



# LumenPnP v3.1

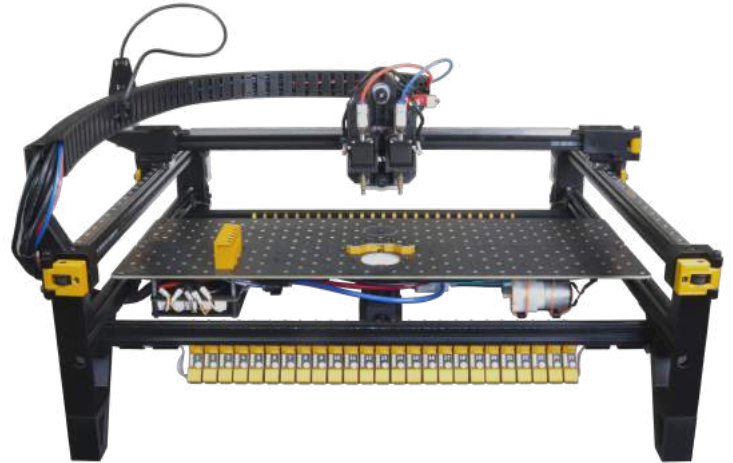
## Desktop Pick and Place

The LumenPnP brings accurate, affordable, and speedy population to your benchtop.

Orders of magnitude cheaper than its next competitor, the LumenPnP leverages the linear motion control advancements of the past decade from the commoditization of desktop FDM 3D printers and applies them to the SMT industry. Removing the need for high-pressure air or industrial power hookups means the LumenPnP can easily be deployed on your production line, or in the office.

## Board Size

The two staging plates provide a usable work area of 400mm in the X axis, and 240mm in the Y, with camera, datum board, and nozzle rack to be considered. While avoiding these, boards 120mm X 400mm, or 240mm x 270mm  
With a third staging plate, these expand to 240mm x 400mm, or 360mm x 270mm



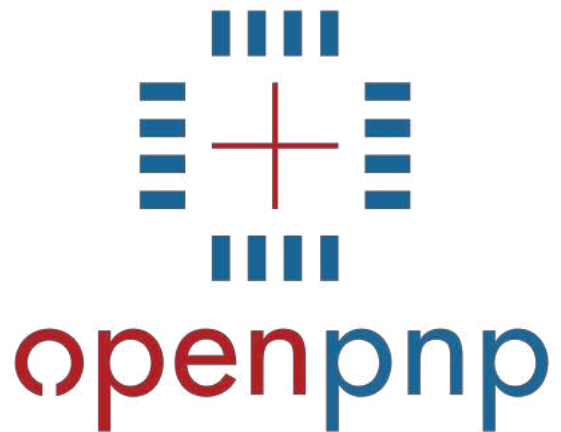
## Dual Nozzles

With two nozzles, the LumenPnP is capable of picking a wide variety of parts without needing to perform a nozzle tip swap (which the machine is capable of doing fully automatically). Correctly choosing your tips allows for the machine to pick 0402s and TQFP-100s without a swap, greatly increasing job speed.

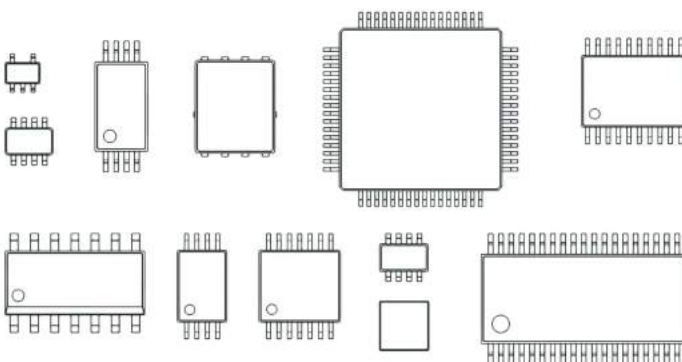


## Control Software

The LumenPnP is controlled using OpenPnP, the industry standard for pick and place machines of this scale. The machine comes with ready-made configuration files, and we walk you through every step of setup and calibration in our thorough documentation. OpenPnP runs cross platform, so you're ready to run jobs with whatever control computer you have available.



## Supported Components

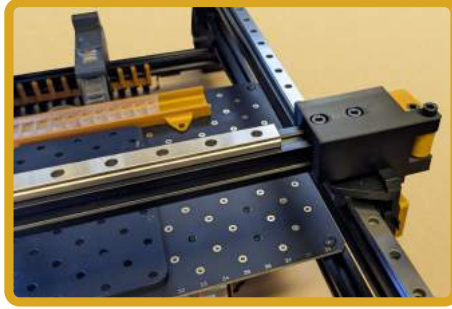


- Down to 0402 Passives
- Up to 30mm x 30mm
- Up to 25 gram weight
- Up to 20mm tall
- BGA Pitch - 0.8mm
- IC Pitch - 0.4mm



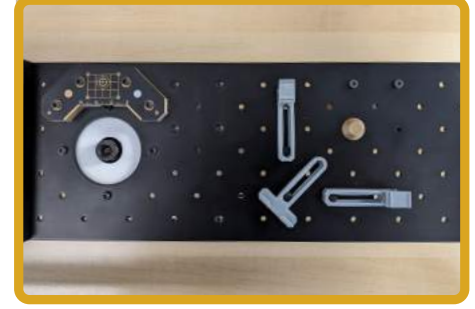
## Vacuum Detection

Two 24 bit pressure sensors come installed on each nozzle air line, allowing the machine to immediately detect a part mis-pick. This saves time by removing the need to jog to the bottom camera for part detection if a mis-pick occurs.



## High Speed

Equipped with high-quality linear rails, the LumenPnP is incredibly fast for machines in its class. It has TMC2209 stepper drivers for each axis, meaning the machine's motor movements are almost perfectly quiet, while providing exceptional current delivery.



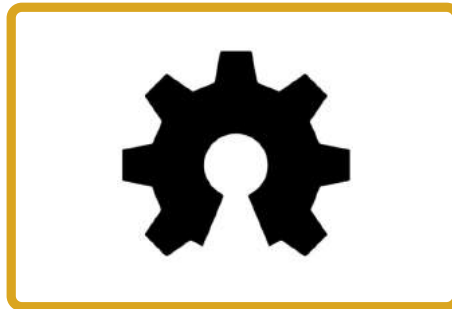
## Configurable

The LumenPnP is highly configurable due to its staging plate system. The staging plates are easily added or removed depending on your needs, and the standard Peek Array mounting hole grid allows for maximum flexibility in mounting placement.



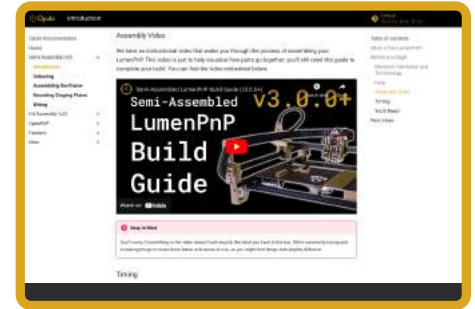
## Easy Setup

Getting your LumenPnP assembled and operational takes less than an hour. Every machine comes with a dedicated calibration kit, which walks you through setup and calibration of the machine so you're ready to run your own jobs.



## Open Source

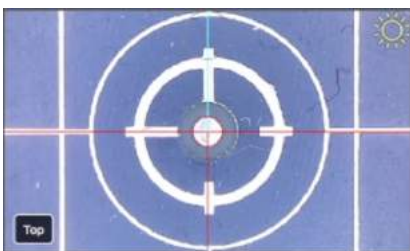
Everything about the LumenPnP is completely open source. From the mechanical CAD, to the circuit board design, to the software, everything about the machine is fully available and ready to download.



## Docs and Support

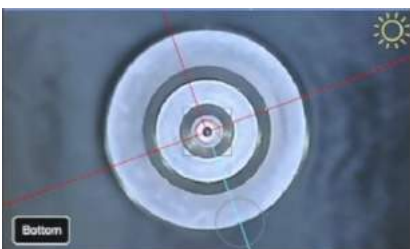
Our fully-documented assembly and calibration process is available online at [docs.opulo.io](https://docs.opulo.io). The LumenPnP has a large community of over 3.5k people and Opulo support is reachable at [support@opulo.io](mailto:support@opulo.io), so there's always someone available to help.

## Vision System



### Top Camera

The LumenPnP comes with an integrated HD camera mounted on the head. This camera is instrumental in a number of calibration procedures that allow the machine to place parts at a high speed, with high precision. The top camera helps navigate the machine's working area, automatically finds feeder pick locations, and performs fiducial calibration on the PCB being populated to optically calibrate every job.



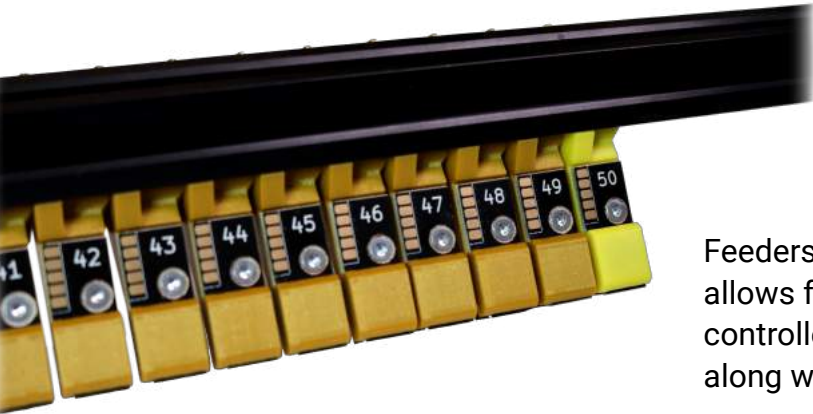
### Bottom Camera

The LumenPnP also comes with a stationary camera mounted to the first staging plate on the machine. This camera provides rotational and translational offset calibration for the parts after they've been picked by the nozzle. After picking, the machine can optionally move the picked part over the bottom camera and perform vision calibration to ensure that the part is placed exactly where it needs to go.



## Feeders

8mm and 12mm feeders are available now. 16mm feeders are in development along with 24mm feeders. 8mm and 12mm take up one feeder slot, allowing up to 50 to be mounted to the machine at a time. 16mm and 24mm feeders take up two slots.



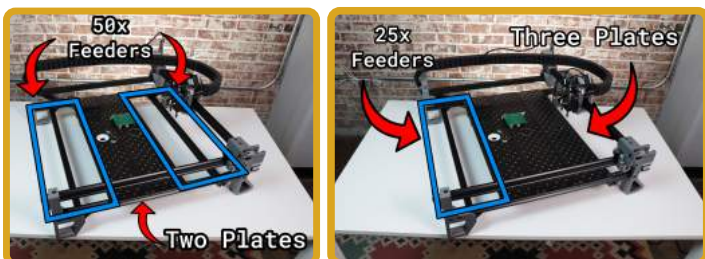
Feeders use an open source protocol called Photon, which allows for feeders to self-report complex data back to the controller, including feeder position, feed and tape status, along with the feeder's universal ID.

Because of this rich communication, feeders can be swapped to different slots and the LumenPnP is able to dynamically find, command, and pick from the newly placed feeder. This means job setup and feeder configuration is order of magnitudes easier than with other systems.

If you have components in tape widths not compatible with powered feeders, or you've fully filled your slots and have remaining parts in your job, the LumenPnP is configured to support a wide array of strip feeders, with widths ranging from 8mm, 12mm, 16mm, 24mm, 32mm, and 44mm tape.

## Staging Plate Count

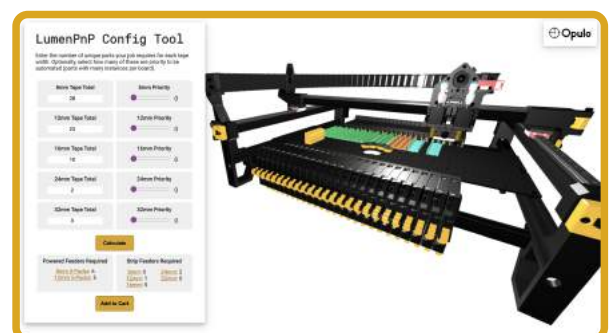
The basis for the majority of your machine's config is the number of staging plates that you have mounted to the frame. Using only the default two plates means you have both the front and back rail available for powered feeders, allowing you to fit up to 50 total. This is the recommended configuration. If you're populating very large boards that require the third plate for mounting, then only the front rail is available for powered feeders. You might also need three staging plates if you have many tape widths not supported by powered feeders.



## Config Tool

It's easy to find the optimal configuration for your LumenPnP using our Config Tool. Simply input the unique part count for each tape with in your job, assign which parts are priority to be fully automated with a powered feeder, and an optimal LumenPnP configuration will be rendered in full 3D. We also outline all the parts required for your config, and a link to purchase them.

[config.opulo.io](https://config.opulo.io)



Metric	Dual Staging Plate	Triple Staging Plate
Maximum PCB Size	120mm X 400mm or 240mm x 270mm	240mm x 400mm or 360mm x 270mm
Max Unique Components	<p>Only Powered Feeders: 50x components in 8mm or 12mm tape</p> <p>Only Strip Feeders (Reduces Max PCB Size): 27x components in 8mm tape</p> <p>Total (Reduces Max PCB Size): 77x unique components in 8mm tape 64.9% fully automatic feeders</p>	<p>Using Powered Feeders: 25x components in 8mm or 12mm tape</p> <p>Using Strip Feeders (Reduces Max PCB Size): 54x components in 8mm tape</p> <p>Total (Reduces Max PCB Size): 79x unique components in 8mm tape 31.6% fully automatic feeders</p>
Machine Dimensions	30in wide, 28in deep, and 10.6in tall (765mm x 710mm x 270mm)	
CPH	875 with vision, 1290 without	
Component Compatibility	<p>Minimum part size: 0402, Minimum lead pitch: 0.4mm            Max part weight: 25 grams, Max part height: 20mm            Down to BGA 0.8mm pitch            Strip feeder support for tape widths 8mm, 12mm, 16mm, 24mm, 32mm, 44mm            Powered feeder support for tape widths 8mm, 12mm</p>	
Power	Max Consumption 145W, accepts AC 100V-240V, 50/60 Hz	
Requirements	One computer (ideally running Ubuntu Linux or Windows) running OpenPnP Can handle 2x 720p USB webcam feeds and 1x USB serial port simultaneously	

## Summary

Ideal for:

- Low-Mid Scale Production
- Prototype Runs
- Contract work
- Makerspaces, Universities
- Up to 50 powered feeders
- Up to 79 unique components
- Supports down to 0402
- Completely Open Source
- Deployable in any setting

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