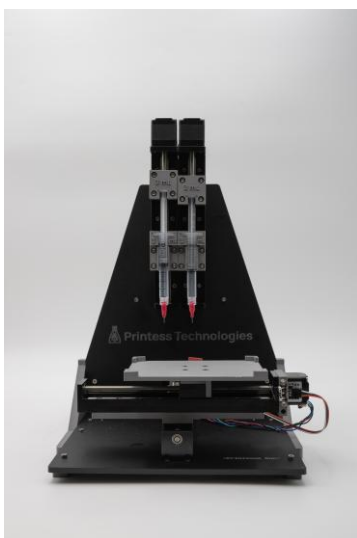




Printessa One

Multimaterial Direct Ink Writing Bioprinter

Technical Data Sheet | Printess Technologies LLC | 2026



The Printessa One is a compact six-axis direct ink writing (DIW) printer for soft and living materials. Two syringe extruders are driven and raised independently, so two inks can be deposited in a single build without a tool change, and the whole machine is light enough to be carried in one hand into and out of a biosafety cabinet.

It is the production version of the open-source Printess platform characterized in Advanced Materials (Weiss et al., 2025), rebuilt around a 32-bit controller with TMC2209 stepper drivers, endstop homing on XY axes, and PrintessFlow, a six-axis aware slicer. It ships fully assembled, wired and tested.

Motion System

Parameter		Specification	
Axes		6 independently driven linear axes: X, Y, Z, A, B, C. Open loop, no encoders.	
Actuators		NEMA 11 captive linear steppers, 1 mm lead screw pitch	
Drive resolution		3200 steps/mm at 1/16 microstepping (0.31 μm per microstep)	
Repeatability		$\pm 5 \mu\text{m}$ per axis †	
Backlash		X $\pm 75 \mu\text{m}$, Y $\pm 150 \mu\text{m}$, Z and A $\pm 50 \mu\text{m}$ †	
Maximum recommended print speed		6 mm/s (F360)	
Acceleration		1000 mm/s ²	

Axis	Drives	Positive direction	Endstop
X	Stage, left and right	Left	Yes
Y	Stage, front and back	Forward, toward the front	Yes
Z	Extruder 1 height	Up, away from the plate	Shared with A
A	Extruder 2 height	Up, away from the plate	Shared with Z
B	Extruder 1 plunger	Down, dispenses	None, zeroed with G92

Axis	Drives	Positive direction	Endstop
C	Extruder 2 plunger	Down, dispenses	None, zeroed with G92

Build Envelope

Parameter	Specification
Build volume	130 x 80 x 80 mm
Printhead travel	100 mm each in Z and A
Plunger travel	50 mm each in B and C
Work surface	Interchangeable holder for multiwell plates, petri dishes, glass slides and custom plates.

Extrusion

Parameter	Specification
Mechanism	Lead screw driven syringe plunger, volumetric. 50 mm NEMA 11 actuator per extruder.
Syringes	1, 3 and 5 mL sterile single-use luer-lock (BD), snap-fit holder
Maximum force	57.5 N nominal per plunger †
Maximum pressure	433 psi (1 mL), 141 psi (3 mL), 75 psi (5 mL)
Dispense tips	Nordson luer-lock needles, 11 sizes from 0.10 to 1.54 mm inner diameter
Retraction	Negative B or C move
Cooling	Syringe and plate cooler modules in development

Control and Software

Parameter	Specification
Control board	BigTreeTech Octopus Pro V1.0, 32-bit.
Stepper drivers	6 x TMC2209, 1/16 microstepping, VREF 0.50 V ± 0.03 V
Firmware	Marlin, configured for six independent axes
Power	24 VDC, 2 to 3 A, panel-mounted barrel connector
Host interface	USB-C, 115200 baud
Host software	Pronterface (Printrun). Windows and macOS.
Slicer	PrintessFlow. Windows and macOS
G-code	Marlin dialect. G0/G1 moves, G2/G3 arcs, G4 dwell, G28 homing, G90/G91, G92 datum, M106 accessory PWM, M114 position.
Onboard storage	None. No SD card and no screen. The host computer streams the file for the whole job and must stay awake and connected.

Physical and Safety

Parameter	Specification
Mass	Approximately 3.5 kg (7.6 lb)

Parameter	Specification
Dimensions	230 x 250 x 430 mm (W x D x H), 9.1 x 9.8 x 16.9 in
Chassis	Laser-cut acrylic plates with 3D-printed supports, M3 fasteners in heat-set inserts
Handling	Integrated carrying handle, one-handed transport into and out of a biosafety cabinet
Environment	Indoor laboratory bench, level and stable. Biosafety cabinet compatible.
Maintenance	Silicone grease on the six leadscrews. No consumable parts in the motion system. Petroleum and lithium greases must not be used.
Work envelope	Open, with no cover and no interlock. All axes can move whenever the printer is connected and powered.
Stopping	No hardware button. Switching off or unplugging the power supply stops all motion at once and is the primary emergency stop. Disconnecting in Pronterface ends the running file.
Firmware halt	M112 from the console halts all motion at firmware level. The board must be reset and reconnected afterwards.
Sharps	Blunt-end dispensing needles. Smaller gauges can puncture skin and gloves and are an eye hazard at bench height.

Demonstrated Performance †

Measurement	Result
Feature accuracy	513 ± 11.4 µm printed pitch from a commanded 500 µm
Embedded fidelity	Hausdorff distance 0.25 ± 0.34 mm from the source model, by micro-CT
Cell viability	Greater than 95 percent for hiPSCs, HNDfCs and HUVECs in gelatin-fibrinogen bioink
Multinozzle uniformity	Under 10 percent flow deviation across eight nozzles
Material switching	1 mm switching resolution, 5 Hz at 5 mm/s

Printing Modalities

Modality	Notes
Multimaterial DIW	Standard. Two syringes, two height axes, two plunger axes, no tool change.
Embedded printing	Into a viscoplastic self-healing support bath, typically 0.1 percent Carbopol
Photocuring	Compatible with photocurable inks such as PEGDA with a LAP initiator, cured off the machine
Active mixing	Module in development. Rotary impeller driven from the board PWM pins, full mixing at 200 RPM, mix ratio and speed settable from G-code.
Multinozzle	Not available for sale, but STLs are available upon request. Eight-nozzle MM3D printhead, or a 32-outlet array for high-throughput embedded printing.

- † Measured on the open-source Printess platform, which shares the Printessa One's six-axis NEMA 11 motion system and syringe pump extruders, and published in Weiss, J. D. et al., Advanced Materials 2025, 37, 2414971 (DOI 10.1002/adma.202414971). Not re-measured on a Printessa One.
- Read the Printessa One Operation Manual in full before the printer is powered on. Specifications are subject to change without notice.