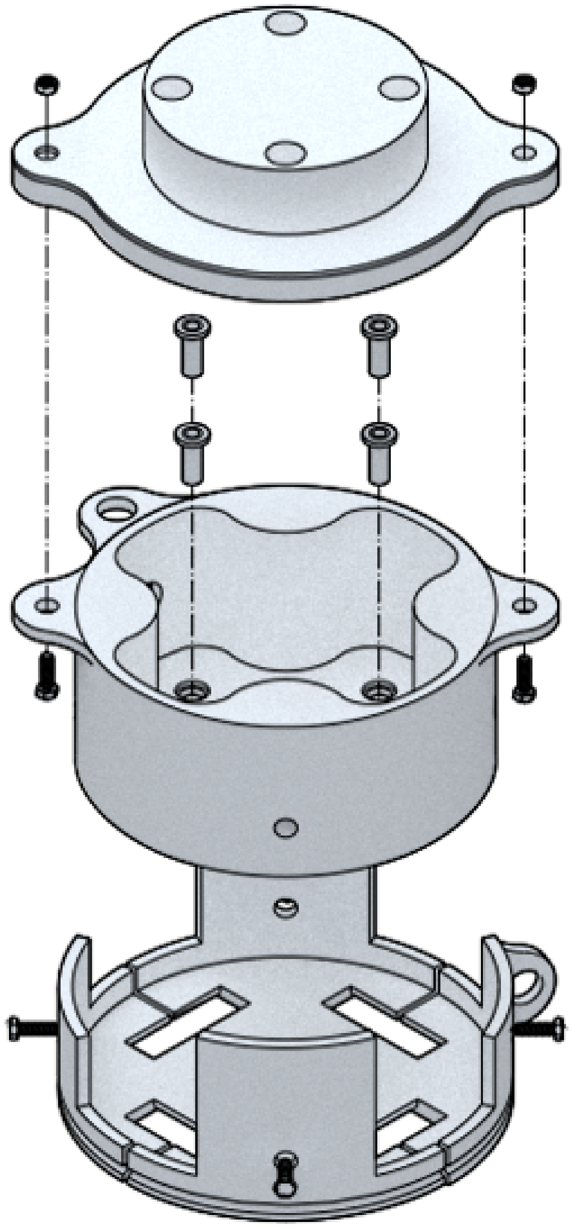
6. Leave the moulds to dry for at least 2 hours before carefully de-moulding.
7. Glue the bottom mould to the main body mould by applying a thin layer of silicone on the edges of the bottom mould and then placing the main body mould on top. Apply extra silicone on the vertical walls around the seam if needed to tightly close the mould.

8. Once the mould is dried in its final shape, pierce the air channel of the moulds with the syringe needle and test if the mould is inflating.

9. Repeat the process four times, for each one of the fingers.
10. Attach the force pressure sensor to one of the fingers. (for this prototype in particular, we used superglue to fix it to the silicone)



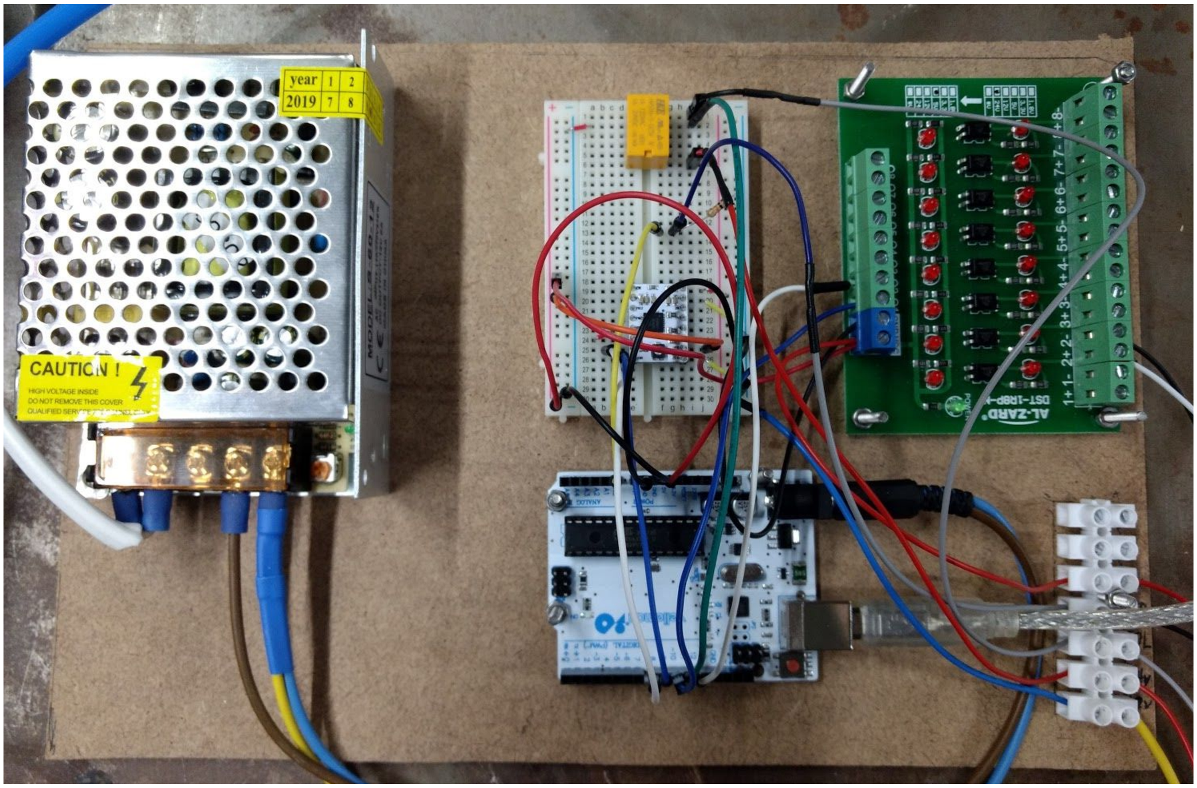
02. CONNECTION TO ROBOTIC ARM

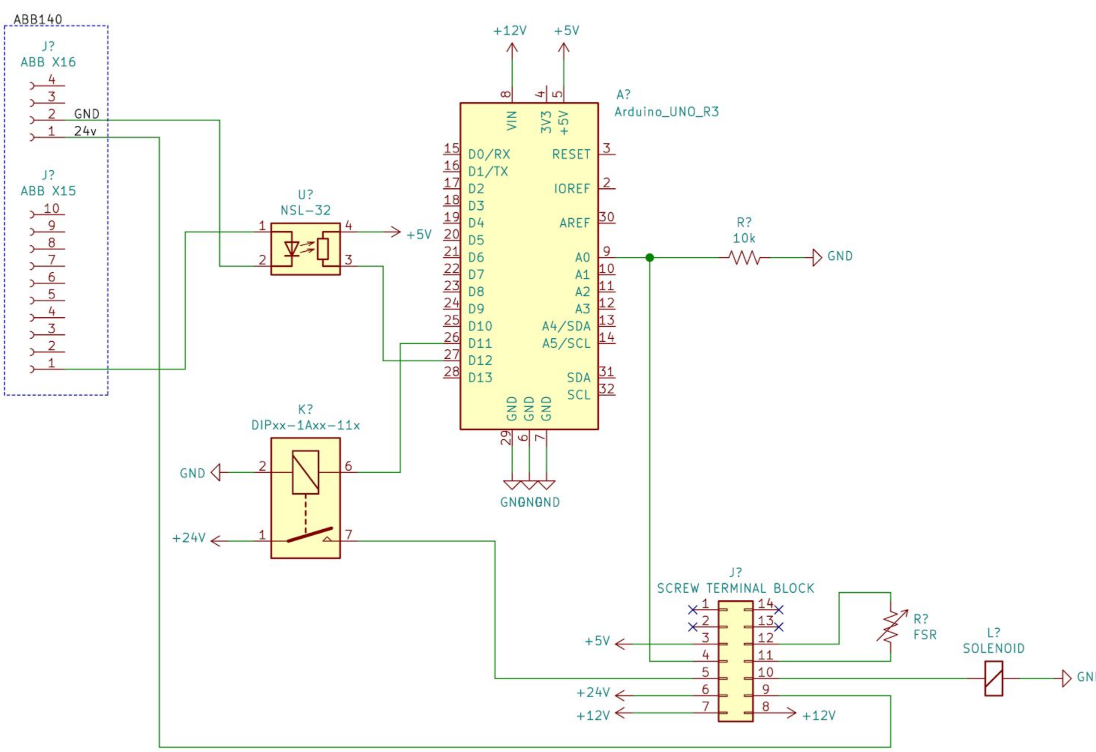


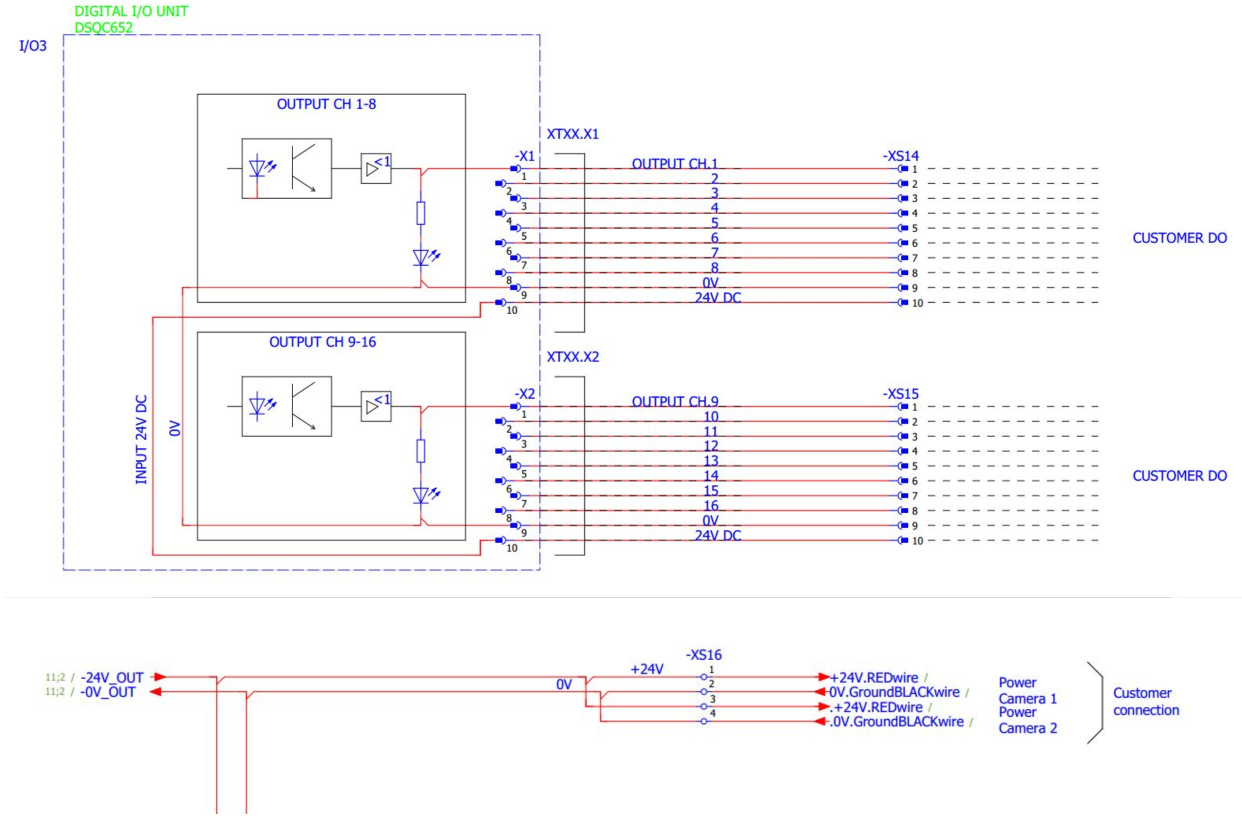
1. Download the Rhino file for the robot arm connection and 3D print it.
2. First screw in the robot arm connection plate using bolts compatible to the specific robot arm you are working with
3. Glue in the air inputs to the fingers to the bottom of the air chamber. (In this case we used four cut-up aluminium rivets as air inputs)
4. Fix each finger in between the finger holder plates and connect each one of them to one of the air inputs.
5. Fix the air chamber to the robot connection plate using screws and washers. (In this case we ended up cutting up a rubber plate in the shape of the connection plate and placing it in between the air chamber and the connection plate in order to reduce the amount of air leakage)
6. Fix the finger holders and the fingers to the rest of the connection module using screws.

* This prototype also used electrical tape and elastic bands as an extra sealing layer to reduce air leakage to workable levels

03. HARDWARE AND CONTROL SIGNALS







1. First, the robot sends signals from its digital IO's. This prototype used an ABB IR140, using the X15 and X16 ports for power and signals. (See diagram).
2. The 24v robot DO signal from X15 passes through an optocoupler to provide a 5v signal to the microcontroller. This lets the microcontroller know when the program expects the gripper to be activated.
3. However, the gripper shouldn't continue to inflate constantly when in this state, so for this prototype a force-sensitive resistor was used to detect when the gripper has made sufficient contact with the workpiece. The microcontroller considers both inputs and sends out a 5v signal. *Note : Since the gripper reservoir had an amount of leakage in this prototype, turning off the solenoid will immediately start to deflate the fingers. To keep the solenoid from 'bouncing' rapidly when the force hovers around the cutoff point, the timing of changes is monitored, and the solenoid will only switch every 250ms at minimum. This feature will become unnecessary with the inclusion of a tighter seal and controllable deflation.*
4. The microcontroller output signal passes through a relay which switches the 24v supply from X16 on the robot. This signal then connects to the air solenoid to send air to the gripper.