

# Designing an Automated Soldering Station to Solder Copper-Ribbons onto PV Cells

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## Problem Overview

- Soldering tin-coated copper-ribbons on PV cells requires precise control of temperature, soldering speed, and the applied force.
- Additionally, the tabbing needs to be soldered to a specific part of cell metallization.
- When done by hand, it can take upto 40 minutes and human error can lead to the breaking of multiple cells.

## Design Goals

- Solder tin-coated copper-ribbons (300 $\mu$ m round) on PV cells (~200 microns thick) without damaging them.
- Increase accuracy of soldering on the cell metallization
- Reduce the time taken by the process compared to manual soldering

## System Design

The modular design of the holder allows us to retrofit a 3D printer for better and more accurate control of the position of the soldering iron. The holder has force-sensing resistors inside allowing the Arduino Mega with a PID controller to adjust the angle of the iron to adjust the force applied. The 3D printer chassis allows us to position & move the iron precisely with minimum error.

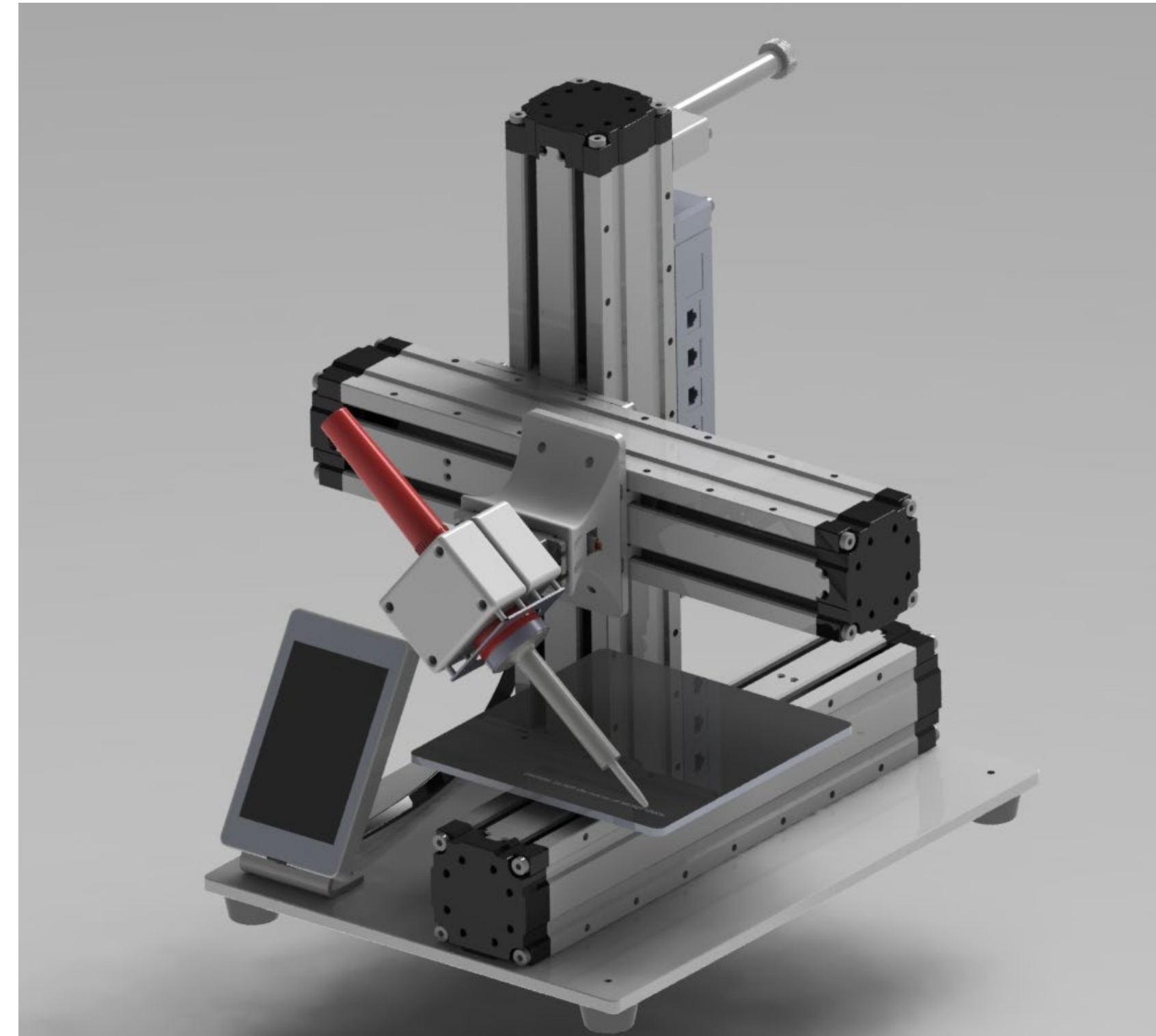


Figure 1: 3D render of the design

## Impact

- This consistent fracture-free soldering will allow other researchers to gather uniform data on stresses induced on PV cells due to other factors (such as lamination), eliminating the variability of soldering stresses in experiments.
- Provide a modular automated soldering station that can be used for precision soldering

## Challenges

- Getting an accurate value of the force applied by the soldering iron on the cell.
- Positioning the soldering iron over the copper-ribbon precisely.

## Next Step

- Optimizing the system: Studying the connections made by the system to reduce errors and increase precision in the position of the soldering iron.
- Improving the pressure reading: using more accurate force sensors to understand the pressure applied by the soldering iron on the cell to better improve the connection quality

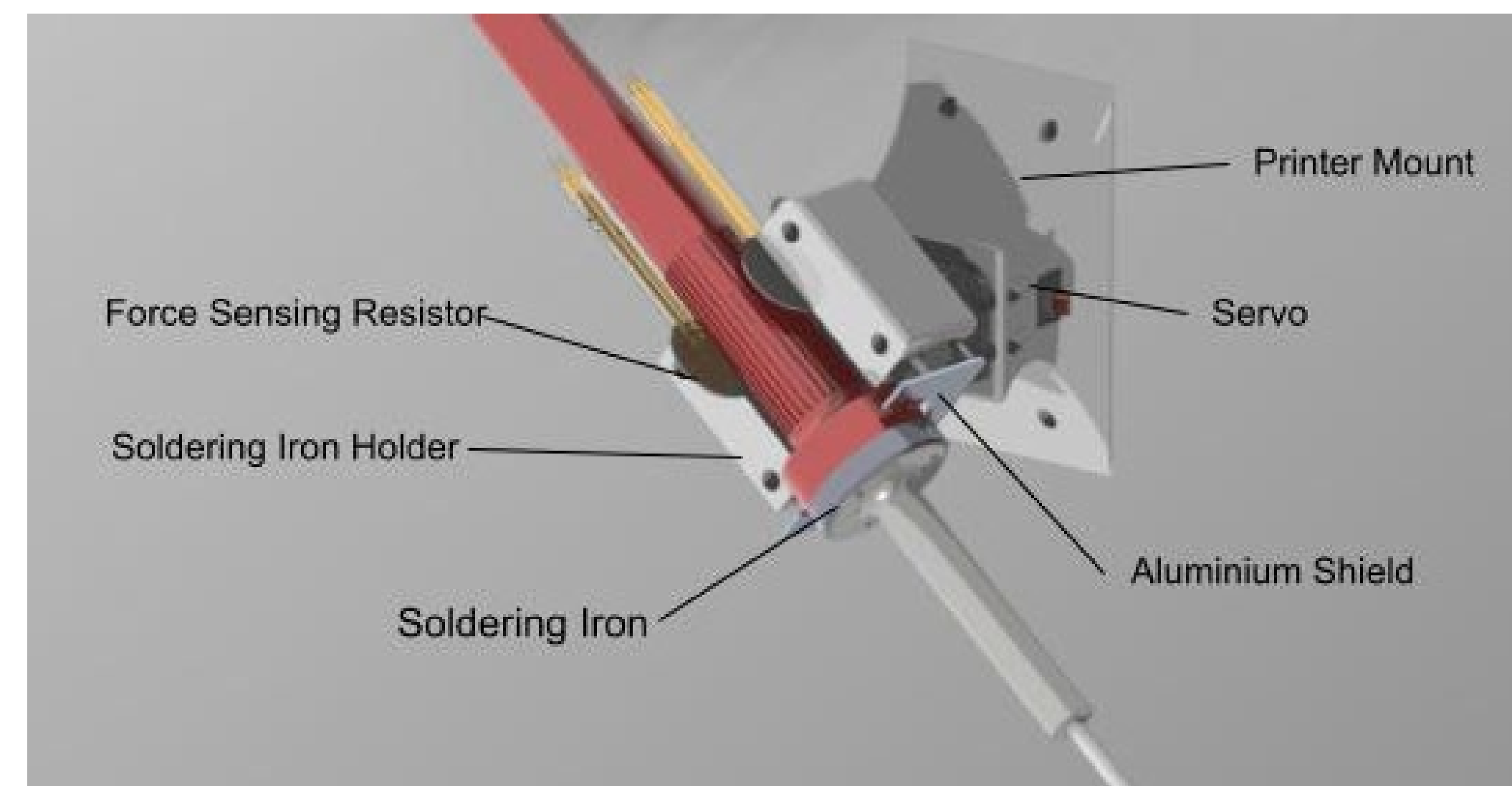


Figure 2: Component view of the holder



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