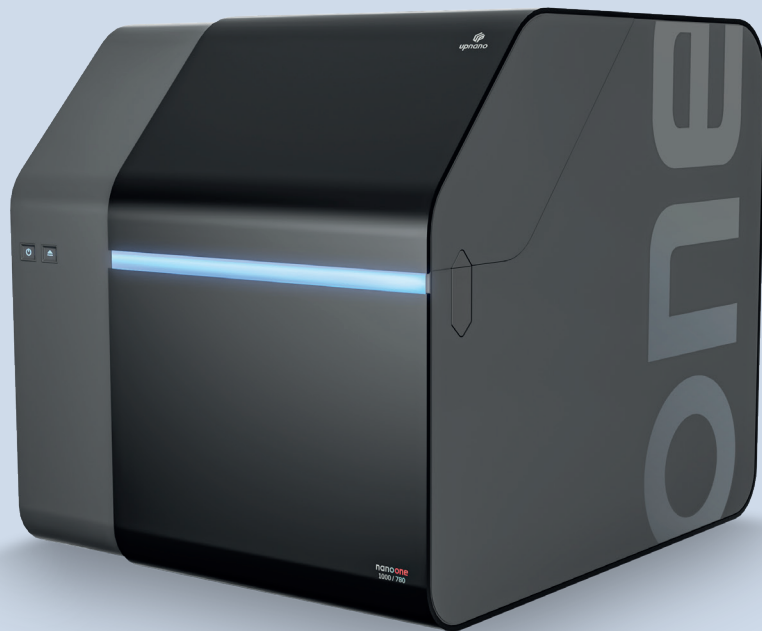


nanoOne

The world's fastest 2-photon
polymerization 3D printing system
with a resolution below 0.2 μm



Upscaling nanofabrication

As an innovation leader in the field of high-resolution 3D printing, we see it as our mission to upscale nanofabrication.

UpNano is a high-tech company with a focus on development, manufacturing and commercialization of high-resolution 3D printing systems.

The state-of-the art NanoOne platform is based on 2-photon polymerization, abbreviated as 2PP, which offers industry-leading speed and resolution below 0.2 μm .

UpNano is committed to providing customers with a comprehensive package of hardware, software and optimized printing resins.

The systems are used for the fabrication of polymeric microparts as well as the unique possibility of bioprinting in a native cell environment.

Using UpNano's cutting-edge technology makes it possible to print objects with sizes ranging from the sub-micrometer to the centimeter range and create 3D structures up to 40 mm in height – with unprecedented printing speed.

Quality and environmental awareness are two fundamental prerequisites, which are reflected in the ISO 9001 and 14001 certifications of our company.

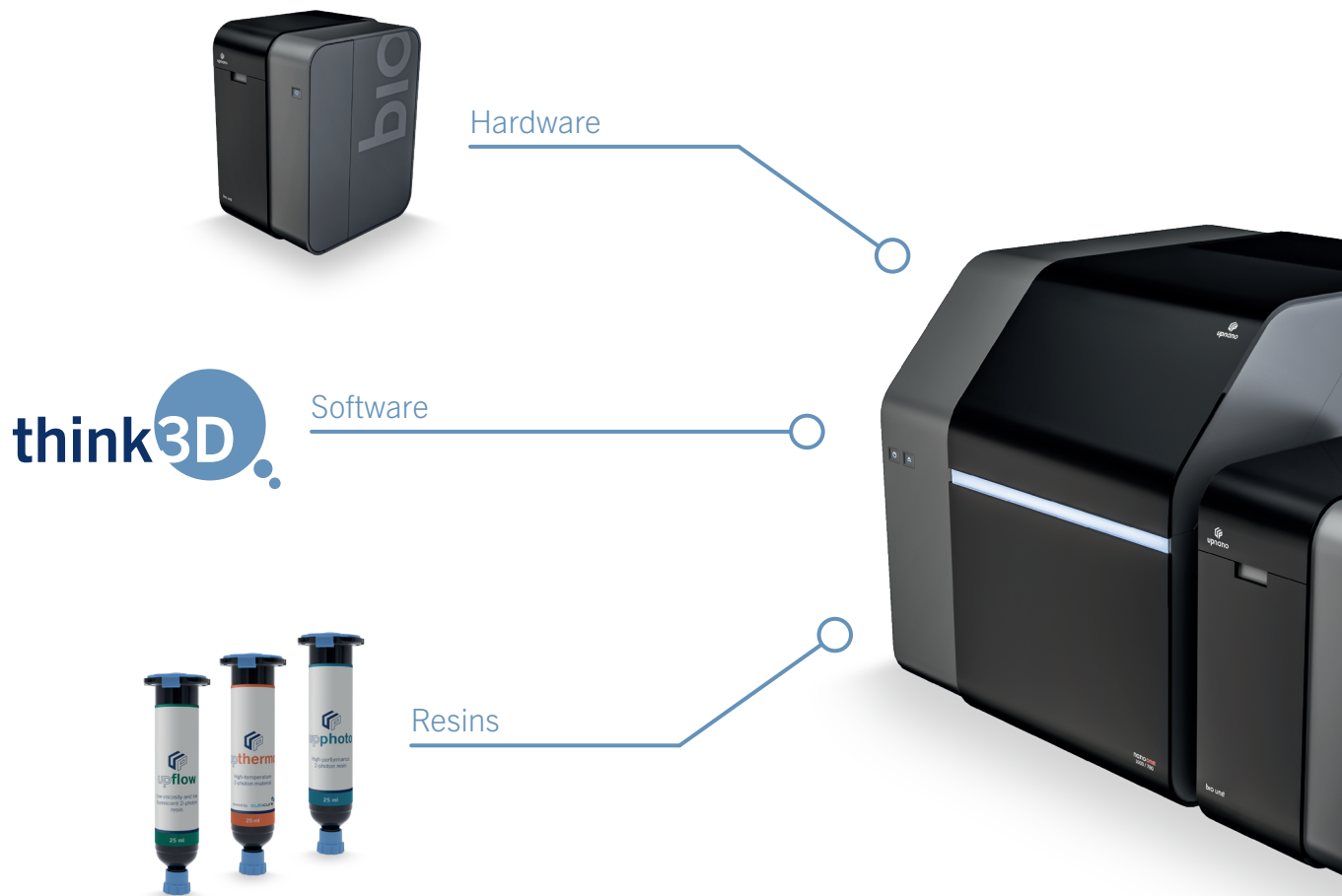


nanoOne

A platform technology

The NanoOne platform is the fastest high-resolution 3D printing system available. It combines the precision of 2-photon polymerization with unmatched high throughput.

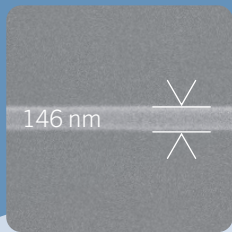
This incredibly compact benchtop system is the right choice for scientific research approaches and multi-user facilities. A throughput of more than 450 mm³ per hour also allows for batch and small series production of industrially applied microparts.



The technology is uniquely suited to address the trend towards miniaturization. This 3D printing system supports all branches of

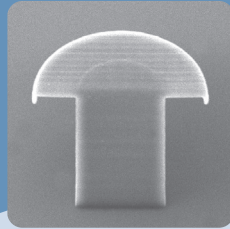
industry, from micro-optical and electronic components to microfluidic applications, medical technology, and cell research.

Ultra-precise polymeric parts



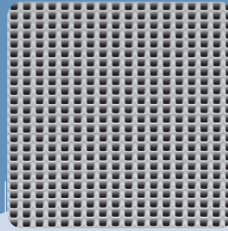
Smallest details

The realization of detail <150 nm is a classic 2PP benchmark that can easily be met with the high resolution of the NanoOne.



Surface elements

Periodic microelements and structures that influence the adhesive, optical, electronic, and sensory properties.



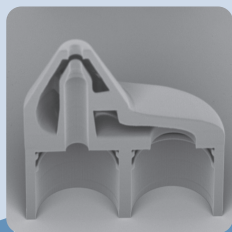
Filter systems

Filter structures with consistent pore size as small as $1\text{ }\mu\text{m}$ and versatile shape.



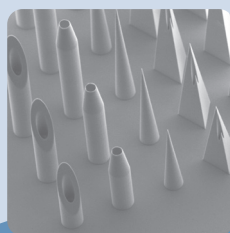
Castle on a pencil tip

Our well-known project demonstrates in an artful way how miniscule and precise 2-photon printed components can be.



Nozzles

Integrated microfluidic components with connectors and internal complex structural elements.



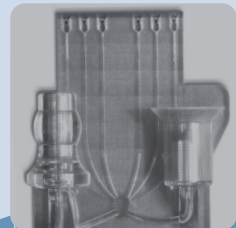
Microneedles

High-resolution needles with a tip size $<1\text{ }\mu\text{m}$ and unprecedented aspect ratios.



Polymer MEMS

Intricate, free-moving components with mechanical properties and printable in a single process in unmatched time.



Microfluidics

Manufacturing entire chips with high-precision channel systems and large-volume connectors using optically transparent resins.

The perfect solution for your application

With three different model configurations, the NanoOne is the right solution for every application and customer – from printing macroscale components to classic 2PP application. It also offers high-resolution bio-printing in the presence of living cells.

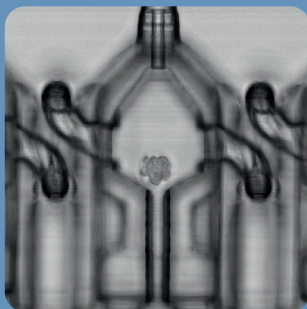
UpNano's 2PP printing systems enable our customers worldwide to overcome manufacturing barriers across multiple sectors. The NanoOne is creating entirely new solutions never before possible.

"We are so glad that UpNano managed to develop a resin to achieve our goal of printing not only fine but also macroscopic elements within one print job using the NanoOne printing system which we can use in our unique IVF environment."

Marty Gauvin, CEO and founder of Fertilis

To increase in vitro fertilization (IVF) success rates and reduce stress on embryos, Fertilis, an Australian pioneer in the medtech sector, is developing and has patented a unique environment for the critical life phase between fertilization and implantation of the embryo.

This first-of-its-kind 3D printed microdevice incorporates 0.05 mm channels in diameter, allowing an embryologist to precisely monitor and control the culturing process of



the fertilized egg, eliminating the need for IVF practitioners to move cells between petri dishes, a process that is fraught with risk. And it is ex-



actly those miniscule features that proved challenging in the production of the device. Fertilis managed this perfectly using the UpFlow resin, which was specifically developed for microfluidics, together with UpNano's NanoOne 2PP 3D printer delivered to the Australian National Fabrication Facility (ANFF) at the University of South Australia. The new procedure allows nanoliter per hour dynamic flow of nutrients across the embryos, which is more aligned to what occurs in the reproductive tract compared to current static culture conditions.

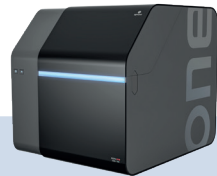
Fertilis devices are still in development and will not be available until appropriate regulatory clearances have been obtained.

Find the NanoOne model suitable for your application

Out of the three models of NanoOne available, the UpNano experts can guide you to find the right system for your desired applications. The modular platform allows users to upgrade the system over time, adding

capabilities as your research or business expands. For custom instrumentation, the NanoOne has over- and under-stage access ports.

nano **one** 250



The entry into the world of 2-photon-based 3D printing

This entry model is a printing system with enhanced speed for all classic 2PP applications. Starting from structure details in the 100-nanometer range to components with an edge length of up to 40 mm or full-surface printed wafers.

nano **one** 1000



More power creates more possibilities

The NanoOne 1000 has the most powerful femtosecond laser in its class. This makes it the right choice not only for classic 2PP applications but also to produce mesoscale structures and for the printing of exotic resins.

nano **one** bio



The only 2PP printer with an integrated incubation system

NanoOne bio allows 3D printing of structures in the presence of living cells for biological applications with unprecedented precision. Cell models mimicking natural tissue topography and sterile fabrication of cell scaffolds herald a new era for biomedical research.



	nano one ₂₅₀	nano one ₁₀₀₀	nano one _{bio}
Average power	250 mW	1,000 mW	1,000 mW
Pulse length	95 fs	90 fs	90 fs
Bio unit	Optional	Optional	Included
Objectives	40x NA 1.4 20x NA 0.7 10x NA 0.4	40x NA 1.4 20x NA 0.7 10x NA 0.4 5x NA 0.25	40x NA 1.4 20x NA 0.7 10x NA 0.4 10x NA 0.3 5x NA 0.25

Dip-in-free printing, this is how it works

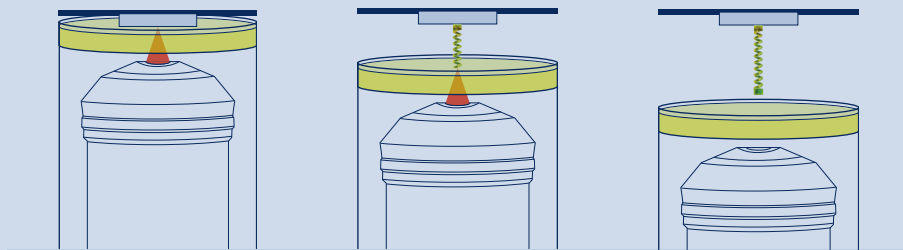
2PP is a non-linear process which, due to the high absorption selectivity, only results in resin polymerization in the focal point of the laser beam.

This enables the production of high-precision structure details smaller than the laser wavelength in the sub-micrometer range, directly within the resin volume.



Vat mode

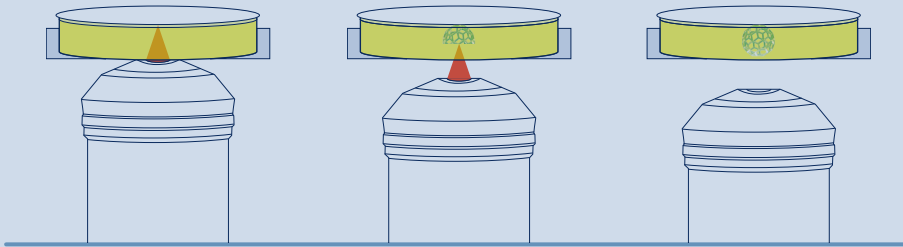
**Printing of structures with finest details
and a height up to 40 mm**



- Standard substrates up to 40 mm edge length
- High level of design and manufacturing freedom
- Vats with cap for resin storage
- Constant focusing power

Top-down mode

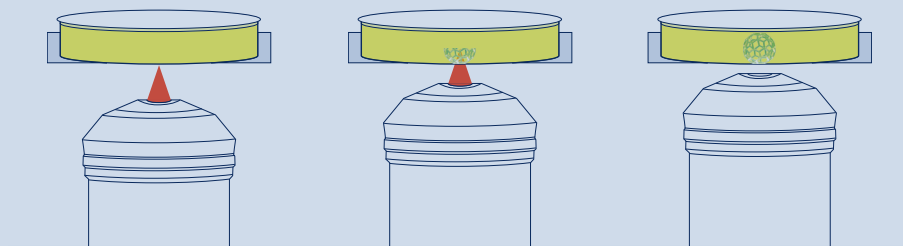
**Printing in highly viscous resins,
with the highest precision**



- Complex freestanding structures
- Manufacturing within microfluidic chips
- Sterile manufacturing possible
- Printing on wafers up to 6-inch

Bottom-up mode

**Universal print mode for structures
within substrates**



- Suitable for all types of resins
- Glass(-bottom) substrates
- Sterile manufacturing possible

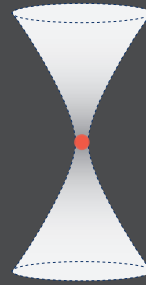
Highest resolution and unbeatable printing times

Each NanoOne model comes standard with several objectives, giving the user a range of choices for their resolution requirements.

Adaptive resolution

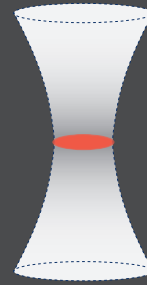
Significant throughput increase can be achieved using any objective by taking advantage of our patented **Adaptive Resolution™** technology. The software classifies the geometry in high-resolution and high-speed areas and adapts the laser voxel size accordingly.

UpNano's proprietary outline mode enables high resolution and surface roughness down to <10 nm. The contours of solid printed components are written with the highest possible resolution to exploit the full potential of the respective objective.



High-resolution region

The laser is precisely focused to achieve the highest possible resolution (fine mode).

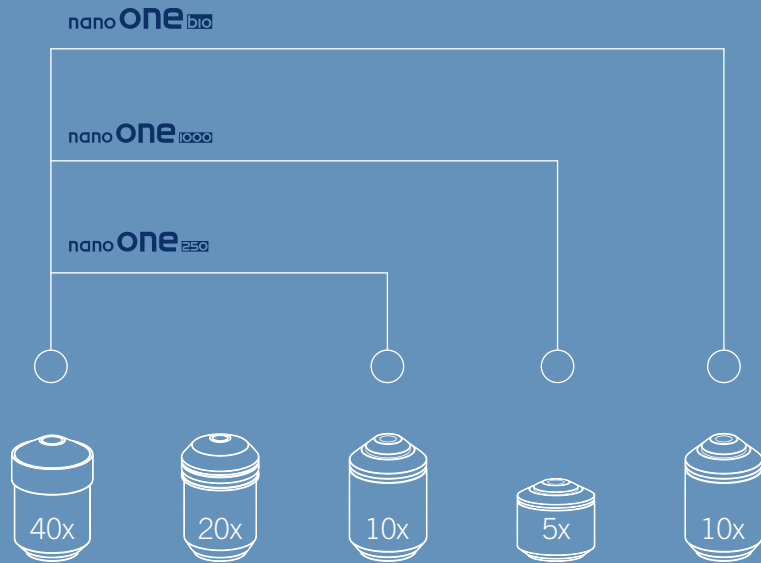


High-speed region

The laser focus is enlarged to increase throughput, while maintaining the part properties (coarse mode).



Overview of standard objectives



Numerical aperture	1.4	0.7	0.4	0.25	0.3
Working distance	0.13 mm	0.35 mm	3.1 mm	12.5 mm	10.0 mm
Immersion media	Oil	Water	Air	Air	Air
Horizontal feature size	≤220 nm	≤420 nm	≤730 nm	≤1.2 μm	≤980 nm
Vertical feature size	≤550 nm	≤2.9 μm	≤9.2 μm	≤23 μm	≤16.4 μm
Field of view	Ø 0.5 mm	Ø 1 mm	Ø 2 mm	Ø 4 mm	Ø 2 mm
Typical writing speed	150 mm/s	300 mm/s	600 mm/s	1.200 mm/s	600 mm/s
Throughput fine mode	0.05 mm ³ /h	0.25 mm ³ /h	4 mm ³ /h	30 mm ³ /h	6 mm ³ /h
Throughput adaptive resolution	0.25 mm ³ /h	2.25 mm ³ /h	40 mm ³ /h	300 mm ³ /h*	60 mm ³ /h

* By adapting the parameters, a throughput of >450 mm³ per hour can be achieved.

Besides the listed standard objectives, which are included with the purchase of the machine, a range of other objectives are imple-

mented on the platform, such as 100x, 63x, 60x or 4x objectives.



Resins for any application

UpNano's high-performance 2-photon resins are engineered and optimized to utilize the full potential of the ultrafast high-resolution printing system NanoOne. The portfolio includes nine resins, each with special

properties for specific applications – from performance printing resins to opto-transparent resins for optical and microfluidic applications to biocompatible formulations.



Standard production

High performance 2-photon resin

Functional parts, fully polymerized after printing, autoclavable, non-cytotoxic*



Fast prototyping 2-photon resin

Ultrafast printing, prototyping resin, allows increased layer spacing



Optically transparent

Ultralow-fluorescent 2-photon resin

Optically highly transparent, ultralow autofluorescence, transmission down to 350 nm, UV post-curing required, non-cytotoxic*



Low-viscosity, low-fluorescent 2-photon resin

Optically transparent, low fluorescence and viscosity, UV post-curing required, for printing microfluidics, channels $\leq 50 \mu\text{m}$, non-cytotoxic*



High-resolution applications

Sol-gel hybrid 2-photon resin

Thin film resin, for spin-coating or drop-casting, 2.5D and micro 3D structures, printing of overhangs, free-floating structures



Refractive index-matched 2-photon resin

Highest resolution printing, used in vat mode, 2.5D and micro 3D structures



Special applications

High-temperature 2-photon resin

Great mechanical stiffness, exceptionally high heat deflection temperature (HDT-B) $> 300^\circ\text{C}$, high-temperature applications, non-cytotoxic*



Low-transmissive 2-photon resin

Light blocking for UV-VIS, transparent to NIR and IR, optically black non-transparent appearance, non-cytotoxic*



2-photon silica slurry

Properties of fused silica glass include extremely high thermal and chemical resilience, exceptional mechanical strength, high optical transmission, and inertness, making it a biocompatible material.

* Certified according to EN ISO 10993-5:2009

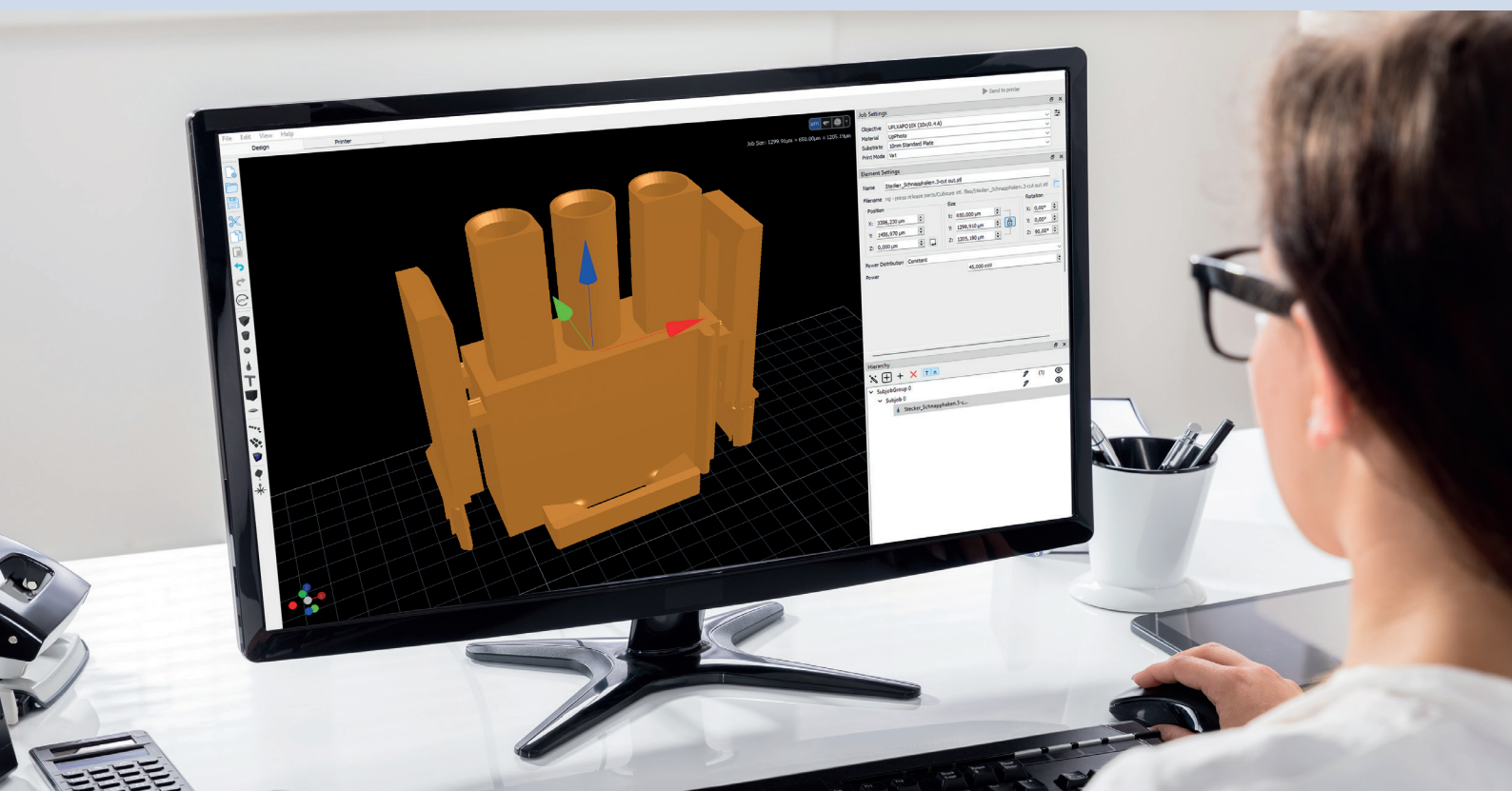
If you think^{3D} it is easy to print 3D

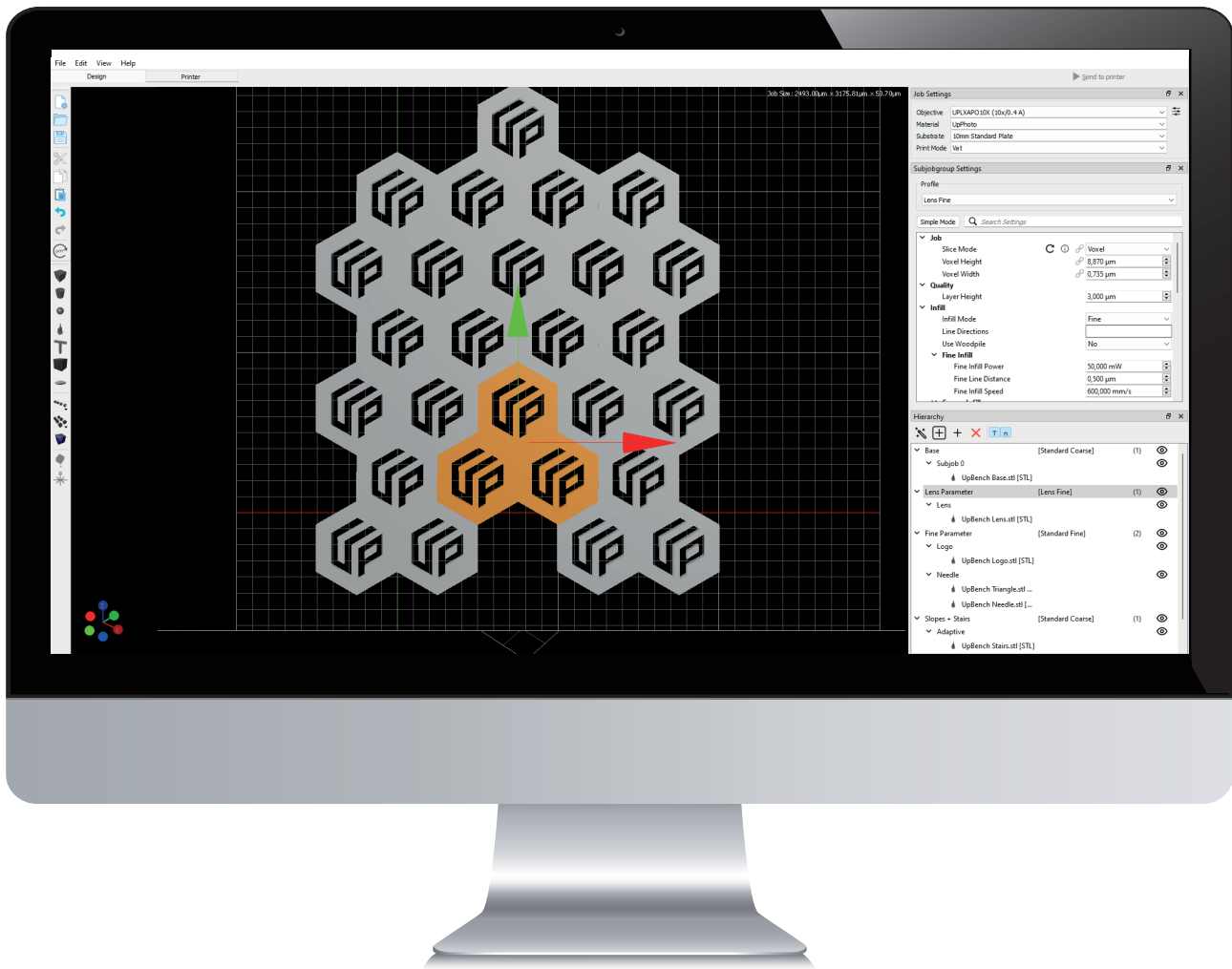
The Think3D™ data preparation software supports the user in a unique, intuitive way. Structures can be imported directly into the software as STL files or geometries can be built up from predefined structural elements.

The Think3D™ software supports the customer throughout the entire printing process in an intuitive and easy way. From the first click, through the set-up of the print structure and parameters, to the start and remote monitoring of the print job, everything is shown in one software interface.

Key features

- Print job files including all parameter settings
- Reproducible production of identical or different objects
- 3D preview of the created print job
- Real-time processing of data
- Adaptive resolution for highest resolution where needed
- Remote monitoring, integrated and automated
- Advanced logging feature including user accounts
- Visualization of field of views and easy customization
- Customized part design with STLs or G-Code





Intuitive interface

The user interface design is intuitive and easy to use. The graphical 3D preview provides an overview of the job design, the field of view as well as stitching and slicing position.

Printing profiles

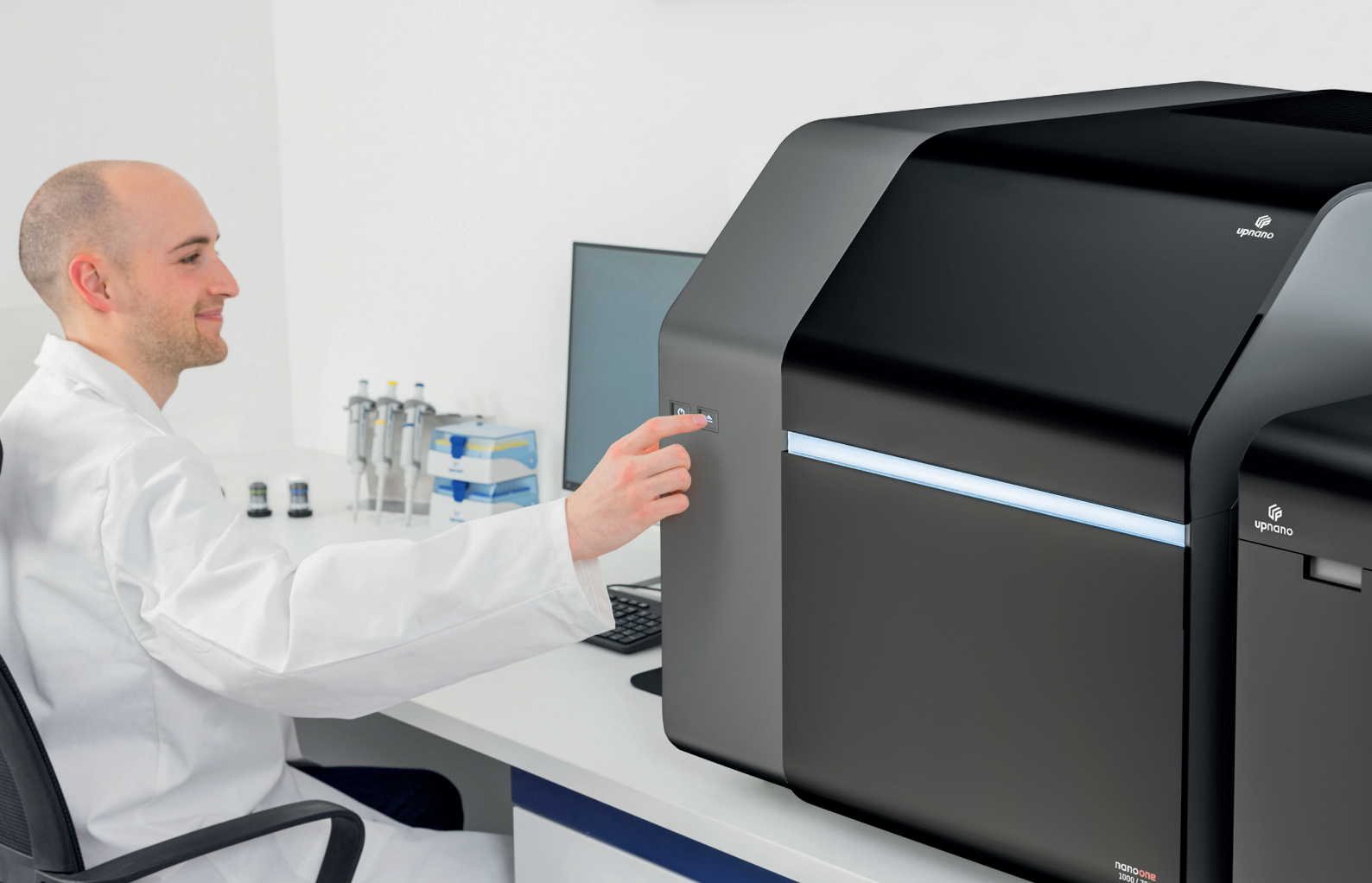
Predefined print profiles, which are optimized for the selected objective and resin, guarantee simplicity of use and fast print results in excellent quality.

Sub-jobs

By using the sub-jobs function, individual printing parameters can be applied for single parts or groups. Therefore, high-resolution and high-speed regions can be combined into one job.

Well-plate mode

With the well-plate wizard, it is easy to assign a different structure to each well and/or to vary the parameters from one well to another in a standard cell culture plate.



nanoOne bio

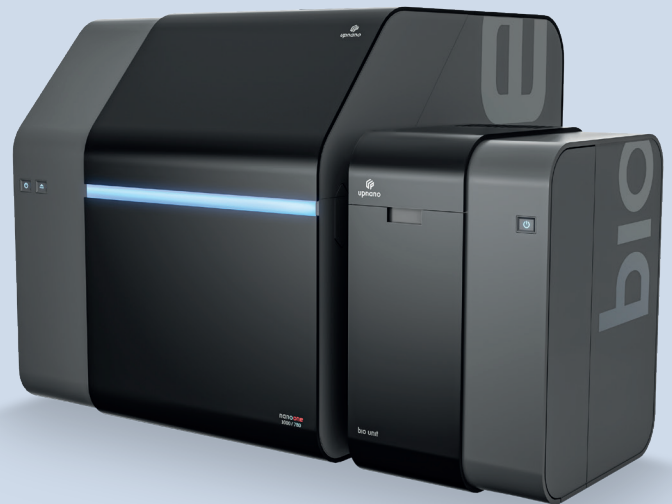
Harnessing the new dimension in 3D bioprinting

The pioneering NanoOne bio combines the possibility of biocompatible applications with the characteristic high precision of the NanoOne platform.

Based on the technology of 2-photon polymerization and equipped with a powerful 1,000 mW femtosecond laser, the system enables applications from nano to centimeter scale.

Fabrication of structures within microfluidic chips or cell culture plates using top-down or bottom-up printing mode are made possible. The process may be performed in the native cell environment and/or under sterile conditions.

The only 2PP printer with a genuine integrated incubation system



The bio unit is the centerpiece of the NanoOne bio and can be used to provide a native, stress-free environment for the living cells during the printing process.

The stage-top incubation system boasts a plethora of features allowing adjustments to match the preferential environmental condi-

tions of the respective cell type, and ensures these conditions during the print. Definable parameters include temperature, CO₂ content, and humidity.

Incubation system

- Ambient temperature to 45°C ± 0.05°C
- Actively humidified 20–99% ± 0.1%
- CO₂ concentration 0–15%

Substrates

- Glass-bottom full-size well plates
- Glass-bottom μ slides
- Injection-molded microfluidic chips
- Glass-bottom petri dishes Ø 20–74 mm

Unlimited possibilities

- Cell-containing samples for three-dimensional in-vitro tests
- Filter elements with defined pore sizes and gyroid structures
- Barrier models with defined semi-permeability within microfluidic chips
- Scaffold structures positioned in each individual well of a cell culture plate
- Cell models mimicking natural tissue topography and microenvironment
- Medical devices such as implants or microneedle arrays

Biocompatible printing resins according to EN ISO 10993-5

In addition to a cell-compatible process, the printing resin is a decisive factor. UpNano has a portfolio of five biocompatible resins certified as non-cytotoxic according to EN ISO 10993-5:2009.

Each of these resins, in addition to their biocompatibility, has distinct properties emphasizing the wide range of possible applications.



Compatible substrates

- Standard glass-bottom well plates in any configuration
- Glass-bottom petri dishes Ø20–74 mm
- Glass-bottom μ slides and μ dishes in different formats
- Microfluidic chips commercially available or custom-made
- UpNano glass substrates and wafers
- Opaque and translucent wafers



BIO INX® – High-quality bioinks and biomaterials

Together with the Belgian company BIO INX®, we have established a material portfolio that is not only cell-compatible but also optimized for the NanoOne platform.

HYDROBIO  U200

Gelatin-based hydrogel resin

Cell interactive, gelatin type B-based hydrogel, derived from natural collagen. Unique two-component bioresin enabling printing in the presence of living cells with low autofluorescence. Suitable for light- and laser-scanning microscopy, biodegradable and non-cytotoxic (ISO 10993-5).

HYDROTECH  U200

Synthetic, technical hydrogel

Bioinert, mechanically robust, soft and flexible hydrogel resin. Orange-red viscous liquid, allowing for VAT mode or in-chip printing. White flexible solid after development in dry state. Opaque when swollen in water. SEM imaging compatible because of its drying and rehydrating properties. Suitable for cell seeding, non-degradable, non cytotoxic (ISO 10993-5).

DEGRAD  U100

Polyester-based, biodegradable resin

Robust, biodegradable thin-film material (2–5 years), solid state cross-linking: suitable for both bottom-up and top-down printing. Extremely high resolution (<500 nm), supports overhangs, for cell seeding, non-cytotoxic (ISO 10993-5).

HYDROTECH  U100

Technical thin-film hydrogel

Bioinert, synthetic hydrogel material for bottom-up and top-down printing with high mechanical integrity. No structural deformation in aqueous medium, due to low water absorption capacity. Suitable for cell seeding, non cytotoxic (ISO 10993-5).

“The combined competences of UpNano in developing 3D printing systems and BIO INX® in designing innovative inks for 3D printing gelled well together. Our U-product line of biomaterials for multiphoton lithography features excellent processability and reproducibility. Especially for high-resolution bioapplications, it is important that hardware and printing resin are optimally matched to each other.”

Jasper van Hoorick, CEO and co-founder of BIO INX®

BIO INX® – a spin-off company of Ghent University and Vrije Universiteit Brussel – focuses on the commercialization of materials and bioinks for 3D bioprinting or biofabrication. For product development and establishment, the team relies, among other technologies, on a NanoOne bio system. The integrated incubation system is essential and important for their work. HYDROBIO INX U200 is the first hydrogel for use together with living cells and 2-photon polymerization that is also crystal clear

for light-microscope use, a very important factor for many researchers.

Many years of research work by the team have already resulted in a remarkable material portfolio. With a diverse range of material properties, the applications become nearly limitless: the bioinks can be applied for various tissue types with applications in regenerative medicine as well as drug and cosmetics screening and bioengineering.





+43 (0)1 890 16 52 | office@upnano.com | www.upnano.com
© 2024 UpNano GmbH, Modecenterstrasse 22/D36, 1030 Vienna, Austria

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