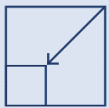




# A new era in high-resolution 3D printing

UpNano is a young high-tech company where long-standing know-how in the field of 2-photon polymerization meets innovative thinking and novel technology.

The NanoOne platform is the first high-resolution 3D printing system that combines the precision of 2-photon polymerization with unmatched high throughput and thus enables new applications in the manufacturing of polymeric micro components.



## Small.

High-resolution 3D printing systems with sub micrometer resolution.



## Fast.

Up to a 100 times higher throughput for short production cycles.



## Powerful.

high power laser for mesoscale fabrication of polymeric micro parts.



## nanoOne Where precision meets economic efficiency

NanoOne is the fastest high-resolution 3D printing system on the market. It is based on multiphoton lithography and combines the precision of 2-photon polymerization with an unmatched throughput of up to 200mm<sup>3</sup> per hour. This makes the system suitable not only for scientific research approaches and multi-user facilities but also for the batch and small series production of industrially applied microparts

Polymeric components from micro to macroscale

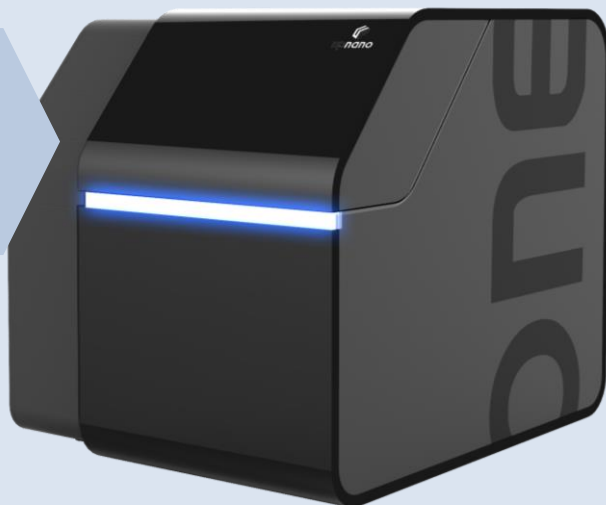
Structural detail in the sub-micrometer range

High-resolution Bioprinting with embedded cells

Patented scanning procedure up to a 100 times faster

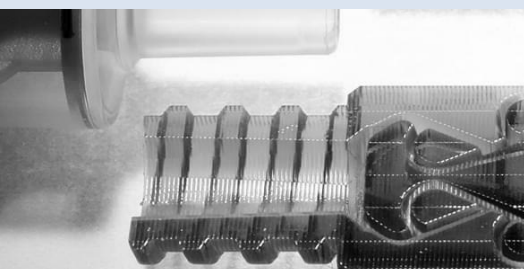
The basis of the UpNano high-resolution printing systems is 2-photon polymerisation. A non-linear process which, due to the high absorption selectivity, only results in material polymerisation in the focal plane of the laser beam. This enables the production of high-precision structure details smaller than the laser wavelength in the sub-micrometre range directly within the material volume, without repetitive material application.

The system is designed as a dip-in free setup. The high-precision optics and the print material do not come into contact with each other. This concept brings with it a multitude of advantages. Not only does this ensure that the high focus precision of the objectives is maintained, but it also allows printing up to a height of 40 millimetres and structures within a sealed substrate.



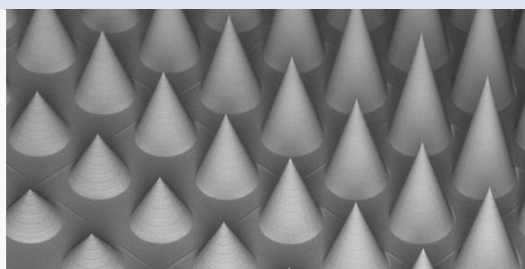
## 16 good reasons

**1. Large structuring area:** 50% larger field of view without stitching compared to other systems **2. Long range piezo stage:** stage with 120x100mm horizontal and 50mm vertical travel range **3. High power femtosecond laser:** up to 1W laser power for high scanning velocities and a wide range of resins **4. Laser power stability:** highly stable laser power output for large-scale printing **5. Ultra-high writing speed:** optimized scanning path for galvanometer scanner allows up to 1500mm/s **6. Adaptive resolution:** high resolution where needed, high throughput everywhere **7. Interchangeable stage inserts:** allows a wide range of inserts, ensuring the high flexibility of substrates. **8. Compatible with cell-culture plates:** glass bottom well plates in any configuration **9. Large structure with highest resolution:** vat printing mode for large structures with up to 40mm height **10. Bottom-up approach:** fabrication of thin objects and structures within a sealed substrate **11. Optimized resin formulations:** highly reactive resins for high throughput **12. Biocompatible formulations:** photo-polymerizable hydrogel resins compatible with living cells **13. NanoOne bio:** native temperature, humidity and CO<sub>2</sub> conditions for bioprinting **14. Robust and compact:** fastest high-resolution desktop system, with an edge length of less than 1 meter, on the market **15. Advanced logging feature:** keep track of printed parts and reuse previous settings as well as user management for multi-user facilities **16. HEPA filter:** filtered air stream over the building platform prevents particle contamination



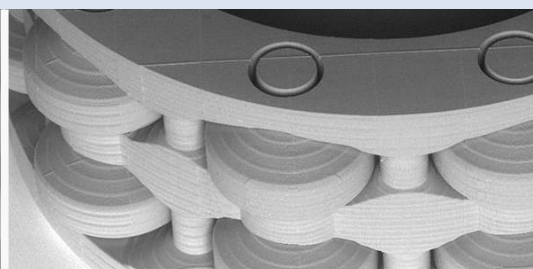
### Microfluidic

Direct printing of integrated microfluidic components and/or fabrication of (sterile) structural elements within a microfluidic chip



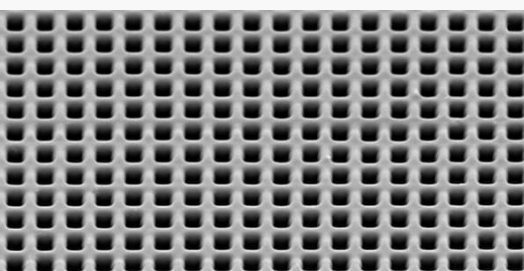
### Medical Engineering

Highly precise and reproducible microstructures for biomedical applications with recurring or different structural elements



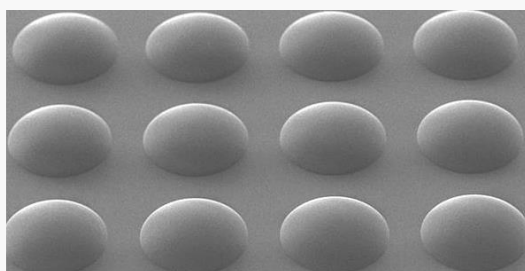
### Micromechanics

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



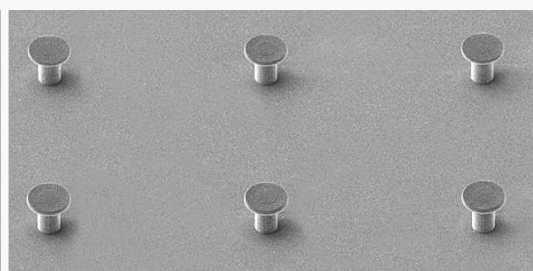
### Filter Elements

Large-volume filter structures with definable, reproducible pore size and shape that could not be produced until now



### Microoptics

Lenses and other optical components with a surface roughness of less than 10nm, for special applications using a low fluorescent material



### Surface Elements

Fine periodic microelements and structures that influence for example the adhesive, optical, electronic and sensory properties



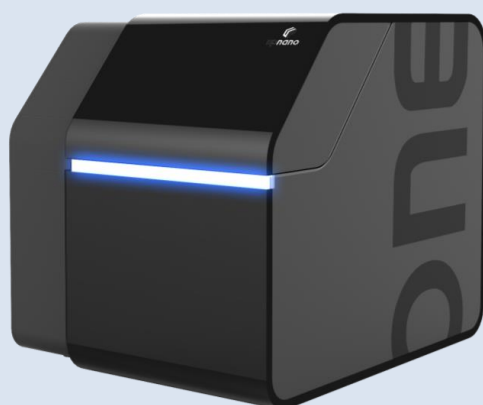
# nanoOne

## A platform technology for every application

With UpNano's cutting-edge technology it is possible to print objects with sizes ranging from the sub-micrometer to the centimeter range and up to 42 mm in height – within times never achieved before.

With three different model configurations, UpNano offers the right solution for every application and customer. From printing macroscale components to classic 2-photon polymerization applications and high resolution bio printing in the presence of living cells. The possibilities are (almost) unlimited with the NanoOne.

System Type	Desktop multiphoton laser lithography system
Printing process	Layer-by-layer 2-photon polymerization
Laser source	Femtosecond fiber laser
Laser safety	Laser class I system
Scanner	Galvanometer Scanner
Stage	Long range piezo stage
Maximum travel range	Up to 120 x 100 x 49mm
System dimensions	Desktop system 58.5 x 71.0 x 65.0cm
Total weight	124kg



### nanoOne<sub>1000</sub>

Applications from the nano to the macro range as well as processing of special materials

### nanoOne<sub>250</sub>

Realization of all classic 2PP applications from the nano to the micro and meso range

### nanoOne<sub>bio</sub>

Production of sterile structures and high-resolution bioprinting in the presence of living cells

Average power	1000mW	250mW	1000mW
Pulse length	90fs	95fs	90fs
Center wavelength	780nm	780nm	780nm
Repetition rate	80MHz	80MHz	80MHz
Bio unit			included
Upgrade options	High volume package Bio unit	Laser upgrade 1000mW Bio unit	



# Resolution is key and adapts to the geometry

The resolution requirements as well as the overall size of the object are decisive for the choice of the objective. It is important to find the right balance between the smallest details and the total volume of the component to obtain a satisfying printing time.



	40x	20x	10x	10x	5x
Numerical aperture	1.4	0.7	0.4	0.3	0.25
Working distance	0.13mm	0.35mm	3.1mm	10.0mm	12.5mm
Immersion media	Oil	Water	Air	Air	Air
Horizontal feature size	$\leq 220\text{nm}$	$\leq 420\text{nm}$	$\leq 730\text{nm}$	$\leq 980\text{nm}$	$\leq 1.2\mu\text{m}$
Vertical feature size	$\leq 550\text{nm}$	$\leq 2.9\mu\text{m}$	$\leq 9.2\mu\text{m}$	16.4	$\leq 23\mu\text{m}$
Field of view	$\varnothing 0.66\text{mm}$	$\varnothing 1\text{mm}$	$\varnothing 3\text{mm}$	$\varnothing 3\text{mm}$	$\varnothing 5\text{mm}$
Typical writing speed	150mm/s	300mm/s	600mm/s	600mm/s	1200mm/s
Throughput galvo mode	0.03mm <sup>3</sup> /h	0.2mm <sup>3</sup> /h	2mm <sup>3</sup> /h	2mm <sup>3</sup> /h	15mm <sup>3</sup> /h
Throughput adaptive resolution	0.18mm <sup>3</sup> /h	2mm <sup>3</sup> /h	20mm <sup>3</sup> /h	20mm <sup>3</sup> /h	150mm <sup>3</sup> /h
Scope of delivery	NanoOne 1000	X	X	X	
	NanoOne 250	X	X	X	
	NanoOne Bio	X	X	X	X
	High Volume Package				X
	Bio Unit			X	X

Besides the listed standard lenses that are already included in our machines and packages, we also offer a range of other lenses that are implemented in our process. Such as **100x, 60x or 4x objectives**.



## Adaptive Resolution

Significant throughput increase can be achieved using the patented UpNano adaptive resolution technology. The software classifies the selected geometry in high and low-resolution areas and adapts the laser voxel size accordingly. The laser focal point is enlarged for bulk segments or precisely focused for the outer shell and fine details. Therefore, throughput can be significantly increased, with internal areas being printed faster.

### High-volume segments

The laser focal point is enlarged in order to increase throughput, while maintaining the mechanical properties of the printed component.

### High-resolution segments

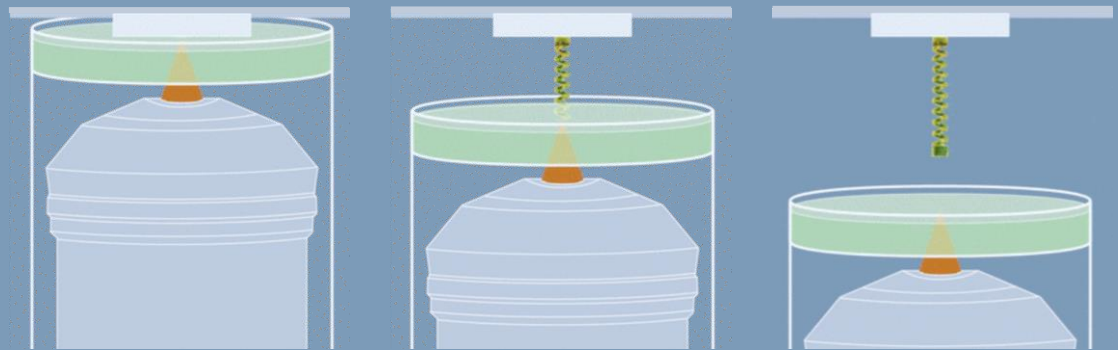
The laser is tightly focused to achieve the highest possible resolution.

UpNano's proprietary outline mode enables high resolution and low surface roughness. The contours of solid printed components are written with the highest possible resolution to exploit the full potential of the respective objective. Among other things, suitable for the production of lenses with a surface roughness down to  $<10\text{ nm}$ . With this mode even larger lenses can be produced in an economical time and with exceptional surface properties.

# Dip-in free printing

All print modes supported by the NanoOne platform are dip-in free. The lenses, as all cover glasses are corrected, and the resin does not come into contact at any time, preserving the focusing power of the objectives.

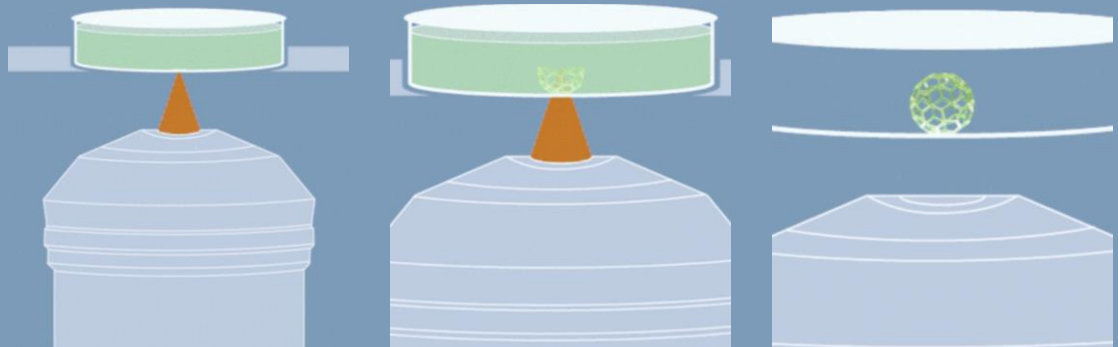
## VAT mode



NanoOne features a unique vat mode which allows the fabrication of large objects with a height of up to 40mm. During printing, a vat with a precision glass window is placed above the objective. During printing, the object is drawn up out of the material vat. The distance between the current print layer and the objective thus remains constant.

- ☞ **Different sized building platforms**  
10 x 10mm, 20 x 20mm and 1" wafer
- ☞ **Part height up to 40mm**
- ☞ **Vats with cap for material storage**
- ☞ **Constant focusing power**

## Bottom-up mode



With the bottom-up mode it is possible to produce high-resolution structures directly within a substrate. The laser beam is focused through the high-precision glass bottom of the substrate and the structure is built from bottom to top. During the printing process, the objective and thus the laser focus point is constantly moved upwards.

- ☞ **Sterile fabrication of micro structures**
- ☞ **Compatible with glass-bottom substrates**  
 $\mu$  slides and  $\mu$  dishes, micro fluidic chips, petri dishes, well plates

In addition to the two standard print modes Vat and bottom-up, the NanoOne platform supports the so-called Top-down mode for special applications. In top-down printing mode, structures can be produced in a pre-coated material free-standing, from top to bottom. This makes it possible to realize complex structures with undercuts and overhangs and to produce several structures on top of each other.

- ☞ **Complex freestanding structures**
- ☞ **Coated objective slides**
- ☞ **Compatible with glass-bottom substrates**  
 $\mu$  slides and  $\mu$  dishes, micro fluidic chips, petri dishes, well plates



# Perfect Materials for demanding applications

UpNano's high performance 2-photon materials are engineered and optimized to utilize the full potential of the ultrafast high-resolution printing system NanoOne. UpNano offers photopolymers and sol-gel hybrid materials, in addition to hydrogel materials for biological applications.



High performance  
2-photon resin



Fast prototyping  
2-photon resin



Refractive index-matched  
2-photon resin



Sol-gel hybrid  
2-photon resin

	4x 5x 10x 20x	10x 20x	60x 40x	60x 40x 20x 10x
Common objective				
Fabrication speed	++	+++	++	++
Vat mode	X	X	X	
Meso-/macro range	X	X		
High aspect ratio	X	X	X	
Low viscosity	X		X	
RI matched			X	
2.5D structures			X	X
Sub- $\mu$ m printing			X	X
Overhangs larger 90°				X



## XHYDROBIO INX® U200

is a gelatin based hydrogel developed specifically for UpNano. It provides all the biological benefits of conventional gelatin based materials in combination with two photon polymerization processability enhanced by a high reactivity and fast curing speed.

Key properties: Biocompatible, Reproducible, Biodegradable and easy to handle

### We are open when it comes to materials

In addition to the materials offered, commercially available resins and established 2PP printing materials can be used with the printing system. The UpNano material experts are happy to assist in the selection of materials or the development of customer-specific materials.

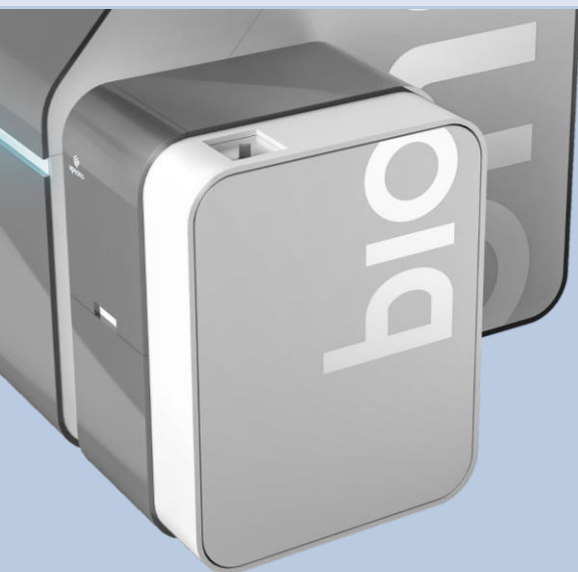
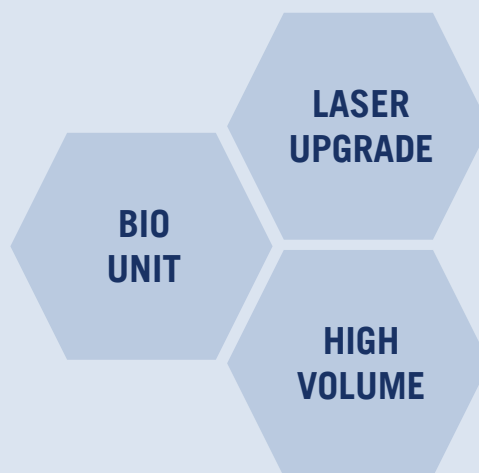
### Dispensing, the clean and precise way

The UpNano resins are supplied in practical resealable cartridges. With the help of manual or automatic dispensing systems, the material can be dispensed into the material vat or substrate with high precision and without dripping.



# The right upgrade for every application

NanoOne printing systems are always offered in a ready-to-use standard configuration but can also be customized with additional modules to meet specific customer requirements. These modules can also be retrofitted at any later time. The NanoOne 250 can also be upgraded from the 250mW laser system to the powerful 1000mW laser at any time.



## The bio unit

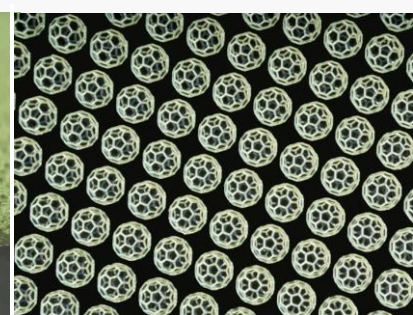
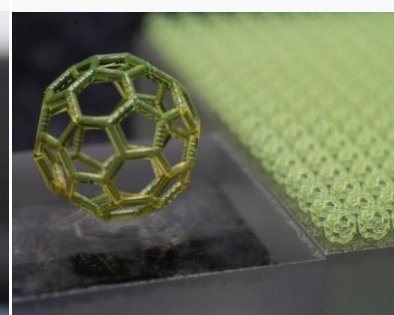
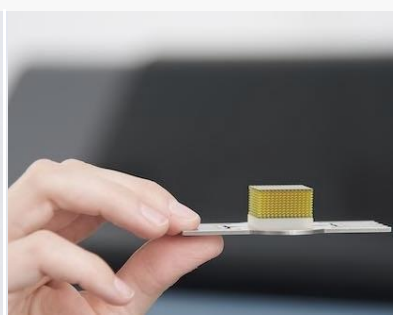
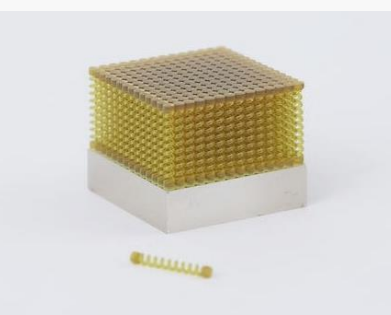
The bio unit of the NanoOne Bio is used to provide a native, stress-free environment for the living cells during the printing process. The fully integrated stage-top incubation system can be adjusted to the preferential environmental conditions of the respective cell type and ensures these conditions during the print. Temperature is one of the key factors in cell incubation. Cells react very sensitively to excessive temperature differences. The heating insert of the incubation system, which is clicked into the building platform of the NanoOne Bio, ensures a stable and homogeneous temperature distribution. The gas incubation system of the Bio unit ensures a controlled gas environment in the form of humid, CO<sub>2</sub>-rich air.

### Cell-containing samples for three-dimensional in-vitro cell tests

- ☞ in glass bottom 8- or 16-well chambers
- ☞ in a microfluidic set-up
- ☞ in glass bottom  $\mu$ -slides or  $\mu$ -dishes

## The high volume package

No matter whether large-volume components with an edge length in the centimeter range or the first small series. The high volume package enables the implementation of project ideas that previously seemed impossible. Larger material vats and suitable substrates with an edge length of 20 x 20mm or wafers with a 1" diameter offer the greatest possible design freedom and take the first step towards industrial implementation. With this setup, for the first time ever, series production of 2PP manufactured micro components is possible while at the same time user interaction is reduced to a minimum. The powerful laser that can be built into the NanoOne system allows the use of low magnification objectives and thus the production of unexpectedly large structures with structure details of less than 2 microns. The solution for components in the sweet spot between classic 2PP and micro-stereolithography applications.



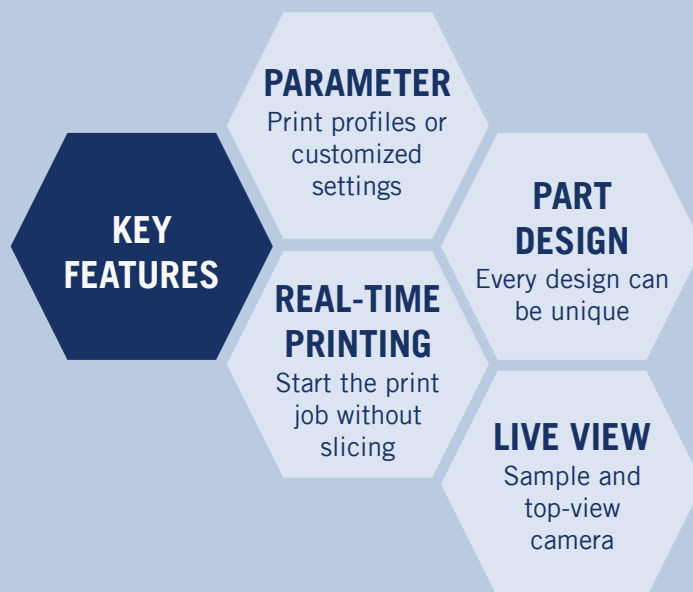


# With think<sup>3D</sup> its easy to print 3D

Whether predefined basic structures or customized CAD objects, NanoOne is the system of choice for a broad range of high-resolution applications. The intuitive THINK3D user software supports the customer throughout the entire printing process.

From the first click, to the import of structures, to the start of the print job, everything is defined in one software interface.

- 🔧 **Print job files** including all parameter settings
- 🔧 **Predefined print profiles** for optimal results
- 🔧 **Series production** of identical or different objects
- 🔧 **3D preview** of the created print job
- 🔧 **Real time processing** of data without preprocessing
- 🔧 **Adaptive resolution** for highest resolution where needed
- 🔧 **Machine monitoring**, integrated and automated
- 🔧 **Advanced logging feature** including user accounts



## We have the right contact person and solution for every problem



Customer service is one of the most important elements for us, which is why the interdisciplinary UpNano team is ready to assist with any of your requests. You can rely on us: we personally deal with any concerns you may have. Questions about the print materials? Need support in creating a print job? Interested in the training and upgrade opportunities? You will be contacted by the person in charge immediately!

As an international company with headquarters in Vienna, Austria we work together with selected distributors with extensive knowledge in the field of high-resolution 3D printing all around the world.



### MAINTENANCE

Customer satisfaction and an efficient operation are fundamental to UpNano



### WORKSHOPS

Sharing know-how to make new customers experts in high resolution 3D printing



### UPGRADES

Every customer is unique and so are our printing systems



### SUPPORT

The UpNano team provides its customers with on-site or remote advice and support



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