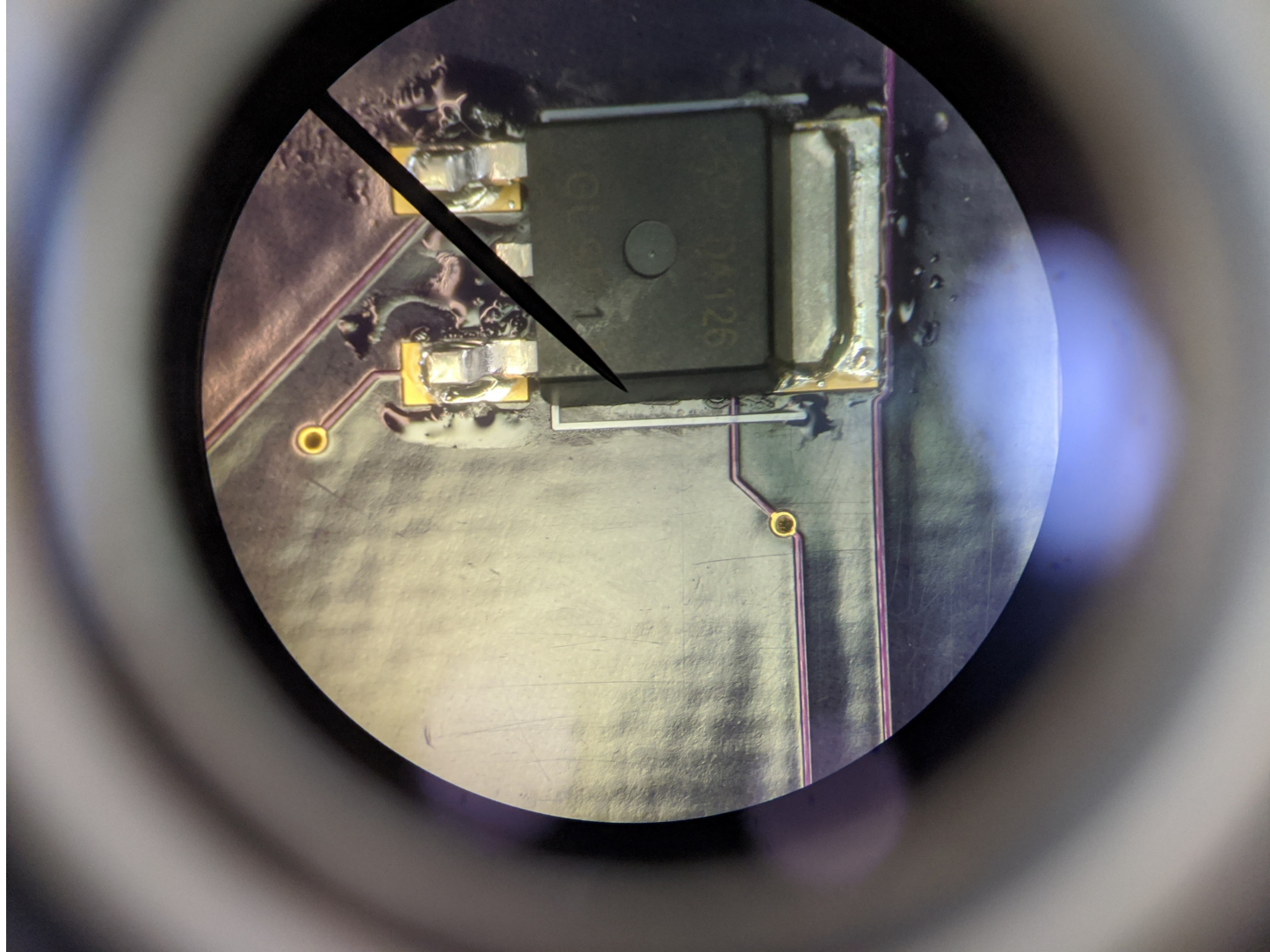
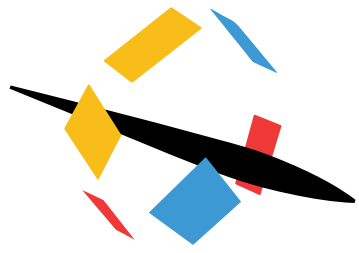
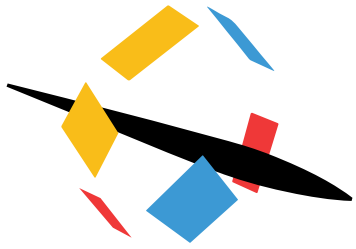


Electronics



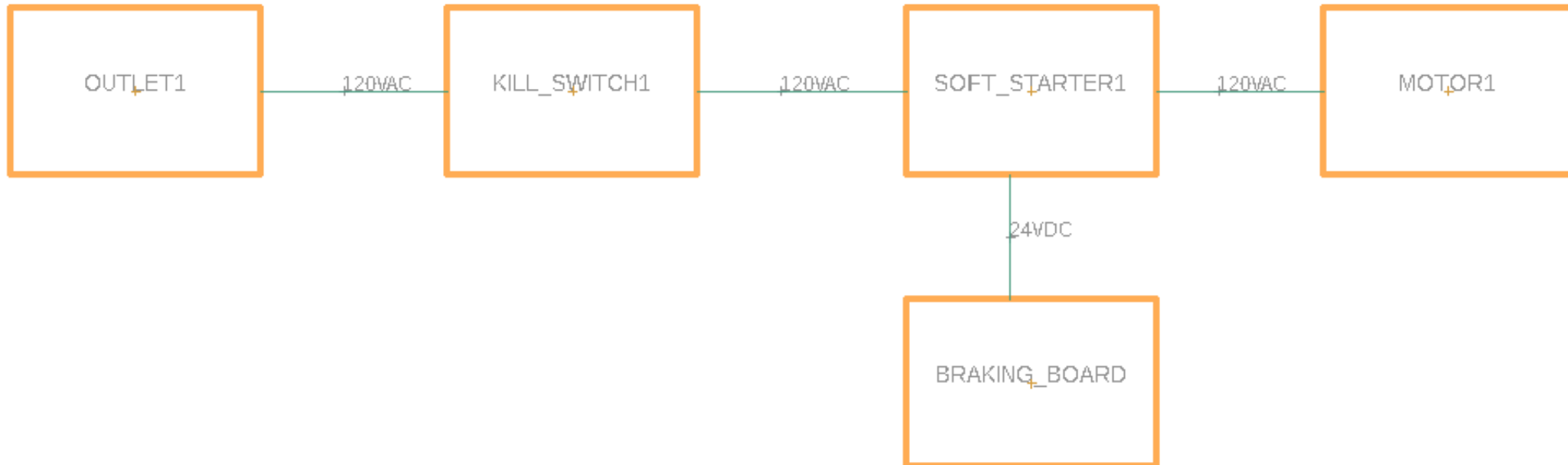
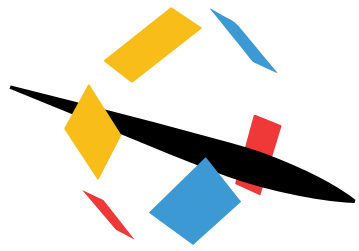
Our Motor



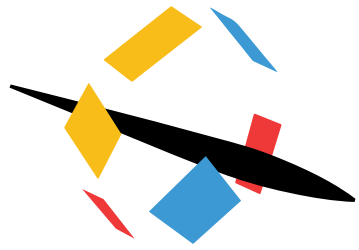
- Make: Dayton
- Type: Induction Motor
- Specs:
 - ½ HP
 - Capacitor start



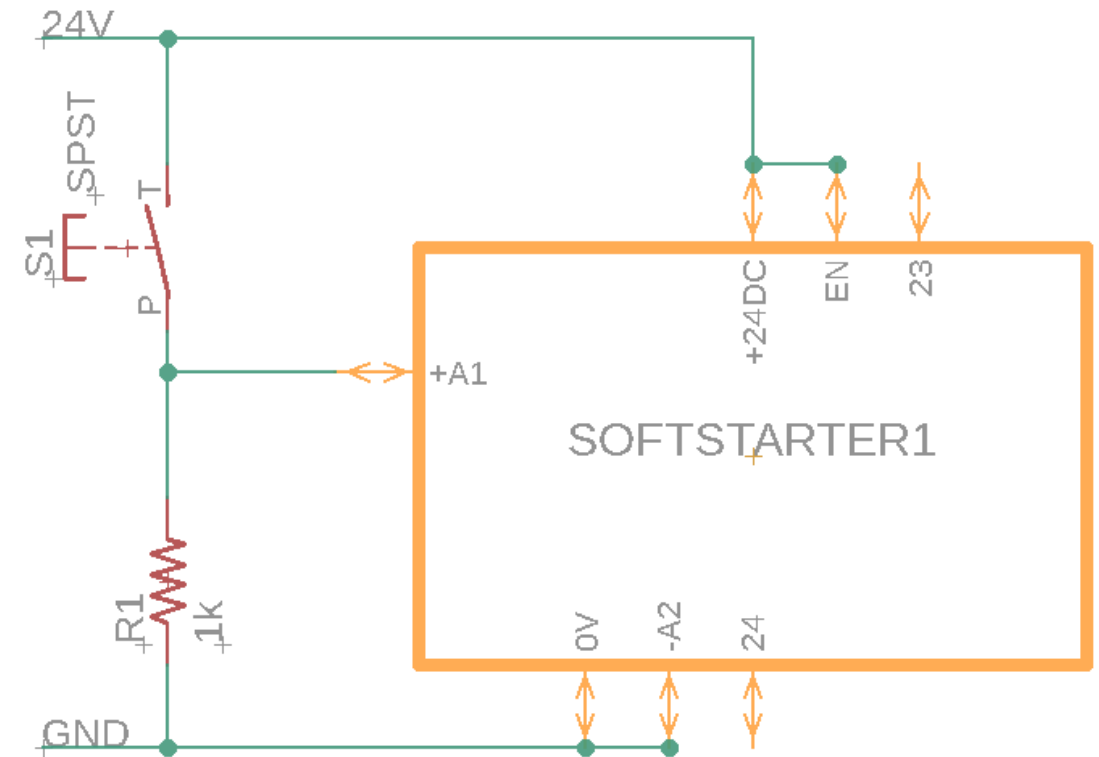
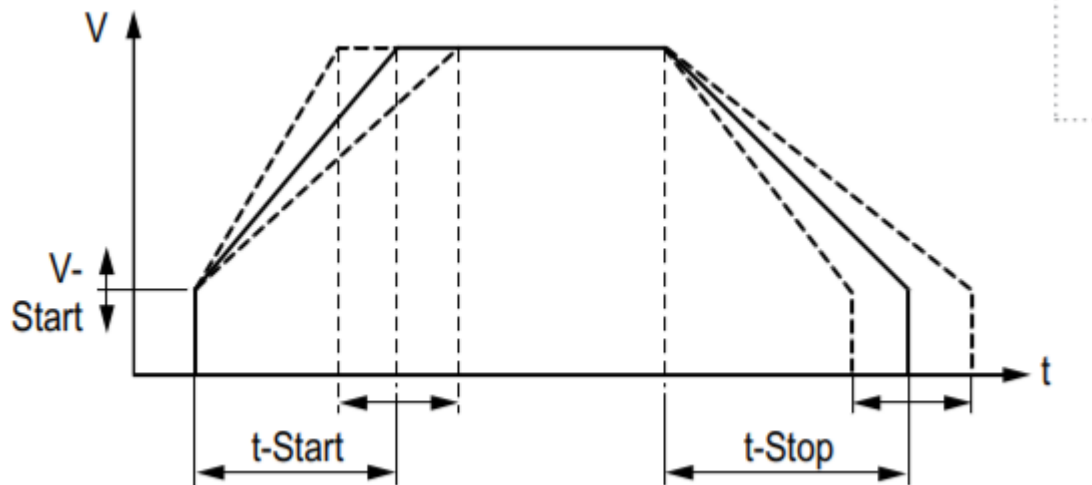
Motor Control Circuit



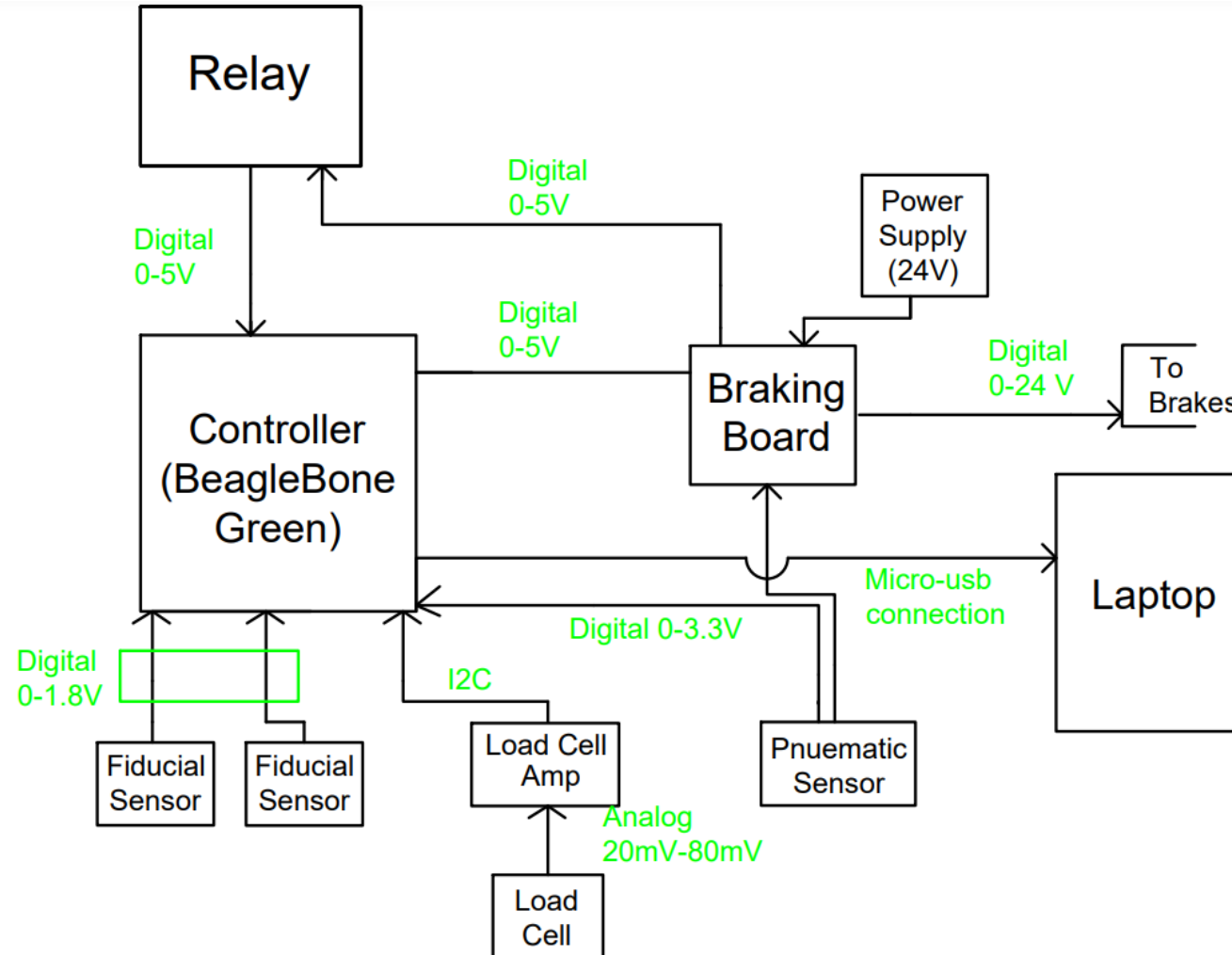
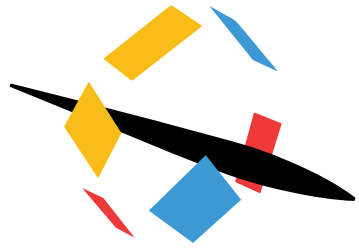
Softstarter



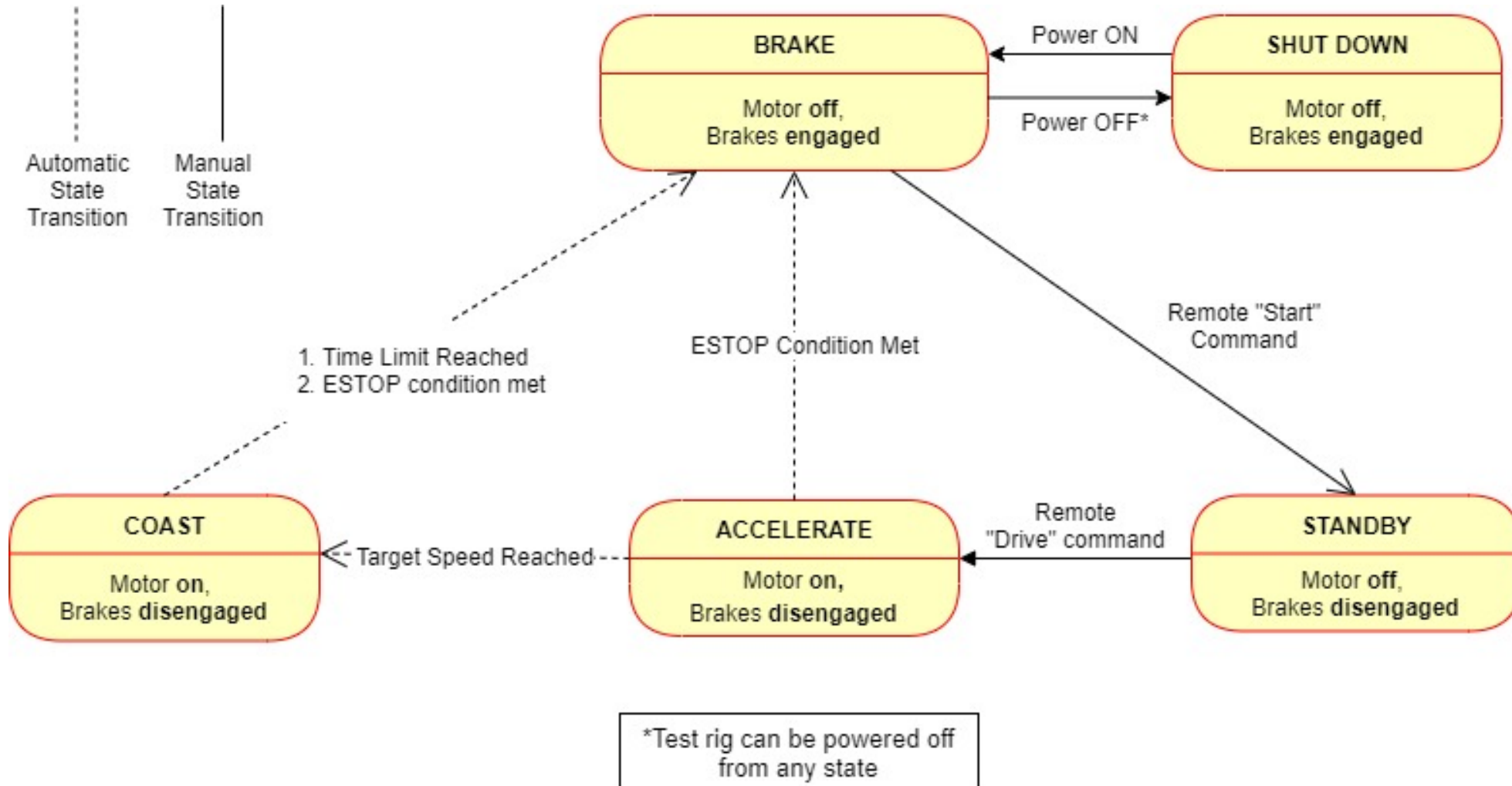
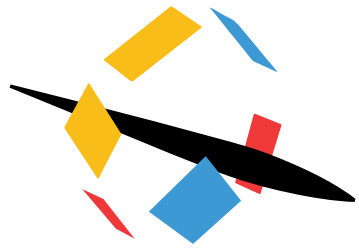
- **Make/Model:** Stellar SR22-12
- **Method:** Voltage ramp-up



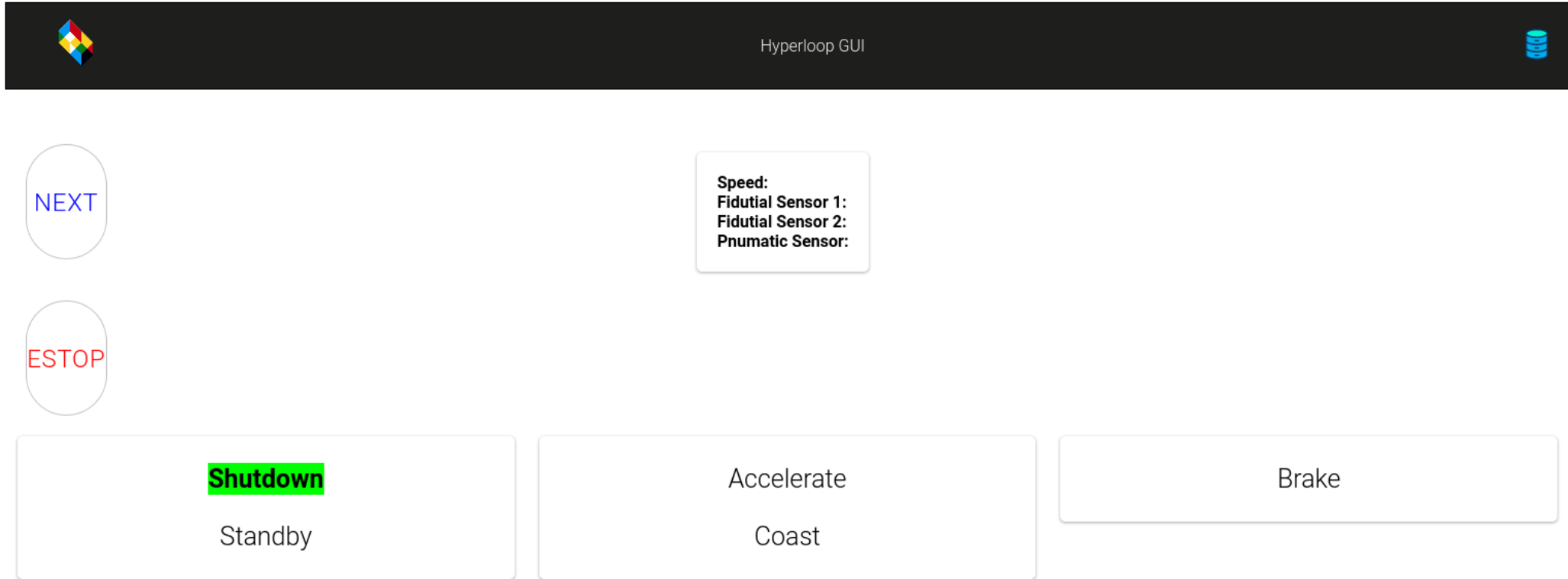
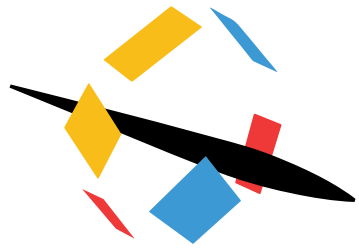
Comms: Block Diagram



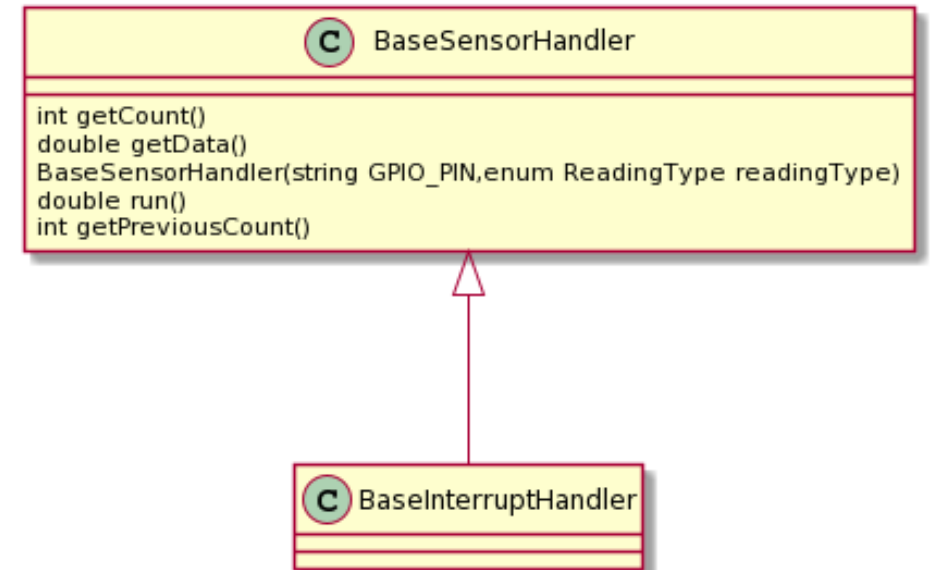
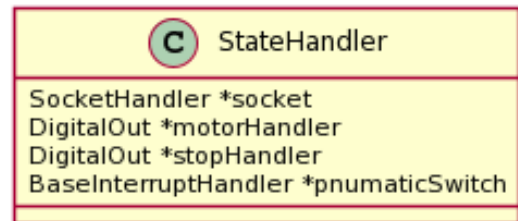
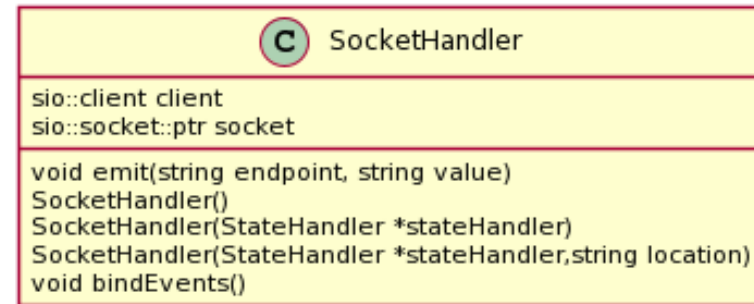
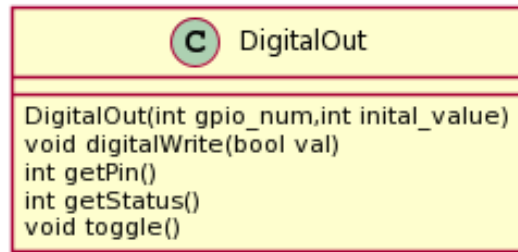
Comms: Automation Sequence



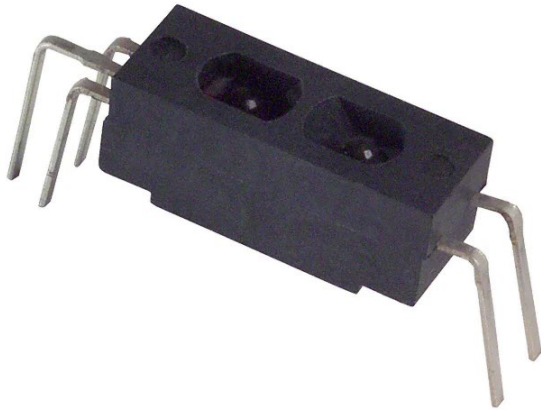
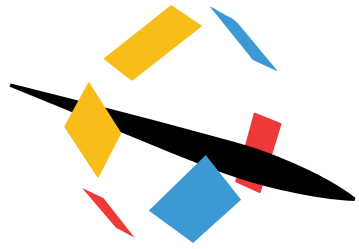
Comms: Graphical Interface



Comms: Code Structure



Sensors



EE-SY310 Omron
Fiducial Sensor



Pressure Switch

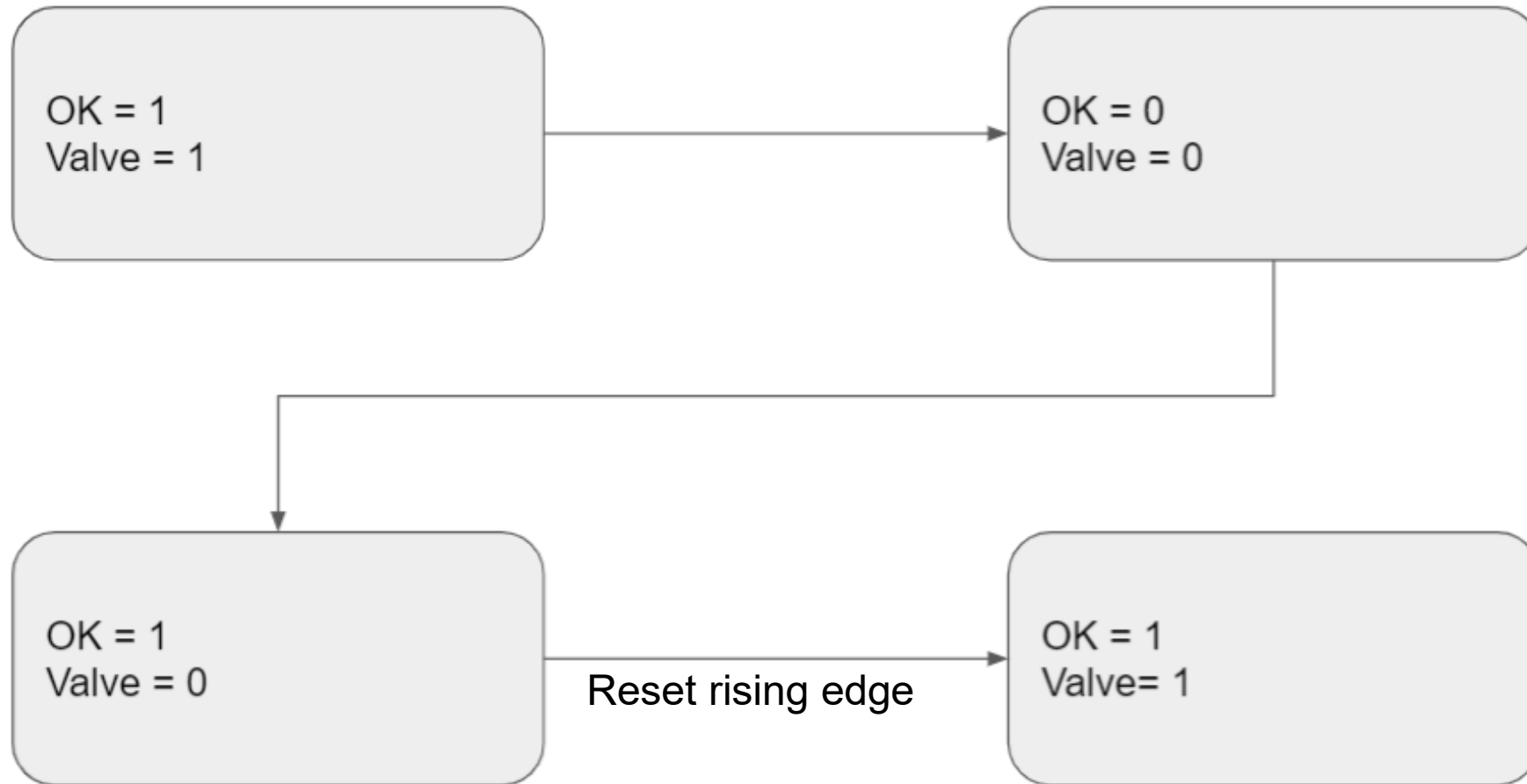
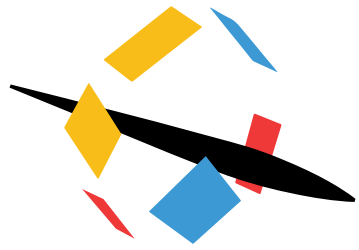


10 Kg series Load Cell



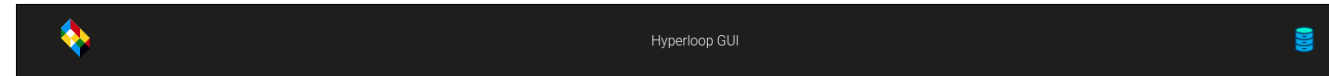
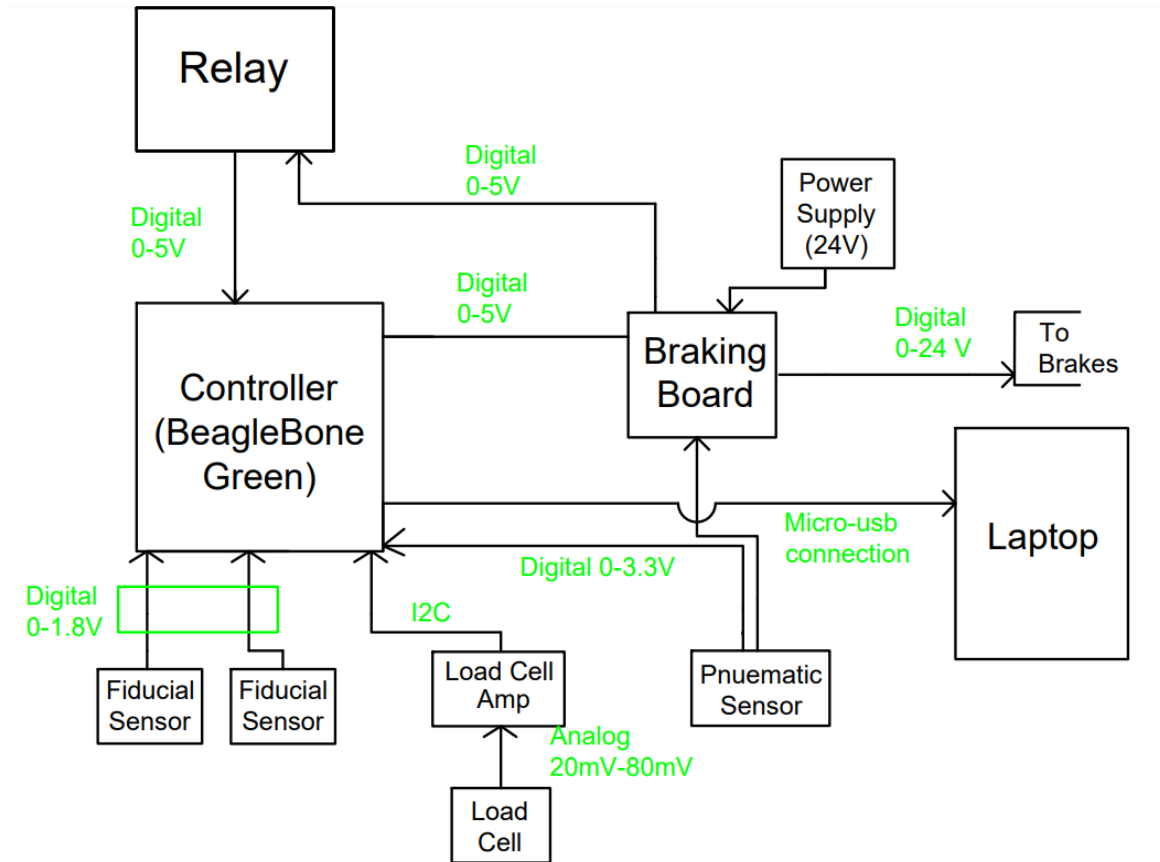
Prosense Digital Pressure
Sensor

Braking Board State Diagram





Summary



NEXT

ESTOP

Speed:
Fiducial Sensor 1:
Fiducial Sensor 2:
Pneumatic Sensor:

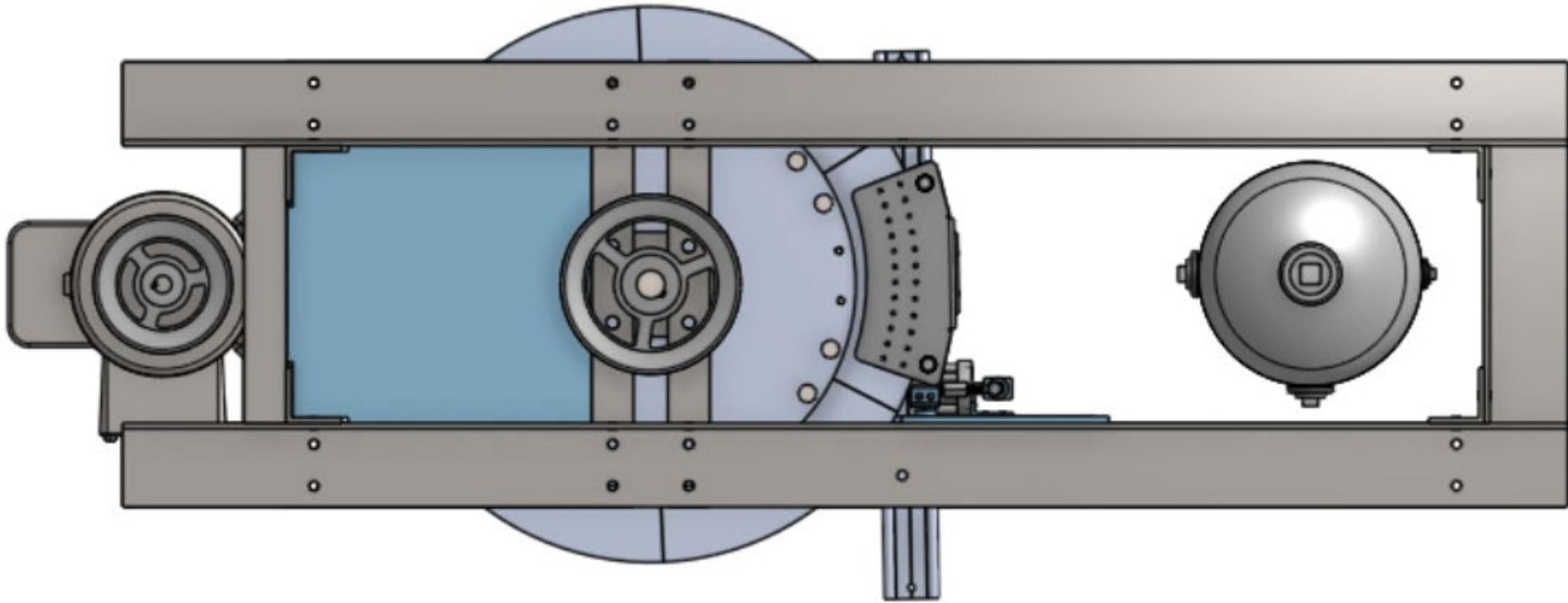
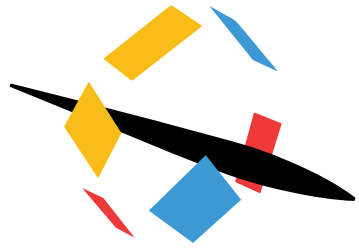
Shutdown
Standby

Accelerate
Coast

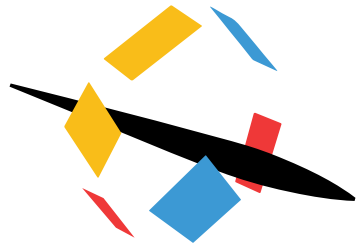
Brake



Brake Dynamometer



Dynamometer Overview

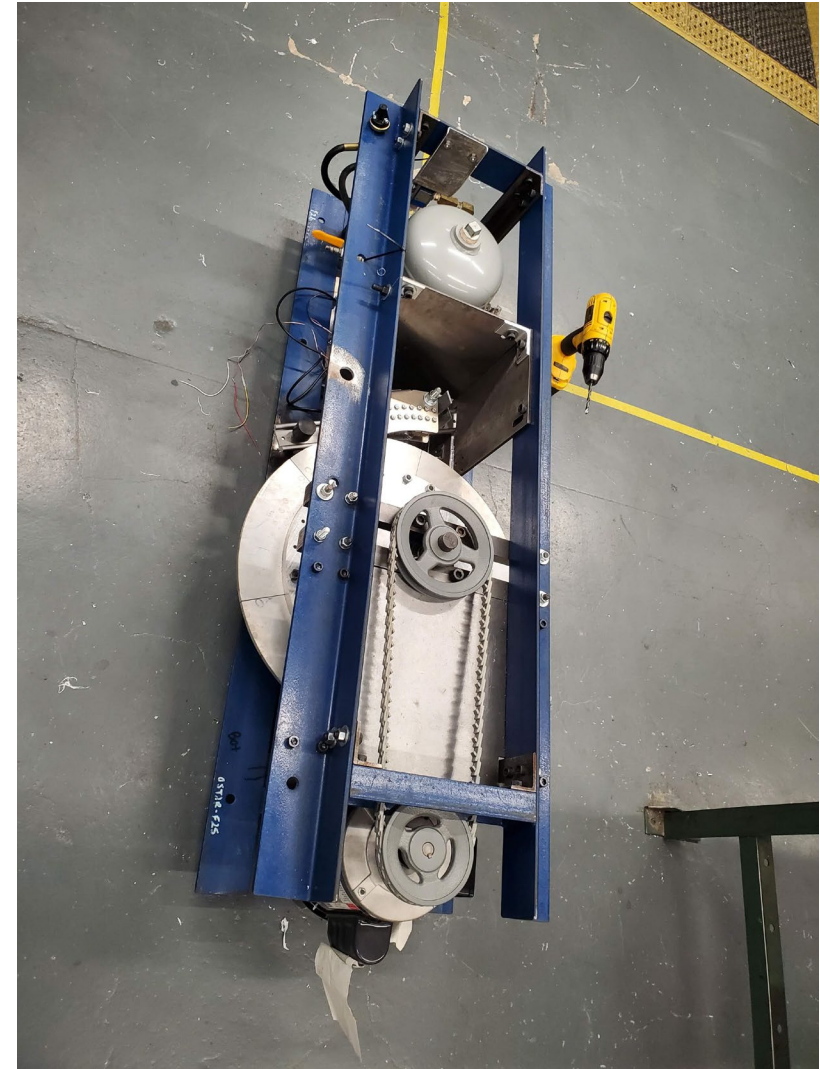


Purpose

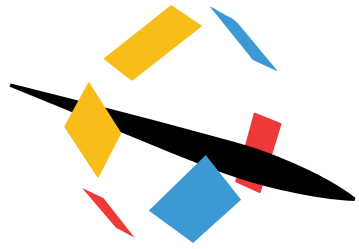
- Test our Eddy Current Brakes
- Verify our simulations

Process

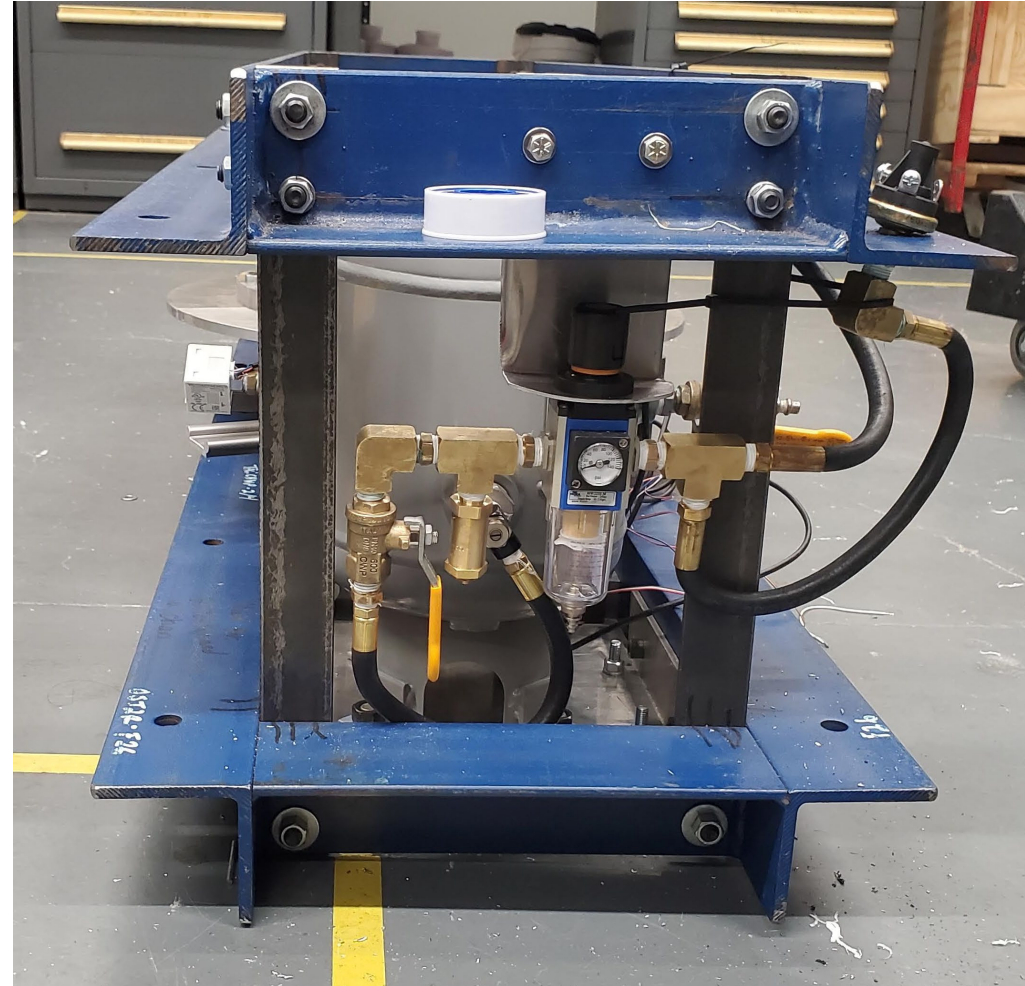
- A flywheel is spun to simulate the track
- The brakes are actuated on a pivot to stop the flywheel



Pneumatic Subsystem

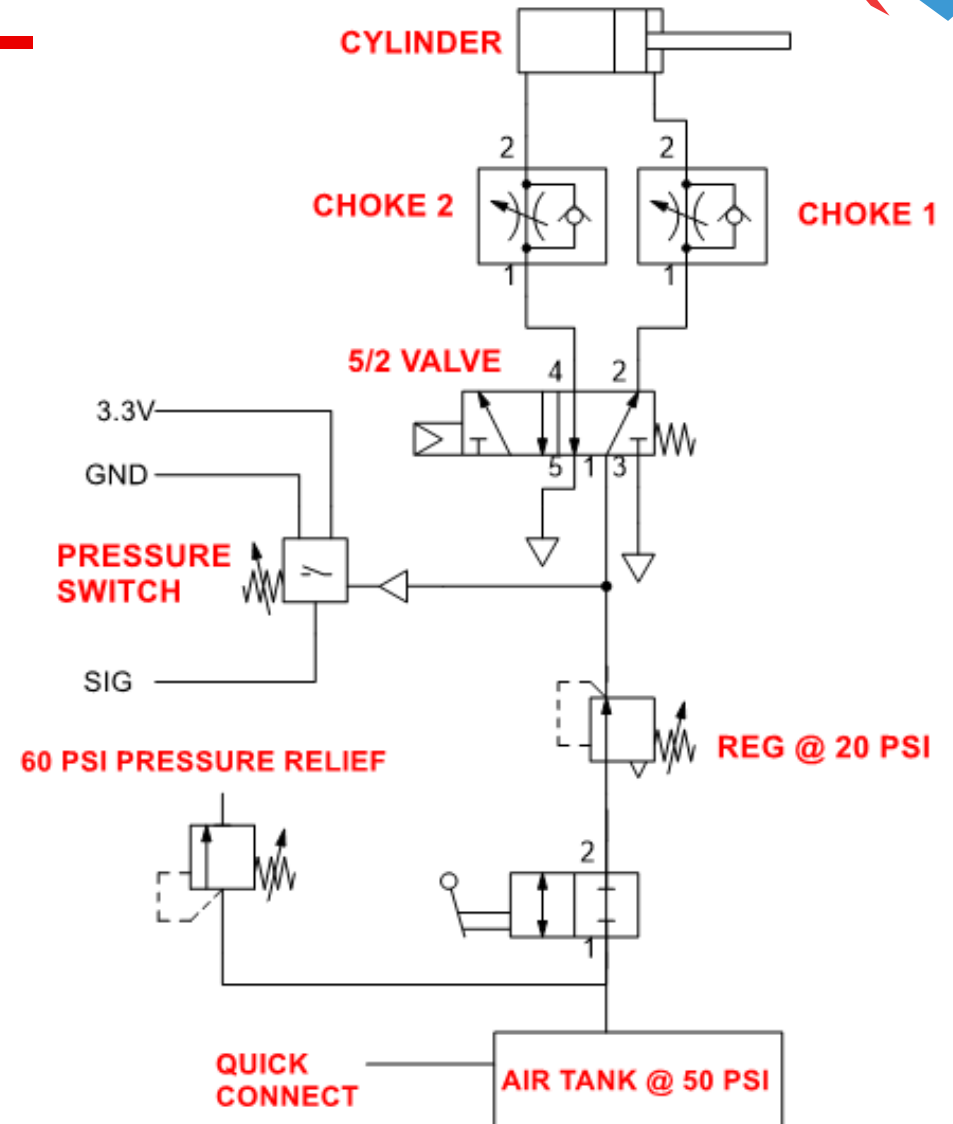


- Low pressures needed
- Compressor on campus and at EHW
- Already tested hardware
- Clean and simple compared to hydraulics or electronics

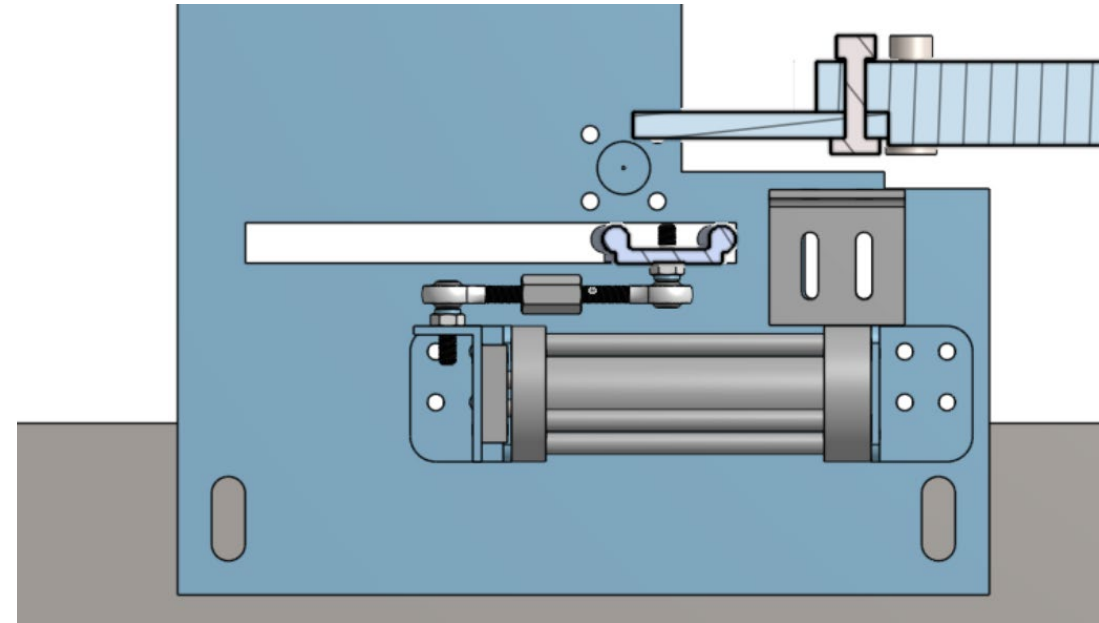
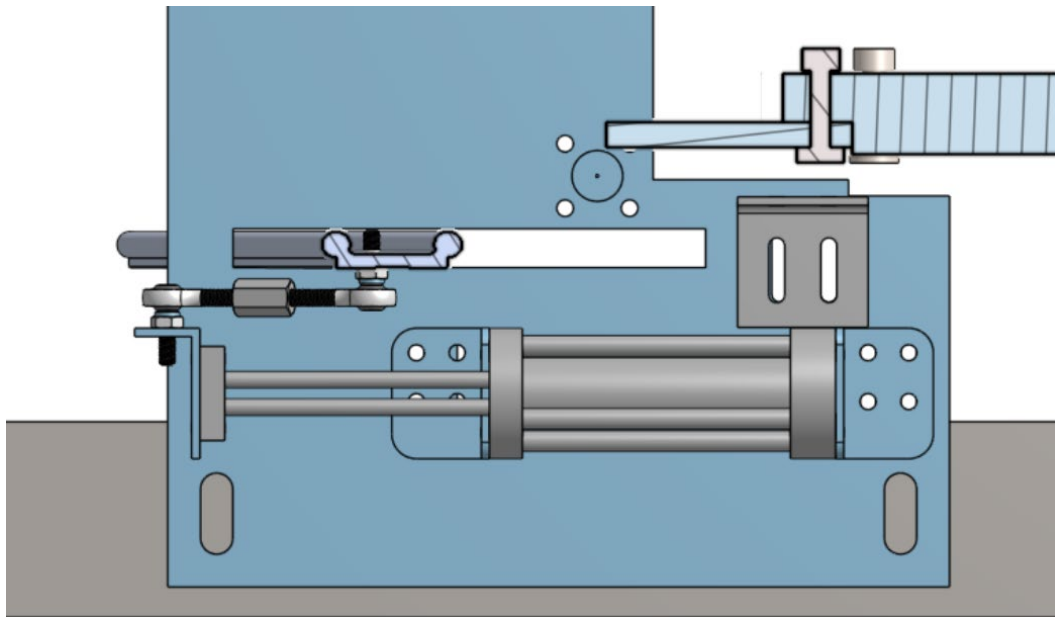
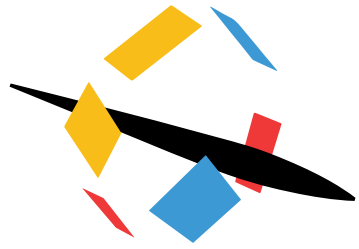


Safety Features

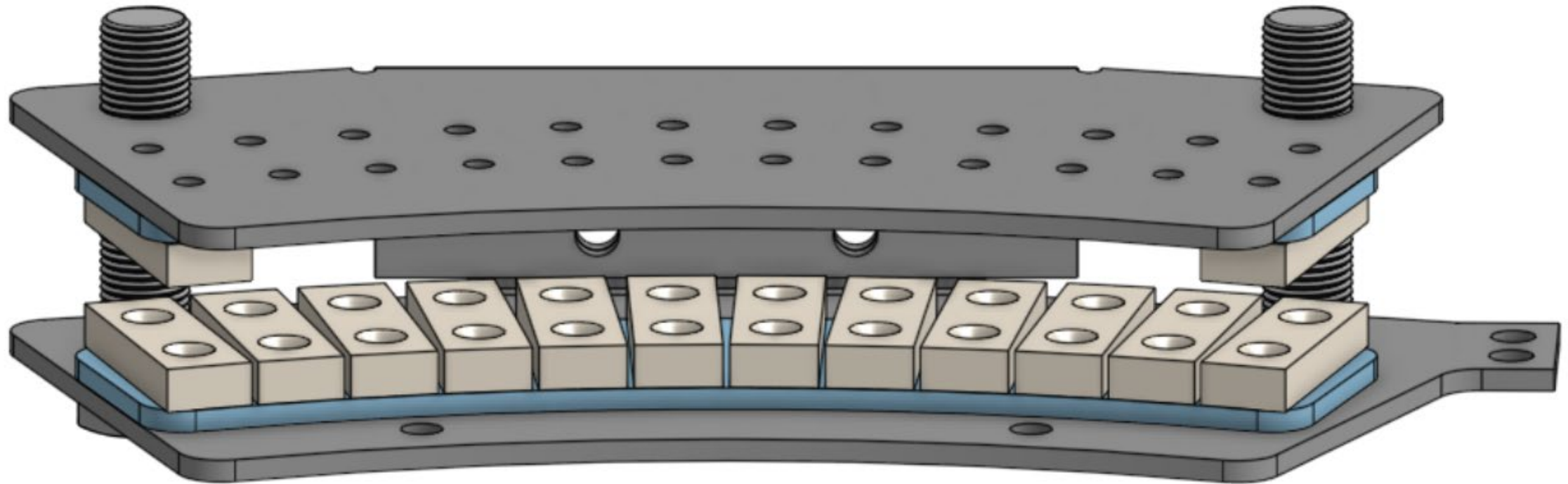
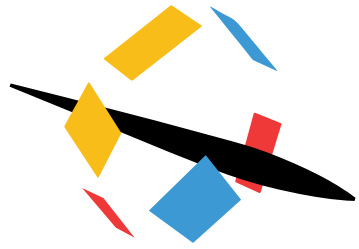
- 5/2 Valve
- Pressure Switch
- Regulator
- Pressure Relief Valve
- Protective Shields



Motion of Brake



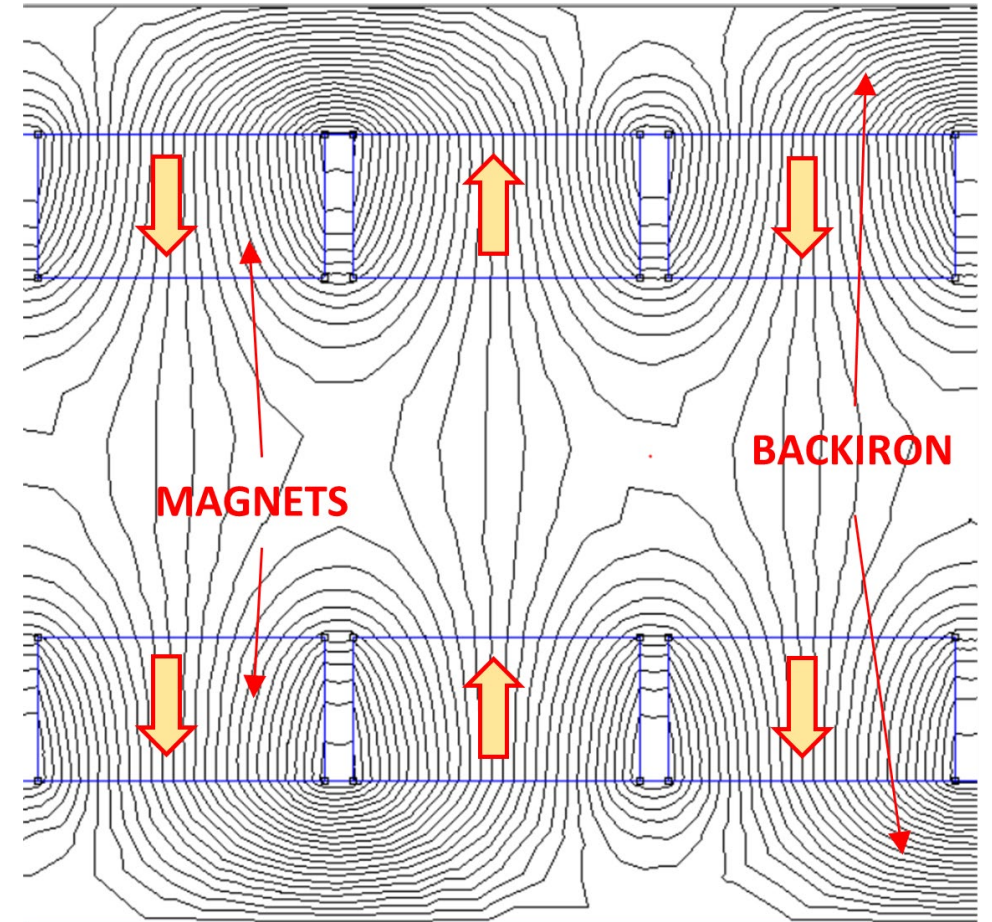
Eddy Current Brakes (ECB)



ECB Design Innovations



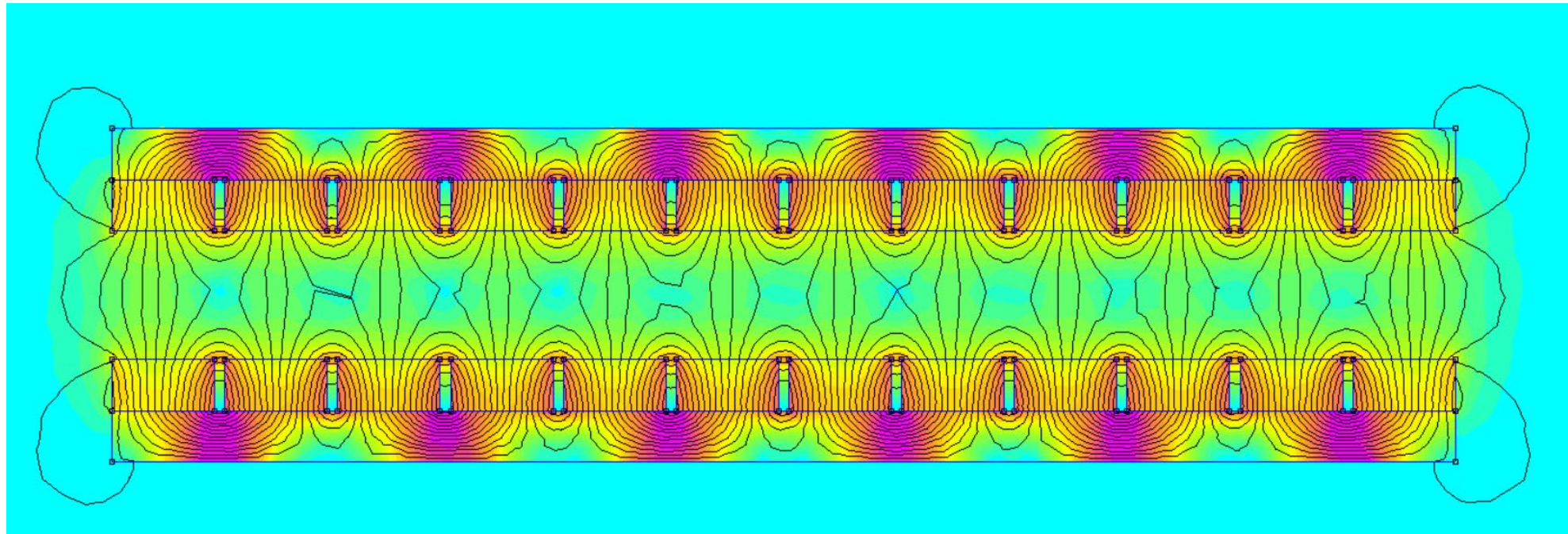
- Uses N-42 permanent magnets
- 1018 Steel backiron
- Flux lines follow pattern below
- Adjustable air gap between magnets



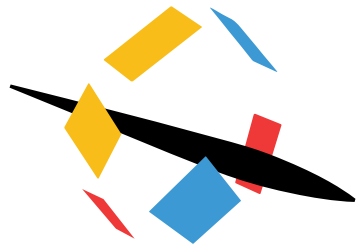
ECB Simulation Results



Average field intensity at flywheel surface: $1.54\text{E-}3$ Tesla



Brake Dynamometer Tests



Fiducial Tests

Tests failed possible lack of adequate IR light

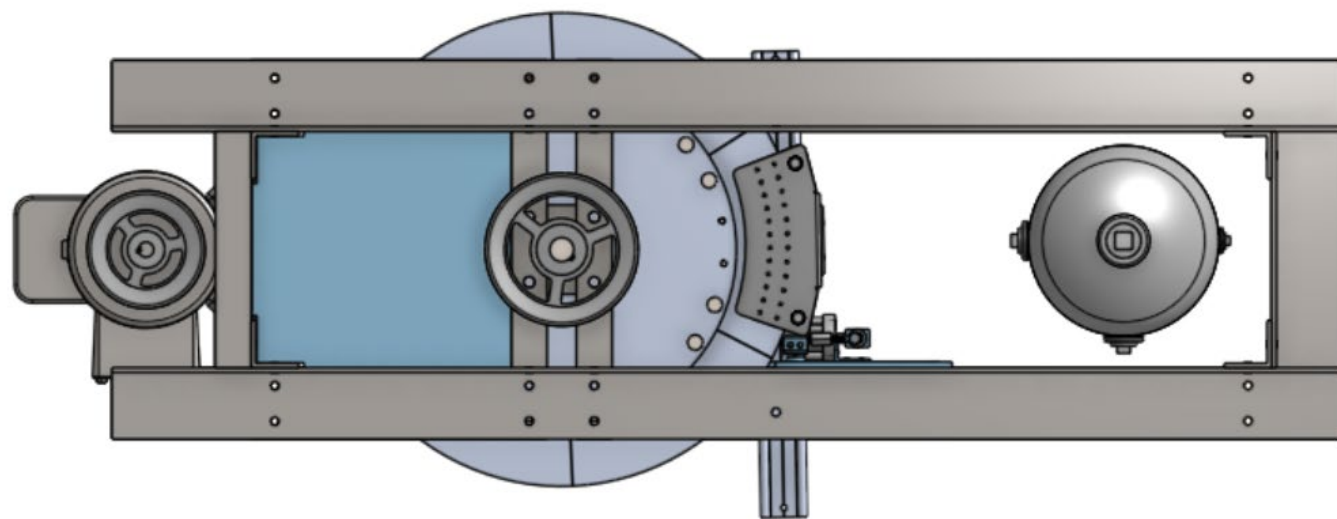
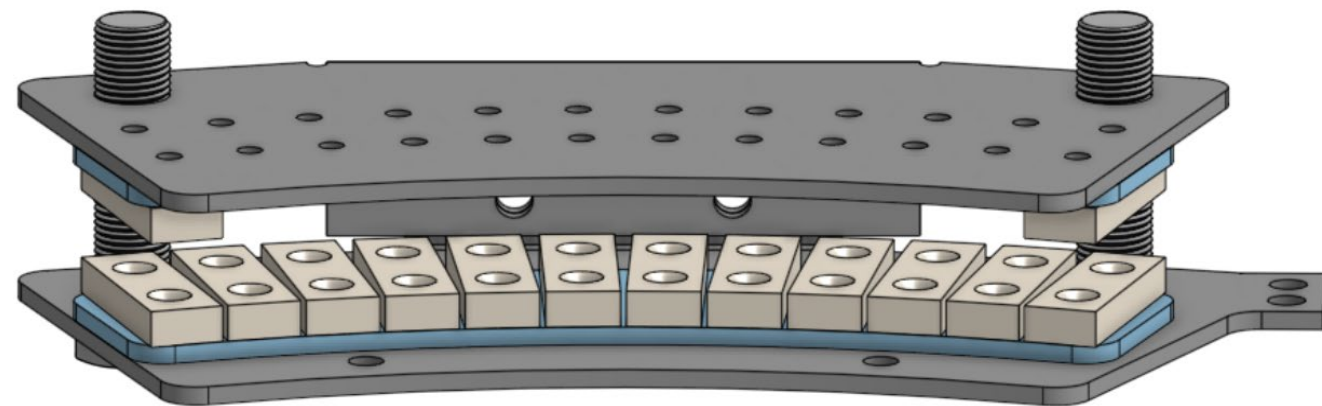
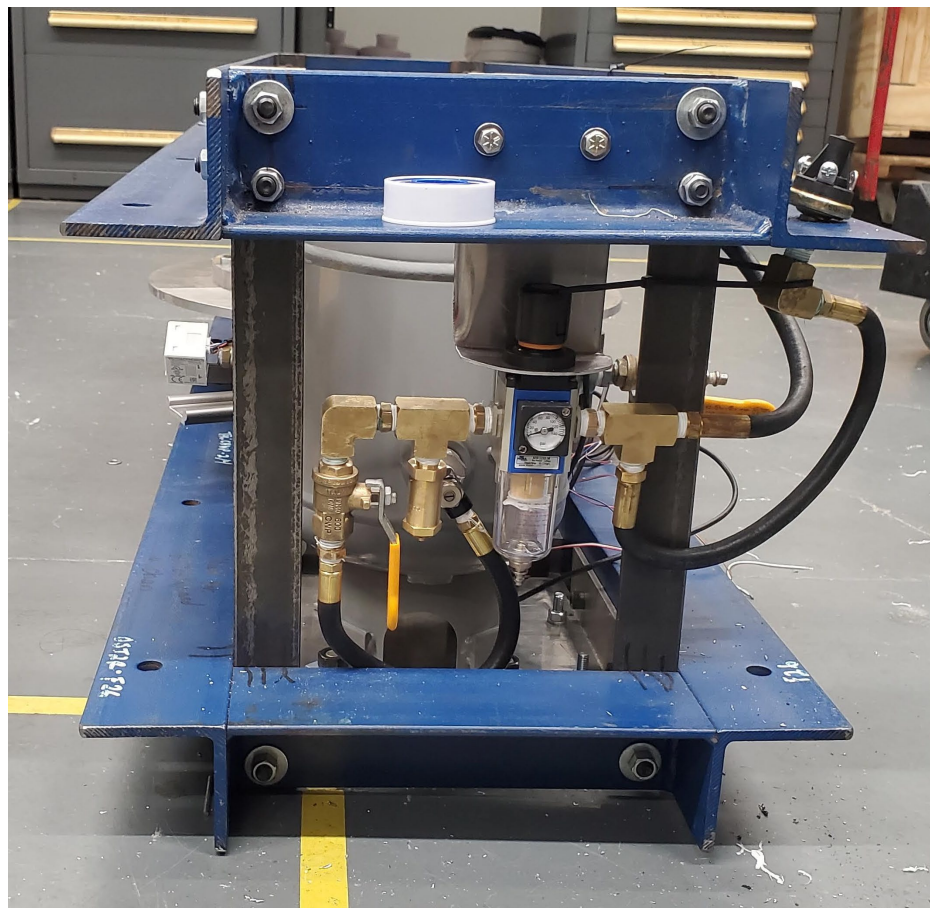
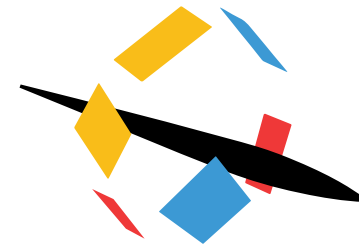
Leak Test

After several iterations, all leaks found and sealed

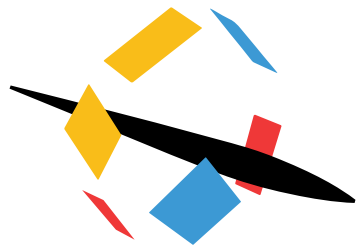
Unpropelled Test

Actuation of ECB test with hand spun flywheel

Summary



Parameters



```
%% Parameters  
G=5.24; % geometry factor--(x_shock/x_wheel)  
b = 1000; % damper  
k = 4000*G; % spring (include geometry factor!)  
M = 150; % mass  
J = 100; % mass moment of inertia  
v = 100; % speed  
l = 1; % half length  
td = (2*l)/v; % time delay back wheel wrt to front wheel
```

Braking Board Logic Diagram

