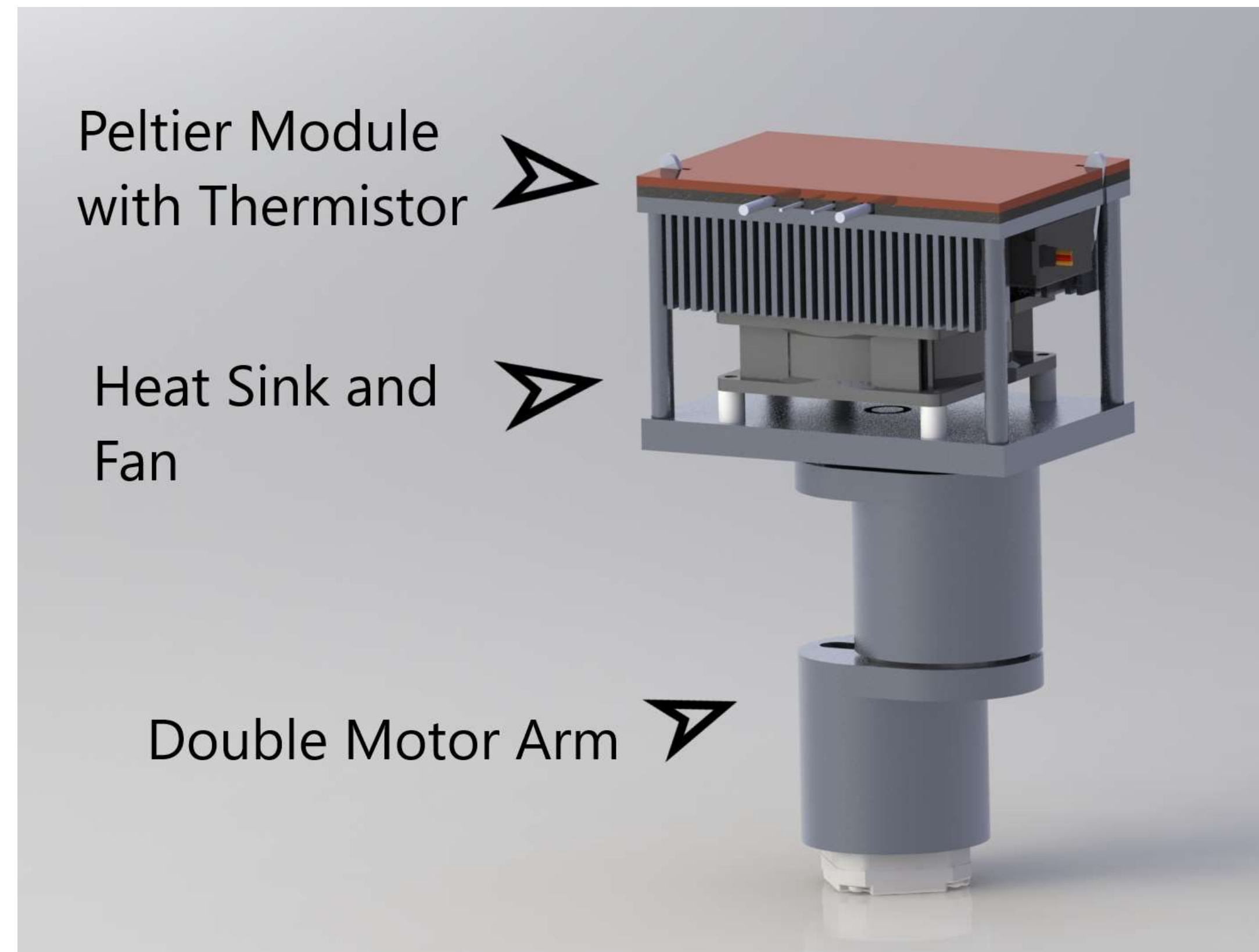


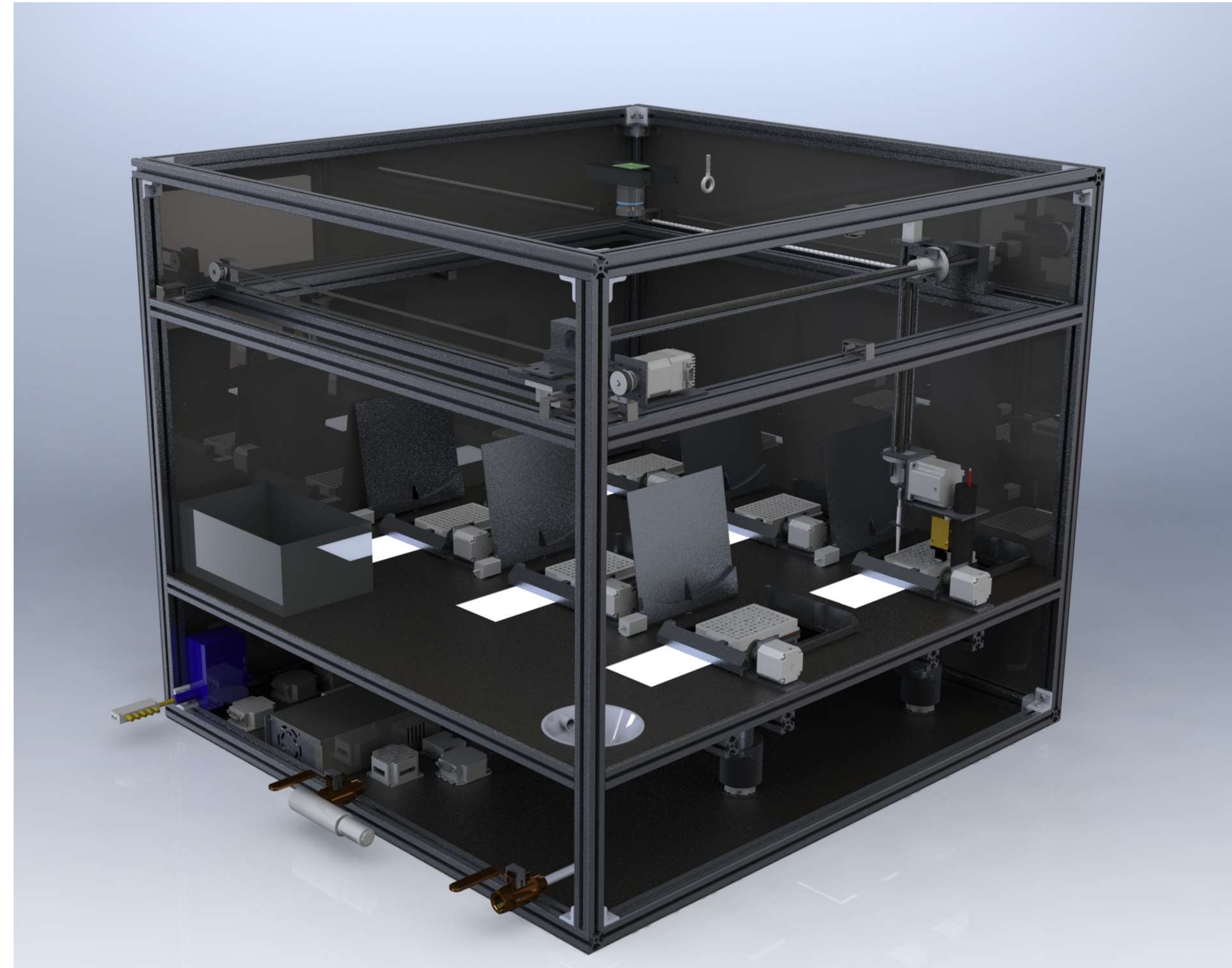
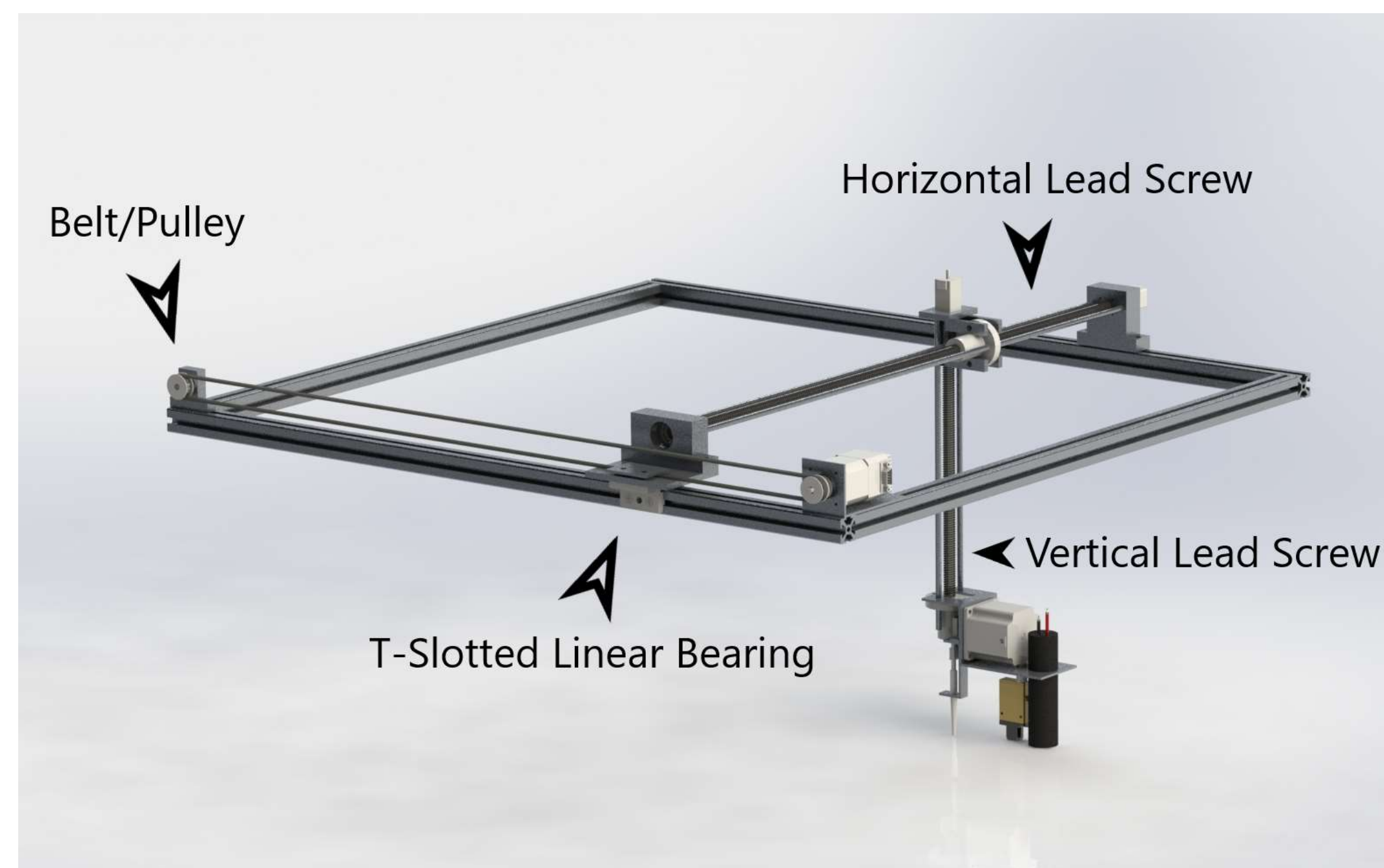
Design Overview

M.A.T.E. is a device that can process cell cultures autonomously. The design can transfer liquids from one vessel to another with high-speed precision, measure OD and FI of individual cultures, and maintain uniform atmospheric conditions. Our goal is to process the highest volume of cultures in the quickest fashion by operating the liquid handling system with seamless transfer from reservoir to culture environment and incorporating several components of culture condition control into one system. Temperature control and shaking are integrated for each plate with simple transfer between the shaking platform and light for optical measurements. Our shakers provide unique 2-D motion, and M.A.T.E. can process 6 different well plates at one time. Our design includes a camera inside the containment space for visual monitoring and a Pythagorean cup design for waste disposal that does not require a valve.

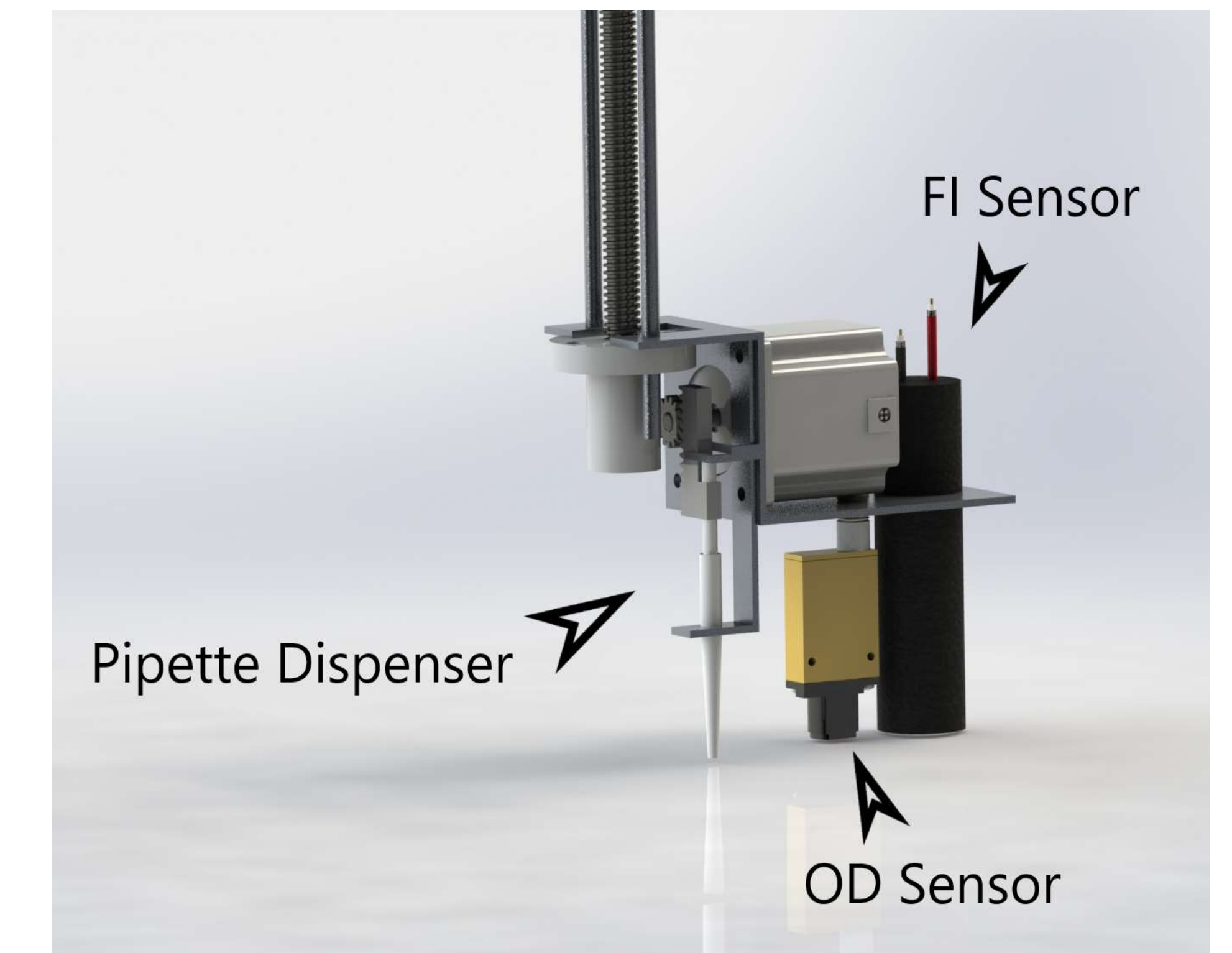
Plate Movement



Liquid Handling



Culture Condition Control



Frame



Product Functionality

To begin, the system is equipped with one volumetric flow meter with a five-valve manifold connected to it, allowing for the connection and control of five different gases into the system. The proximity of the manifold in relation to the system allows for little to no residual gas leakage that might interfere with the integrity of the atmosphere of the system. Multiple sensors exist near each well plate's location that allow for monitoring of the gaseous atmosphere near that well plate. When the system needs to be evacuated of gases to set up a new atmosphere, pressurized air can be connected to the J Series venturi pump, creating a vacuum within the system quickly and easily. For the measurement of OD and FI, a specialized sensor exists on the shaft connected to the pipette that will read each individual well while the well plate rests on its respective LED plate. The pipette itself is capable of motion in the x, y, and z directions via the linear actuators and lead screws located at the top of the system. A feedstock reserves exists within the system for liquid acquisition when the pipette is emptied. The walls of the system are opaque so that no outside light interferes with the culturing of the cells. To be able to see the process happen, an optical camera is placed on the ceiling of the system with red light strips next to it to light the system. The camera sends its image signal to the touchscreen dashboard for a visual, and the red light at 640 nm does not threaten the integrity of the culturing process. The Plate Movement system consists of one linear actuator connected to a simple slider that moves the well plate from the site of being filled to the site where OD and FI measuring will take place. Before this takes place, the plate must be shaken. Underneath the well plate at the measuring site are two orbital motors aligned vertically with one another allowing for linear, orbital, and double orbital shaking patterns as specified. When shaken, the plates are covered by an aluminum strip via a dc motor, and the strip is then sterilized with distilled water that runs through a series of pipes to a self-disposing Pythagorean Cup waste disposal system.

Cost Overview

- OTS: \$6,861.11
- Raw Materials: \$812.70
- Manufacturing: \$1113.53
- Energy: \$10.92/month (not included in total)
- Assembly: \$923.26
- Total: \$9710.60

Acknowledgements

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