

U-FAB

The Most Versatile and Scalable 3D Bioprinting Solutions
for Tissue Engineering and Beyond



The Massively- Multiplexed 3D Bioprinting Technology of U-FAB

The U-FAB, born from the vast body of research experience from tissue engineers and the cutting-edge 3D printing technology from CLECELL, offers radical solutions to the research and development in tissue engineering.

*The 3D Bioprinter of researchers
Designed by researchers
Innovated for researchers*



3D Bioprinting



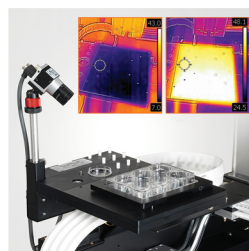
15 Independent Printing Submodules
Independently temperature-controlled submodules provide unprecedented flexibility in printing a wide range of biomaterials, from low viscosity materials (such as growth media) to high viscosity materials (such as silicon or even thermoplastic pellets).

Crosslinking /
Polymerization



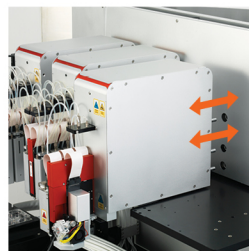
Nebulizer
Built-in nebulizers are used to crosslink pH-sensitive, chemical-/enzymatic-crosslinkable materials through the application of nebulized polymerizing microparticles (size : ~4 μm) with adjustable power setting.

Build plate



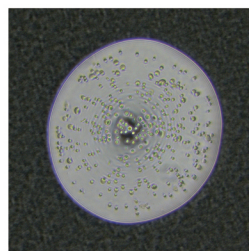
Build Plate Temperature Control
The temperature of the printed construct is also controllable in the range of 4~50°C. This function can help maintaining the stability of the 3D printed tissue constructs.

Convenience



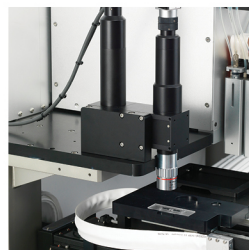
Removable Modules
The U-FAB features removable modules for easy upgrade and maintenance. The users can replace the modules by themselves with unprecedented maintenance efficiency.

Cell printing



Dispensing Volume Control
The U-FAB allows for the printing of biomaterial in nanoliter volume. By controlling the air pressure and valve opening time, the user may have full control over the volume of printed material, providing more precise 3D bioprinting experience.

Monitoring

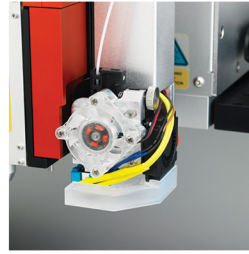


The Bioscope
The Bioscope can help the user to count the number of cells and to observe their shapes in growth media or the bioink. This also allows the user to calibrate the concentration of the cells during preparation.



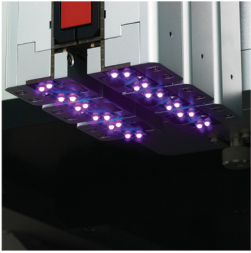
Simultaneous 6-well Printing

The submodule structure is designed to dispense materials onto a 6-well plate simultaneously or sequentially. Simultaneous printing allows for the creation of multiple copies of tissues in one batch.



Filament Extruder

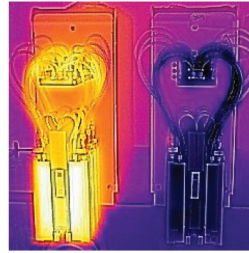
A Filament extruder based on fused-deposition-modeling (FDM) enables printing of thermoplastic filaments (diameter of 1.75 mm). The temperature can be adjusted from room temperature to 285°C.



UV LED

The built-in UV LED (365 nm) allows for photo-polymerization of printed biomaterials. The duration and intensity of the UV light are adjustable.

* Users can custom-order different LED light wavelength.



Temperature Control for Individual Submodules

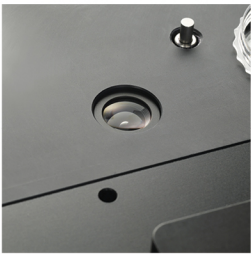
Crucial for many biomaterials and cells.

* Adjustable range

- 4~50°C (13 submodules)

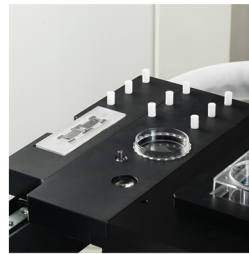
- Room temp.~180°C (1 submodule)

- Room temp.~285°C (1 submodule)



Nozzle Alignment Camera

Proper nozzle alignment is paramount to accurate 3D bioprinting. The on-board camera is used to calibrate nozzle alignment in 10 µm increment.

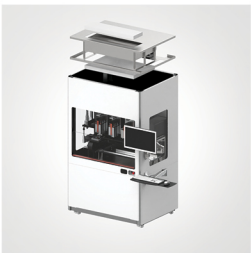


Fabric Nozzle Cleaner

The fabric cleaner is designed to wipe away any residual materials or foreign particles from the printing nozzle.

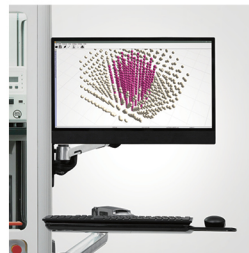
Flushing Dish (35 mm)

It is used as a vat to clean the syringes / valves to stabilize dispensing.



Integrated Bio-Safety Cabinet

Built to the standards of Class II Bio-Safety Cabinet (BSC), the cabinet protects the printed tissue from external contamination. Heavy-duty casters in the bottom of the cabinet offer surprising mobility.



Control PC

A 21-inch touchscreen PC with U-FAB's proprietary U-Studio software.

Ergonomic design for maximal user comfort.

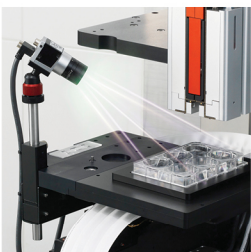
* Base PC Specs

CPU i5 (9th gen) / 8GB RAM / 128GB SSD



Cell Homogenization

Fluidic circulation within a syringe containing cells and growth media (similar to manual pipetting) prevents cells from clumping or settling at the bottom of the syringe. This enables more homogenous cell printing.



Monitoring Camera

A built-in high-resolution camera monitors the 3D bioprinting process in real-time.

The user can see the video feed through U-Studio software, and record the content.



U-FAB Configuration

| Module | | U-BIOLET | U-BIOXT-LV | HYBRID | U-BIOXT-HV | | | | |
|----------------|----------|---|---|---|--|---------------------|---------------------|---------------------|--|
| Description | | <ul style="list-style-type: none"> A droplet dispensing module for printing low-viscosity biomaterials Pre-installed with 6 U-BIOLET dispensers Offers simultaneous 6-submodule printing | <ul style="list-style-type: none"> An extrusion-based dispensing module for printing low-/intermediate-viscosity biomaterials Pre-installed with 6 U-BIOXT-LV extruders Offers simultaneous 6-submodule printing | <ul style="list-style-type: none"> Best of both worlds in U-BIOLET and U-BIOXT-LV : Half of a U-BIOLET and half of a U-BIOXT-LV Pre-installed with 3 U-BIOLET dispensers and 3 U-BIOXT-LV extruders Offers simultaneous 3-submodule printing | <ul style="list-style-type: none"> An extrusion-based dispensing module for printing high-viscosity biomaterials and filaments Pre-installed with 2 U-BIOXT-HV extruders and 1 Filament extruder | | | | |
| Model | Basic | • | | | | | | | |
| | Basic + | | | • | | | | | |
| | Expert | • | | | | • | | | |
| | Expert + | | | • | | • | | | |
| | Pro | • | • | | | | | | |
| | Master | • | • | | | | • | | |
| Submodule | | | | | | | | | |
| Printing type | | Droplet / Non-contact | Extrusion / Contact | Droplet / Non-contact | Extrusion / Contact | Extrusion / Contact | Extrusion / Contact | Extrusion / Contact | |
| Pressure range | | 0~10 psi | 0~14 psi | 0~10 psi | 0~14 psi | 0~114 psi | 0~114 psi | - | |
| Viscosity | | Low | Low / Intermediate | Low | Low / Intermediate | High | High | High | |
| Material type | | Sol | Sol / Gel | Sol | Sol / Gel | Gel | Gel / Pellet | Filament | |
| Temperature | | 4~50°C | 4~50°C | 4~50°C | 4~50°C | 4~50°C | RT~180°C | RT~285°C | |
| | | Coolant / heating liquids circulation | | | | | Heater | Heater | |
| Polymerization | | Nebulization (pH-sensitive, chemical-/enzymatic-crosslinking) / UV LED (photo-crosslinking) / Temperature control (thermal-crosslinking) | | | | | | | |

Specification



| Category | | Description |
|--|------------|---|
| Dimension / Weight | | 1952 (H) × 1178 (W) × 930 (D) mm, 2.14 m ³ / 750 kg |
| Housing | | Stand-alone biosafety cabinet – Class II / Type A2, equipped with a digital humidity indicator, internal light source, and germicidal UV lamps |
| Swappable modules | U-BIOLET | Independently-controlled non-contact droplet dispensers for printing low-viscosity biomaterials <ul style="list-style-type: none"> - Pre-installed with 6 U-BIOLET dispensers (submodule #1~6) - Capable of simultaneous 6-well printing - Independent printing volume adjustment & temperature control (4~50°C) - Embedded LED-based UV crosslinker (365 nm wavelength) and a shutter control mechanism that prevents the polymerization of materials at the surface of the dispenser nozzle - Cell-homogenizing syringe adapter preventing the cells from clumping or settling at the bottom of the syringe during the printing process |
| | U-BIOXT-LV | Independently-controlled contact extruder for printing low-/intermediate-viscosity biomaterials <ul style="list-style-type: none"> - Pre-installed with 6 U-BIOXT-LV extruders (submodule #7~12) - Capable of simultaneous 6-well printing - Independent printing volume adjustment & temperature control (4~50°C) - Automatic leveling and height-adjustment features - Cell-homogenizing syringe adapter preventing the cells from clumping or settling at the bottom of the syringe during the printing process |
| | HYBRID | The best of both worlds in droplet- and extrusion-based dispensing <ul style="list-style-type: none"> - Pre-installed with 3 U-BIOLET dispensers and 3 U-BIOXT-LV extruders (submodule #1~6 or #7~12) - Capable of simultaneous 3-well printing - Includes the same technical features as U-BIOLET dispensers and U-BIOXT-LV extruders |
| | U-BIOXT-HV | Independently-controlled contact extruder for printing high-viscosity biomaterials and fused-deposition-modeling (FDM) type printing of polymer filaments <ul style="list-style-type: none"> - Pre-installed with U-BIOXT-HV extruder (low temperature), U-BIOXT-HV extruder (high temperature), and Filament extruder (submodule #13~15) - Independent adjustment of the printing volume - Exchangeable nozzles with different diameters for maximum flexibility in printing - Temperature control (4~50°C for the Low-temperature U-BIOXT-HV extruder, Room temperature~180°C for the High-temperature U-BIOXT-HV extruder, Room temperature~285°C for the Filament extruder) |
| Nebulization crosslinkers | | Independently-controlled, liquid nebulizer for crosslinking process <ul style="list-style-type: none"> - Pre-installed with 3 sets of nebulizers - Used to crosslink pH-sensitive, chemical-/enzymatic-crosslinkable materials in 3D - Fully-automated nebulization sequence for tailored crosslinking processes - Custom-controlled power output and duration |
| High-intensity UV crosslinker (optional) | | Multi-spectrum, high-power UV crosslinker port using the Omnicure™ system <ul style="list-style-type: none"> - Fully-automated operation - Custom-controlled crosslinking duration |
| Printing platform | | Printable volume : 200 (H) × 150 (W) × 150 (D) mm, 4500 mL <ul style="list-style-type: none"> - Temperature controlled (4~50°C) - Built-in nozzle cleaning unit - Customizable bioware dimension (e.g. 6-well plate / 6-well plate with membrane inserts) - Swappable platform design for multiplexing options |
| Monitoring cameras | | Printing status monitoring camera Printing nozzle alignment camera Microscopic camera for on-board cell counting (optional) |
| Control computer | | Windows 10-based high-performance computer with touch screen capability |
| Control software (U-Studio) | | Comprehensive printing control interface that includes; <ul style="list-style-type: none"> - Independent and simultaneous submodule calibration and control - Printing input files compatible with conventional STL format - Built-in printing functions and customizable tool path definition - Video feedback and recording of printing process |

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