

## NEWS

# Form 3 vs. Form 2: Comparing Formlabs Desktop 3D Printers

With the **release** of the latest Formlabs 3D printers—the **Form 3** and **Form 3L**—you may be wondering how our re-engineered Low Force Stereolithography (LFS)<sup>™</sup> print engine differs from desktop stereolithography (SLA) printers like the **Form 2**, which has become a staple in the workflows of tens of thousands of designers and manufacturers across industries.

In this post, we'll spell out the main improvements we've made to the Form 3, why we re-engineered the stereolithography print process and optics engine, and what has changed to make the latest printers the most intuitive, reliable Formlabs printers yet. We'll focus on the differences between our desktop 3D printers, the Form 3 and the Form 2.

- If you've never used a Formlabs 3D printer before and are looking for the latest in affordable, professional 3D printing, we recommend getting started with the **Form 3**.
- If you're looking for a large format 3D printer, the **Form 3L** is the best choice, with five times the build volume of the Form 3.

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## Low Force Stereolithography (Form 3) vs. Stereolithography (Form 2)

Five years ago, Formlabs was the first to bring high-resolution stereolithography 3D printing to the desktop, in a much smaller and more affordable setup than existing industrial SLA machines. Since then, the Form 2 has become the industry-leading desktop 3D printer, with over 40 million parts printed in the field by engineers, designers, manufacturers, dentists, jewelers, and more.



*A Form 2 3D printing station at the University of Sheffield Advanced Manufacturing Research Centre (AMRC) supports the work of hundreds of engineers.*

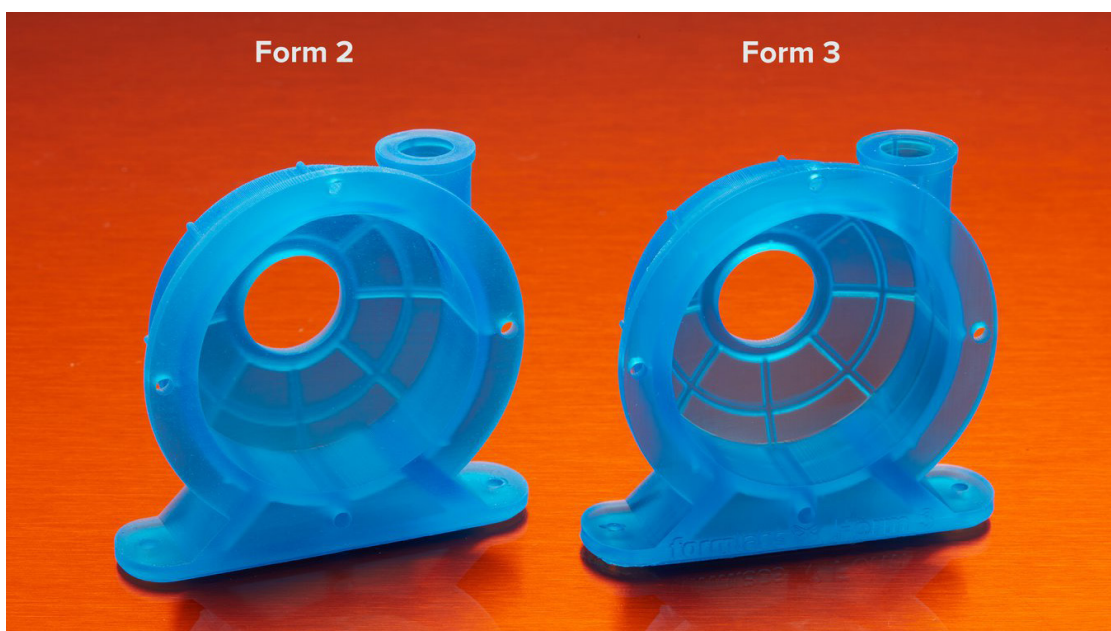
The Form 3 and Form 3L are built on new Low Force Stereolithography (LFS) 3D printing technology, an advanced form of stereolithography that leverages a flexible tank and linear illumination to offer a huge leap forward in print quality and printer reliability.

## A Lower Force Print Process

The Form 2 achieved a substantially smaller footprint than industrial stereolithography printers by inverting the print process.

Inverted SLA introduces peel forces that affect the print as it separates from the surface of the tank, so the build volume is limited and sturdy support structures are required. The Form 2 was heavily calibrated to account for the forces of the peel process and produce high quality parts, putting industrial quality in the hands of more businesses at an affordable price point.

The Low Force Stereolithography technology that powers the Form 3 was developed specifically to drastically reduce peel forces for significant increases in print quality and printer reliability. One key improvement is the flexible film at the base of the tank, which allows for a softer peel between layers during printing.



*Low Force Stereolithography 3D printing significantly reduces peel forces that can create rough surfaces, leading to improved surface finish and part clarity. Both parts printed in Tough Resin at 100 microns.*

This decrease in peel forces brings several key benefits:

- **Improved surface quality**, with less visible layer lines and decreased surface roughness for incredible smooth surface finish and clarity even at 100 microns.
- **Light-touch support structures** with smaller touchpoints that easily tear away from the part for faster cleanup and finishing.
- Better print success across all materials, most noticeably for **materials with high viscosity and low green strength**. While we will continue to release materials that are compatible with both printers, some future material releases will only be compatible with Form 3.

Decreased peel forces lead to incredible surface quality, easier support removal, and cutting-edge material possibilities. Choose the Form 3 for the best surface finish and the easiest post-processing.



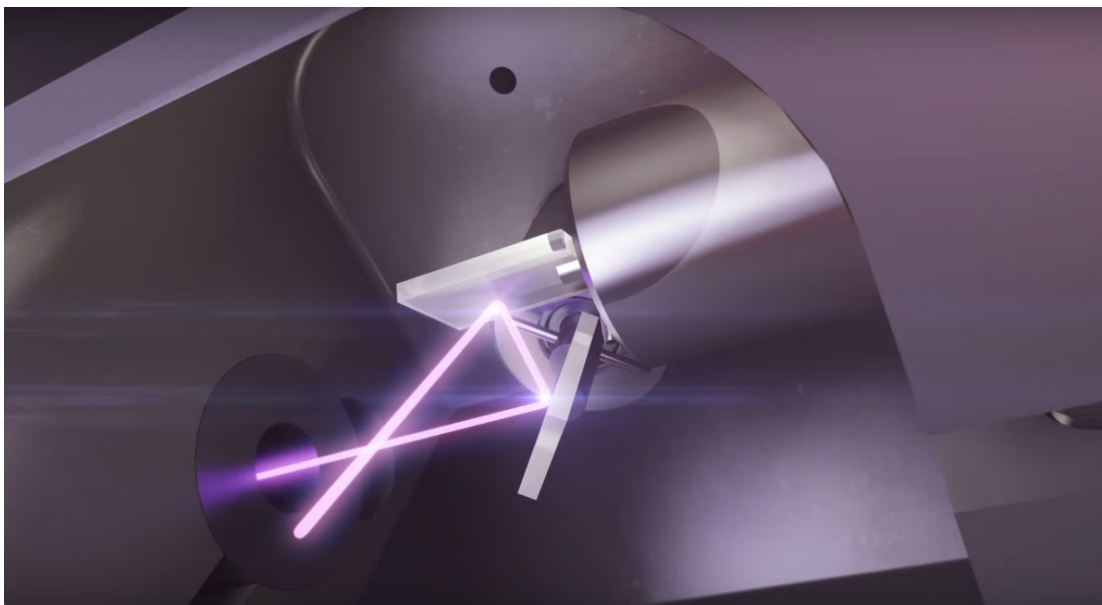
*"The improvements to the light-touch supports that break away are game-changing. There is no way to describe the first time you take a part and pull at it and it just seamlessly pops completely free. It takes the stress out of building and cleaning parts and lets us keep our focus on design and creation."*

**—Justen England,**  
Managing Director, [Delve](#)

## Optics

The precision optics engine within the Form 2 has proven over time to meet the accuracy requirements of the most demanding applications (for example, dental labs, who need to produce many highly accurate parts on a repeated basis).

The Form 2 uses two galvanometers for X and Y positioning, directing laser light from the back of the printer to a large stationary mirror that delivers the beam to the print plane.

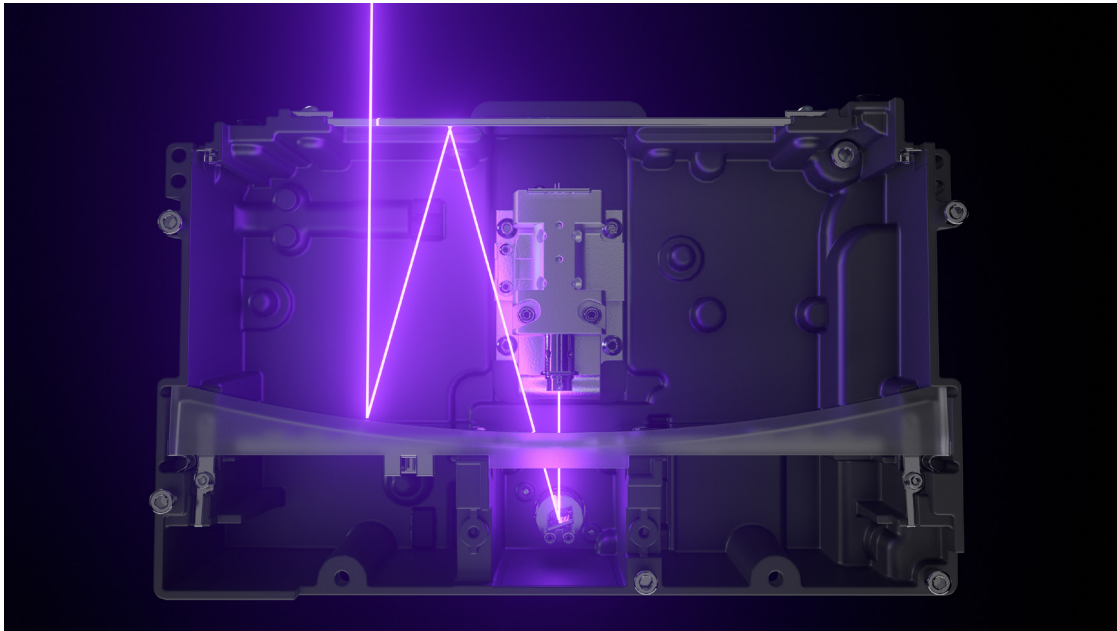


For the Form 3, we focused on further refining accuracy and consistency, and making the system scalable. LFS 3D printing houses the optics inside a Light Processing Unit (LPU) that moves in the X direction. One galvanometer positions the laser beam in the Y direction, then directs it along across a fold mirror and parabolic mirror to deliver a beam that is always perpendicular to the build plane.

While beam deviation at the print plane is small on a printer the size of Form 2 and Form 3, a perpendicular beam allows for uniformity as hardware scales up, which is why it was possible to develop the large format Form 3L.

The Light Processing Unit uses a spatial filter to create a crisp, clean laser spot for greater precision, and a higher-frequency galvanometer, which leads to some gains in print speed over the Form 2.





*The Light Processing Unit (LPU) inside the Form 3 contains a system of lenses and mirrors that ensures an accurate, consistent laser spot.*

|                            | FORM 3   | FORM 2   |
|----------------------------|--|--|
| Laser Power at Print Plane | 120 mW   | 96 mW  |
| XY Resolution              | 25 microns<br>0.001 in                             | n/a  |
| Laser Spot Size            | 85 microns (0.0033 in)                             | 140 microns (0.0055 in)                            |
| Laser Wavelength           | 405 nm wavelength                                  | 405 nm wavelength                                  |
| Laser Specifications       | EN 60825-1:2007 certified<br>Class 1 Laser Product | EN 60825-1:2007 certified<br>Class 1 Laser Product |

The LPU delivers more uniform, precise optics to the Form 3 and Form 3L than the Form 2, and is easier to replace in the rare case that optical issues arise. Choose Form 3 and Form 3L for the highest optical precision, part accuracy, and consistent printing over time.

## Truly Nonstop Printing

With the Form 2, we set out to create the most reliable 3D printer on the market. It's been incredible seeing businesses from [dental labs](#) to [Gillette](#) rely on fleets of Form 2 printers for production at volume.



*Ashford Orthodontics, the largest orthodontic laboratory in the United Kingdom, created a digital department from scratch that now produces 1,200 clear aligners and retainers a month running a fleet of 12 Form 2 3D printers.*

Formlabs machines are designed to free up time so you can focus more on designing and creating and less on checking and maintaining your printer.

The Form 3 has introduced several new features to push toward maximum uptime:

- **Even more integrated sensors** across the printer detect and maintain ideal print conditions and alert you when the printer needs your attention. The optical sensor can even detect dust!
- The Light Processing Unit, resin tank, rollers, and optics window are designed to be **easily replaced in-house**. Some Form 2 components are user-replaceable, and we've learned from working with users how to make these replacements even more intuitive.
- **Improved failure detection and handling** means you can experiment with challenging geometries with ease. If a print fails, the Form 3 can print a cleaning mesh for easy removal.

The Form 3 takes printer reliability to the next level with more features to help you spend less time checking on your printer so you can focus on designing and creating.



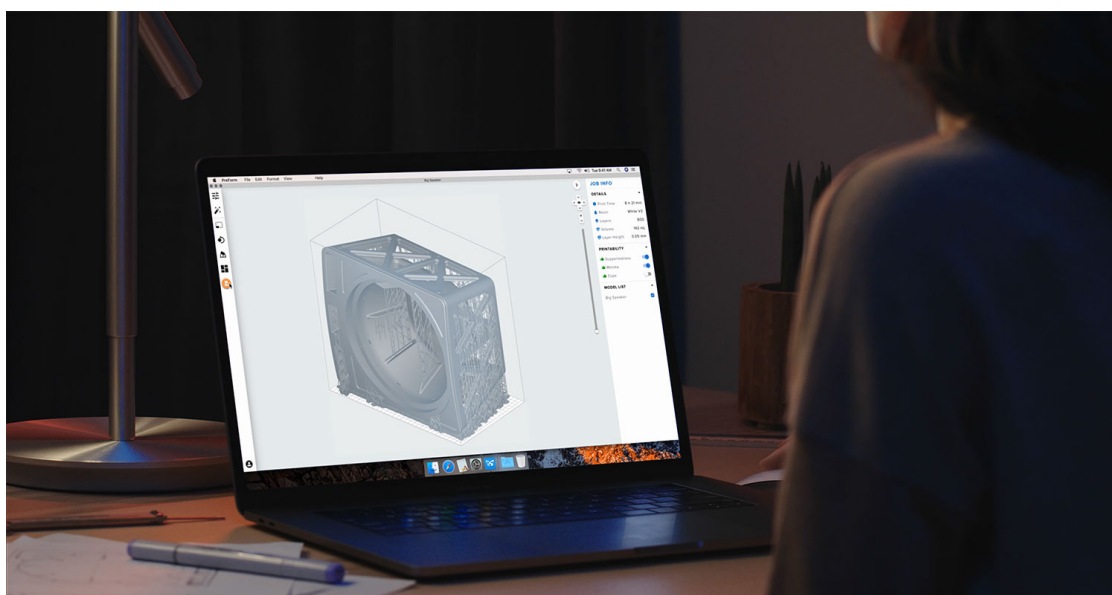
*“The Form 3 cuts down on the number of things that you have to know, in order to get good parts. That's good product design.*

*The surface finish is better and the support sizes are smaller, so everything just comes out cleaner. Less work has to go into getting viable parts. That speeds everything up, especially when you're trying to get something from ‘we want to tweak the dimensions here’ to trying it on a robot within a couple of days. You can't do the same quick design cycles with out-of-house processes.”*

**—Nick Payton,**  
Mechanical Engineer, [RightHand Robotics](#)

## Print From Anywhere With Remote Print

For those who receive urgent or last minute print requests, the Form 3 introduces the ability to start prints from anywhere. Pre-prime the printer before you leave, then start the next print job from anywhere in the world (not just the local network).



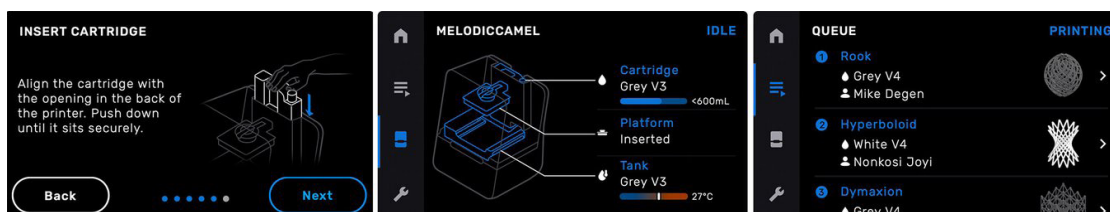
*Start Form 3 prints from anywhere with Remote Print.*

## Familiar Workflows, New Ways to Interact

If you've used a Form 2 before, the overall workflow for the Form 3 should feel quite familiar. Even if you have never used a Formlabs printer, it's easy to get started with either machine. To further empower beginners and accelerate the workflows of advanced users, Formlabs offers similar service and training options for each machine.



The basic printing process looks like this: Import your design into PreForm, choose a material from our extensive materials library and insert the cross-compatible cartridge, and click print. Our automated post-processing machines, Form Wash and Form Cure, are compatible with both Form 2 and Form 3, which use the same build platform.



*Some good news for Form 2 users: we've updated the software for all of our printers, giving both PreForm and the touchscreen interface a facelift!*

The Form 3 has introduced a few new features to make interacting with the printer even easier:

- **A larger, higher resolution touchscreen.** The Form 3 can be controlled completely digitally from the screen, while the Form 2 includes an additional button. A larger screen also enables future translations of the interface into new languages.
- **Two LED status indicators and a speaker** for ambient visual and audio alerts ideal for drawing the attention of anyone passing by.
- **Sleek, redesigned hardware** with a printer cover that opens up flat against the wall, optics protected from resin exposure, and components that are easily replaced by the user.

|                 | FORM 3   | FORM 2   |
|-----------------|--|--|
| Printer Control | 5.5" interactive touchscreen<br>1280 × 720 resolution  | 4.3" interactive touchscreen<br>480 × 272 resolution |
| Alerts          | Touchscreen alerts<br>SMS/email via Dashboard<br>Two LED status indicators<br>Speaker for audio alerts | Touchscreen alerts<br>SMS/email via Dashboard        |

With cross-compatible materials and accessories and the same intuitive software, it's just as easy to manage several Form 2 and Form 3 printers side by side as it is to manage a uniform fleet.



## The Form 3: The Next Generation of Industrial SLA

Today, Formlabs users are leading the way in how to grow 3D printing from one machine to 24/7 digital factory, from prototyping tool to indispensable driver of business. The Form 2, the 3D printer that changed the standard, is now available at an even more affordable price point to bring industrial-quality 3D printing in-house.

With the Low Force Stereolithography (LFS) print process behind the Form 3 (and its large format counterpart, the Form 3L), Formlabs has re-engineered the print process to create an in-house fabrication platform that's more reliable and versatile than ever.