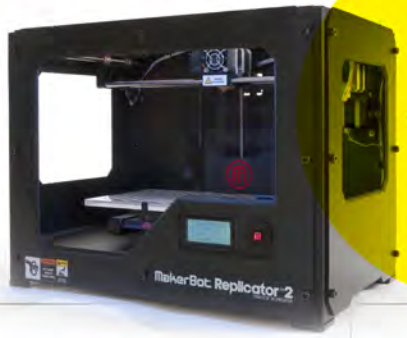
3D PRINTER BUYER'S GUIDE **WHICH ONE IS RIGHT FOR YOU?**

Make:

Winter 2013



15 PRINTERS REVIEWED!

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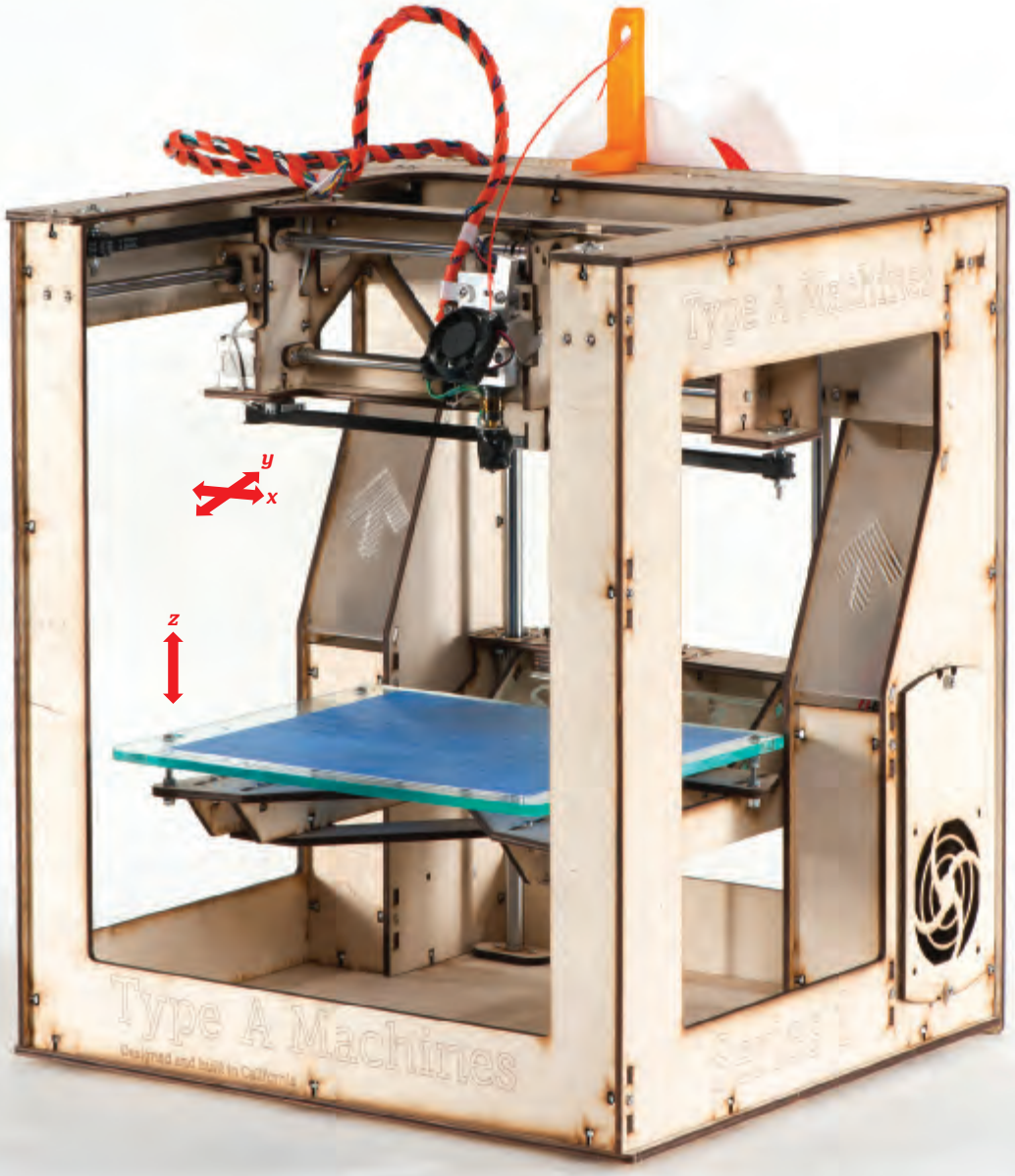


- **Primo features** Huge print volume, quick-release build platform, rock-solid extruder
- **Print volume** 9"×9"×9"
- **Print speed** 90mm/sec
- **Print material** PLA, ABS, PVA
- **Resolution (z-axis)** 0.1mm
- **Machine software** Repetier or Printrun
- **Slicing software** Slic3r or KISSlicer
- **OS supported** Windows, Mac, Linux
- **Open source?** Yes
- **Price as tested** $1,400 assembled
- **Pedigree** Original, with RAMPS electronics
- **Print without PC?** No

Type A Series 1

Type A Machines typeamachines.com

An affordable, accurate printer with a huge build area and lots of potential.

WRITTEN BY **ERIC WEINHOFFER**

TESTED BY **ERIC WEINHOFFER** *AND* **KEITH OZAR**

TYPE A MACHINES' SERIES 1 IS ONE OF THE NEWEST (AND LARGEST) 3D PRINTERS we reviewed, but even though it was released only months ago, it has already made waves in the community due to its huge build area and competitive price.

Based in San Francisco, Type A's tiny crew of Andrew Rutter and a handful of hackers out of Noisebridge and TechShop began constructing Series 1 proto-

types in August 2011. By the time Maker Faire Bay Area rolled around in May 2012, the team had several iterations of their machine on view, and they've been selling the finalized design since mid-year.

Like several printers in our lineup, the Series 1 case is constructed from laser-cut plywood. This route is popular for good reason: plywood is cheap, easy to cut, and paintable.

The Series 1 is an open hardware product, meaning you can download the pertinent case and equipment files from Thingiverse, build your own, and make modifications at will. (We'd like to see someone from this community share a design for a fan shroud to direct air from the diagonally mounted fan toward the nozzle.)

Like MakerBot's Replicator 2, the Type A Series 1 is optimized to print in PLA plastic. PLA is not only a pleasing material to look at, it's also biodegradable (made of cornstarch) and nontoxic. This removes the need (and expense) for a heated print bed for printing ABS plastic, with a minor tradeoff: PLA is more "gooey" than other media under heat. In general, PLA rarely causes warping problems, meaning you can build large objects, and since the included spool of PLA is mounted on a spindle in the back, you don't have to babysit the machine while it's at work.

The machine's 9"-cubed build volume is so big (1.2 liters) that one of the "bonus" prints we did during our review weekend was a full-scale, wearable hat. The jumbo volume is also perfect for printing multiple parts or even whole assemblies at once. The build platform is made of laser-cut acrylic, and it's held in place on the Z stage between the head of a bolt and a spring at each corner. To level it, you simply adjust these 4 bolts; to remove it, just pull it toward you to move larger slots over the 4 bolts, and lift it free.

Type A outfitted our demo unit with their new "Winchester" extruder drive, an element they're still developing for production. Its construction is rock-solid and reliable, with aluminum parts including a lever that keeps your filament tight against the drive gear. A beefy torsion spring keeps the filament in place, and helps the extruder adjust for minor changes in filament diameter. We're huge fans. Changing plastic is a breeze: simply pull the lever back and slide your filament out. It's also completely exposed, which leads us to believe it'll be easy to troubleshoot and repair. (Type A is also prototyping a Double Winchester for sale in time for the holidays.)

Another benefit of the Series 1's construction: speed. The Type A crew claims their frame design can clock in at printing speeds of 90mm/sec and travel speeds of 250mm/sec. It's also quite accurate — it will print beautifully at a layer thickness of 0.1mm and will happily go all the way down to 0.05mm (50 microns), where the stepping of layers is difficult to detect.

The Series 1 performed extremely well in our test prints. The large bed allowed us to print all parts of the nautilus gears in one go, the owl came out beautifully (even at the tips of the ears), and achieving a perfect snake print was no challenge. However, like many of the other machines, the Series 1 wasn't able to handle the extremely small arch in our "torture test."

Series 1 has a few downsides. Our demo unit was loud, especially when moving at high speeds, a problem that might be minimized with grease and the tightening of bolts. Also, the machine lacked an SD card slot in this configuration. Given that many of today's machines are moving to untethered printing, we'd like to see Type A offer this as standard.

Also disappointing was the lack of documentation on Type A's website. They provide the necessary download links and slicing profiles, but no troubleshooting or instruction on how to use them, as of the time of this review.

CONCLUSION

Overall, we're very happy with this machine. It has a huge build area and it's fast, affordable, and reliable. If you're looking for a PLA-printing machine that works great out of the box at a competitive price, this is your printer. Type A has already proven that they're quick innovators. We look forward to seeing what's next.

HOW IT COMPARES

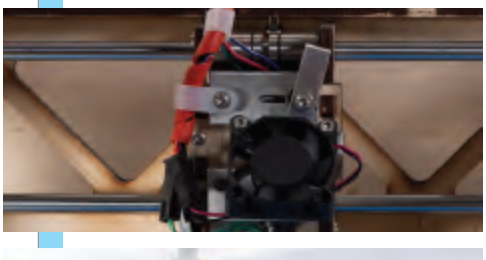
Setup	3/5
Documentation	1/5
Ease of Use	4/5
Hardware User Interface	3/5
Machine Software	3/5
Slicing Software	3/5
Speed	4/5
Reliability	5/5
Print Quality	5/5
Accuracy	4/5
Support/Overhangs	4/5
Noise	2/5
Value	5/5

PRO TIPS

Use a laser cutter to make extra build platforms and minimize time between prints!

For computer-less printing, the Series 1's RAMP electronics support an SD card slot, which is easy for users to install. In fact, Ultimaker's UltiController kit will work with this machine, giving you SD, stand-alone printing, and an LCD-screen interface to boot.

THE DETAILS



We like the rock-solid Winchester extruder with its lever-action filament feeder, and the convenient "Easy-Off" build platform.

PREMIUM	$2K+
MIDRANGE	$1K-$2K
ENTRY LEVEL	<$1K

PRICE AS TESTED

Assembled or Kit

Print Volume

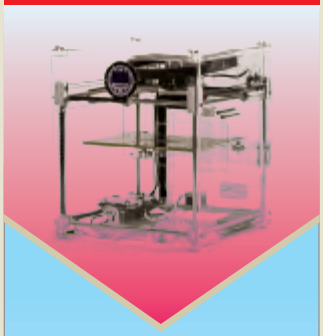
Print Speed (per Mfr.)

Print Material

OS Supported

Print without computer?

3DTOUCH



$4,370

Assembled

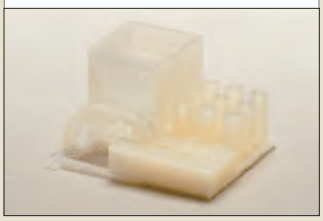
7.3"×10.75"×7.9"

15mm³/sec

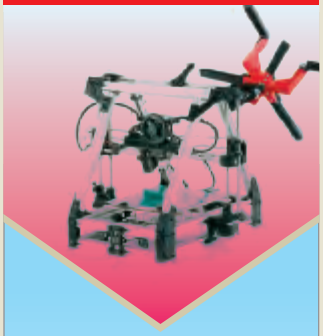
ABS, PLA, Soluble PLA

Windows

USB Stick



LULZBOT AO-100



$2,500

Assembled

7.9"×7.5"×3.9"

150mm/sec

ABS, PLA

Windows, Mac, Linux

SD Card

REPLICATOR 2

$2,199

AVAILABLE AT MAKERSHED.COM

Assembled

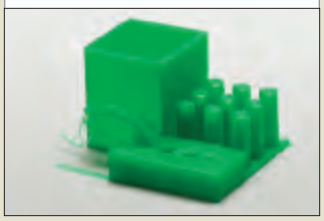
11.2"×6"×6.1"

80-100mm/sec

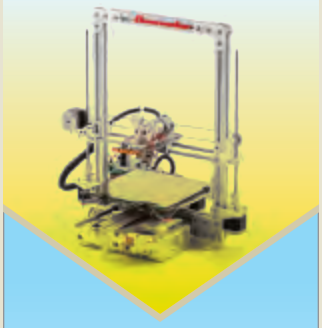
PLA

Windows, Mac, Linux

SD Card



BUKOBOT 8



$1,385

Assembled

8"×8"×8"

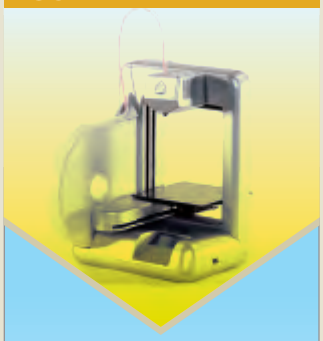
120mm/sec

ABS, PLA, PVA

Windows, Mac, Linux

Optional, SD Card

CUBE



$1,299

Assembled

5½"×5½"×5½"

15mm³/sec

ABS

Windows

Wi-fi, USB stick

MENDELMAXPRO

$1,295

Assembled

9"×10"×7"

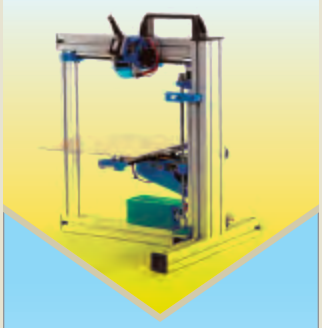
150mm/sec

ABS, PLA, PVA

Windows, Mac, Linux

Optional, SD Card

FELIX 1.0



$1,122

Kit

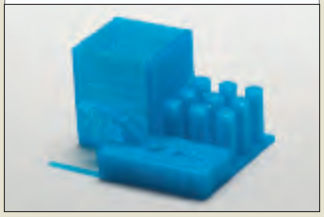
10.2"×7.8"×7.8"

150mm/sec

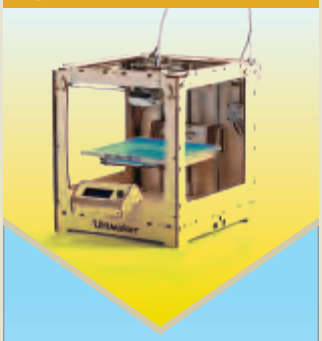
PLA

Windows

No



ULTIMAKER



$1,556

Kit

8.3"×8.3"×8.3"

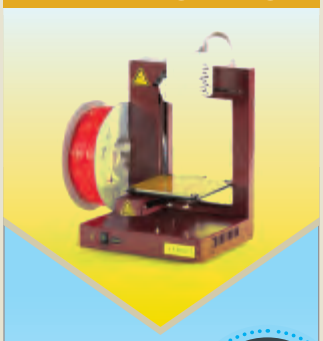
150mm/sec

ABS, PLA

Windows, Mac, Linux

Optional, SD Card

AFINIA H-SERIES



$1,499

AVAILABLE AT MAKERSHED.COM

Assembled

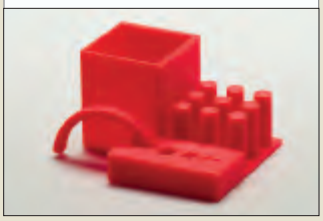
5.5"×5.5"×5.3"

3-30mm³/sec

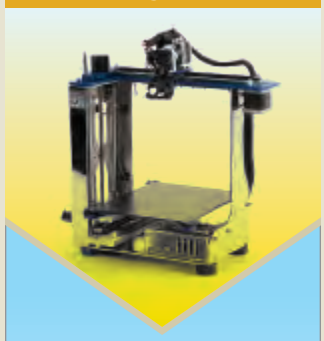
ABS, PLA

Windows, Mac

Onboard File Storage



MAKERGEAR M2



$1,499

Assembled

8"×10"×8"

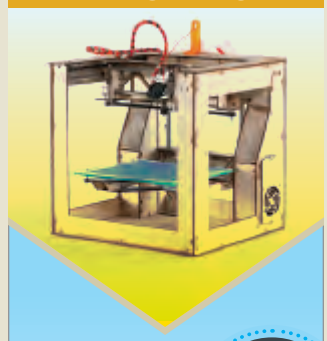
150mm/sec

ABS, PLA

Windows, Mac, Linux

SD Card

TYPE A SERIES 1



$1,400

AVAILABLE AT MAKERSHED.COM

Assembled

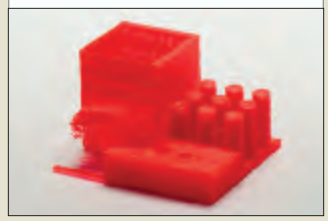
9"×9"×9"

90mm/sec

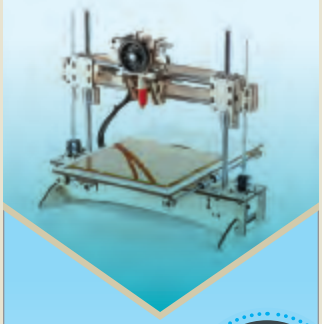
ABS, PLA, PVA

Windows, Mac, Linux

No



PRINTRBOT LC



$799

AVAILABLE AT MAKERSHED.COM

Assembled

6"×6"×6"

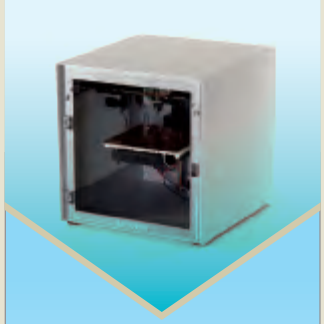
200mm/sec

ABS, PLA

Windows, Mac, Linux

SD Card

SOLIDOODLE 2



$699

Assembled

6"×6"×6"

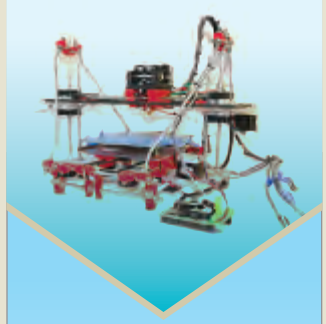
50mm/sec

ABS, PLA

Windows, Mac, Linux

No

SEEMECNC H1.1



$551

Kit

6"×6"×6"

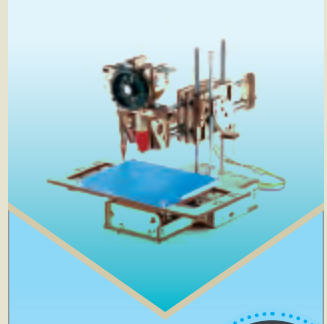
80mm/sec

ABS, PLA

Windows, Mac, Linux

No

PRINTRBOT JR.



$399

AVAILABLE AT MAKERSHED.COM

Assembled

4"×4"×4"

100mm/sec

PLA

Windows, Mac, Linux

No

The Standouts

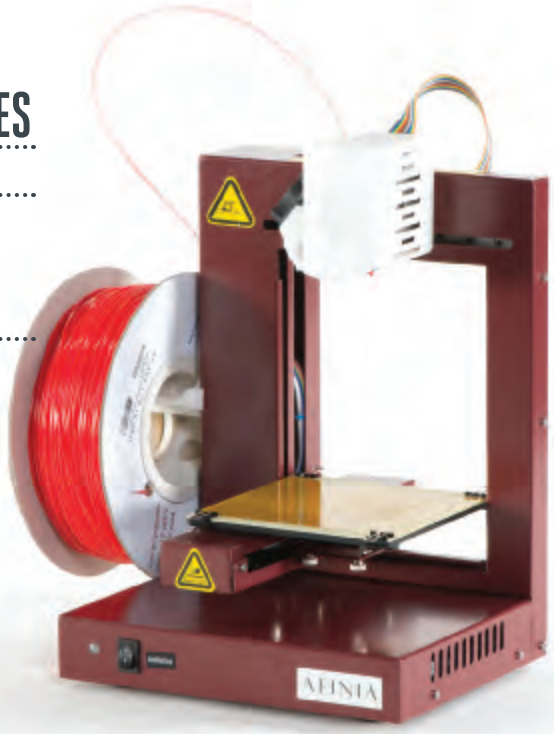
Clear winners in every category.

BEST OVERALL EXPERIENCE

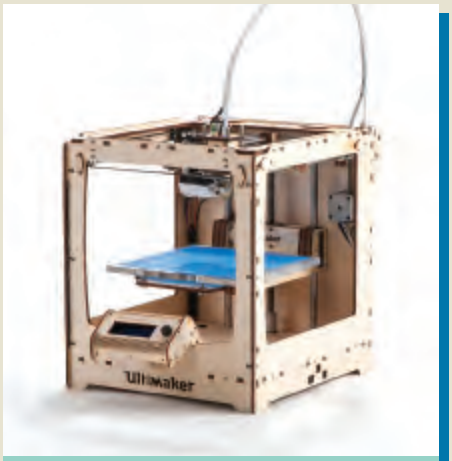
AFINIA H-SERIES

Review on page 44

Also won for Easiest Setup, and Easiest to Use (tied with Cube)



AVAILABLE AT MAKERSHED.COM



BEST OPEN HARDWARE

ULTIMAKER

Review on page 70

Also won for Most Accurate and Fastest

PREMIUM

AVAILABLE AT MAKERSHED.COM

BEST IN CLASS

REPLICATOR 2

Review on page 62

Runner-up for Most Accurate

MIDRANGE

AVAILABLE AT MAKERSHED.COM

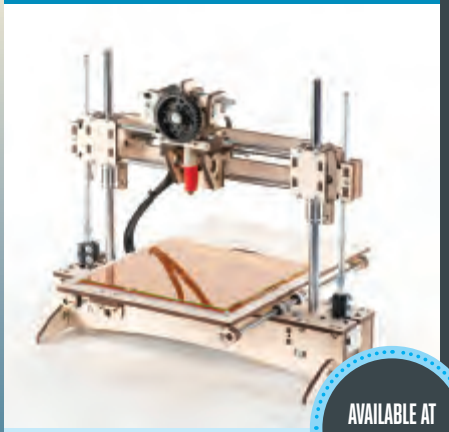
BEST IN CLASS

TYPE A SERIES 1

Review on page 68

Runner-up for Most Accurate

ENTRY LEVEL



AVAILABLE AT MAKERSHED.COM

BEST IN CLASS

PRINTRBOT LC

Review on page 58