

High-precision 3D optics printer

Aligned 3D printing for integrated photonics & optics

Quantum X align is a high-resolution 3D printer designed for optics manufacturing, featuring automated alignment on fibers, chips, and wafers. It enables reliable, low-loss photonic coupling and supports a wide range of sensing and imaging applications. Leveraging ultra-fast 3D printing

by 2GL®, Quantum X align fabricates freeform micro-optics with outstanding shape accuracy and surface quality, and detects chip edges, fiber cores, and fiducials on chip surfaces, on wafers, and on further prestructured substrates to print optics with nanometer-scale precision in place.



FEATURES

included

- ▶ Aligned 3D printing on various substrates enabled by Aligned 2-Photon Lithography A2PL®
- ▶ Automatic printing aligned to fiber cores enabled by the Fiber Printing Set
- ▶ Automatic printing aligned to fiducials and chip edges enabled by the Chip Printing Set
- ▶ Flexibility with a wide range of printing materials and substrates
- ▶ Ultra-fast 3D printing by 2GL®

optional

- ▶ Ultra-fast 2.5D printing enabled by Two-Photon Grayscale Lithography 2GL®

FOCUS APPLICATIONS



High-res 3D printing



High-res 3D biofabrication



Optics manufacturing



2.5D surface patterning

SOFTWARE

included

- ▶ nanoPrintX for aligned 3D printing and 3D printing by 2GL®
- ▶ nanoConnectX for remote control of the printer

optional

- ▶ GrayScribeX for 2.5D printing with 2GL®
- ▶ DeScribeX for 3D printing by 2PP

Benchmark scores *

3D alignment detection accuracy ^{1,2}	down to 100 nm
Surface roughness R _a	down to ≤ 5 nm
Shape accuracy S _a	down to ≤ 200 nm
Feature size control ²	down to 100 nm
Typical processing time ³	10 min for 8x lensed fiber array
Achievable coupling losses	down to ≤ 1 dB

*Peak values, only achieved under specific conditions such as printing parameters, print heads, photoresins, and designs.

General system properties

Printing setup	Upright system enabling high-resolution 3D printing with flexible DiLL and non-DiLL setups to suit various material and application requirements.
Laser source	Femtosecond laser (780 nm), avg. power 250 mW
Laser safety	Class 1 (IEC 60825-1)
Voxel modulation rate	1,000 kHz
Positioning volume	150 x 150 x 20 mm ³ , stage repeatability ≤ 150 nm
Substrates	Fiber arrays, single cleaved fibers Microchips, TO cans Wafers (from 1" to 8" / 25.4 mm to 200 mm) Glass, silicon, other transparent and opaque materials
Workflow & batch processing	Substrate holder for multiple parts Adaptable submounts
Photoresins	Nanoscribe polymer photoresins; others on request
Noise emission	36 dB LpA
System dimensions (L x W x H)	161 x 100 x 179 cm ³
Weight	Up to 1,350 kg

Print head specific properties

	SF	MF	LF
Magnification / NA	63x / 1.4	25x / 0.8	10x / 0.3
Print mode	Dip-in ⁴	Dip-in ⁴	Dip-in ⁴
Working distance	360 µm	380 µm	2,600 µm
Field of view diameter (max.)	400 µm	800 µm	2,300 µm
Calibrated print field diameter	270 µm	700 µm	1,750 µm
Scan speed (max.)	100 mm/s	250 mm/s	625 mm/s
Voxel size (xy / z) (typical)	0.2 µm / 0.5 µm	0.6 µm / 3.6 µm	1.2 µm / 12 µm

SF: Small Features, MF: Medium Features, LF: Large Features

Software

included / optional

nanoPrintX basic version	Process parameter presets for 2PP-based 3D printing included Compatible with alignment routines Input format: STL, OBJ, lens formula
nanoPrintX 3D printing by 2GL version	<i>Additional features compared to the nanoPrintX basic version:</i> Process parameter presets for 3D printing by 2GL® included Throughput increase of up to 60x times at high quality Quality increase at same throughput
GrayScribeX	Software for 2.5D structures with 2GL® 2GL stitching for seamless prints Input format: STL, grayscale images
DeScribeX	3D printing preparation software for classic 2PP Process parameter presets for 2PP-based 3D printing included Parameter sweeps, STL scaling, print preview and simulation Input format: STL, plain text coordinates
Printer touchscreen	User interface with print job management, live-view camera and two navigation cameras, and a 3D model view “Tap to align” function for printing aligned to any position on a substrate
nanoConnectX	Remote control of the printer with complete replication of the touchscreen functionality

Application Sets

included / optional

Chip Printing Set

Key process	Automated printing aligned to fiducials and chip edges
Alignment system	Confocal detection of fiducials and 3D topographies
Detection accuracy in x/y direction ¹	≤ 100 nm
Compatible form factors	Unmounted with flat bottom, TO cans, others on request
Compatible substrate materials	Silicon, SiP, Sol, SiN, InP Polymers Glass Others on request
Fiducial detection	Via pattern matching (e.g. crosshairs, double squares, circles); index contrast fiducial/surrounding material > 0.02
Printing to chip edges	Automatic chip edge detection and laser power compensation

Fiber Printing Set

Key process	Automated printing aligned to fiber cores
Alignment system	Fiber core illumination (requires FC connector, others on request)
Detection accuracy in x/y direction ¹	≤ 500 nm
Compatible fiber array types	V-groove fiber arrays with 2.5 – 8.5 x 2.0 x 10.0 mm ³ block size, 127 – 250 µm or custom pitch 4 x 8 fibers Others on request
Compatible single fiber types	Single cleaved fibers (SM/MM/PM), fibers in FC or SMA connectors
Lensed fiber mode field diameter (typical)	3 - 30 µm
Height of optical elements (typical)	≤ 250 µm

Alignment processes

included / optional

Alignment to	Fiber cores Fiducials (e.g. markers, waveguides) Chip edges
--------------	---

Site requirements

Conditions	21 °C (± 1 °C); 35-65 % relative humidity
Environment	Yellow light (> 520 nm) recommended, low dust, low vibration
Power supply	100 - 240 V, 50/60 Hz, standard electrical connection
Power consumption	400 W (typical)
Compressed air supply ⁵	6 - 8 bar

Specifications are subject to change without notice and may vary depending on the photoresin, print head and structure geometry.

¹ Depends on Print Set

² in x/y direction

³ Strongly depends on the design

⁴ It is possible to avoid contact with the photoresin

⁵ Compressor available on request

Datasheet valid from January 2026

BE AT THE FOREFRONT OF MICROFABRICATION

Reserve now.

We would be pleased to send you a tailor-made offer.

If you have any further questions, please contact our sales team at sales@nanoscribe.com.



Nanoscribe GmbH & Co. KG
Hermann-von-Helmholtz-Platz 6
76344 Eggenstein-Leopoldshafen
Germany

Phone +49 721 981 980 200
Fax +49 721 981 980 130

info@nanoscribe.com
nanoscribe.com

Nanoscribe China Co., Ltd.
Shanghai, China
+86 135 1215 1378

Nanoscribe
Woburn, MA, USA
+1 857 919 8069

Nanoscribe is certified

ISO 9001: Quality Management Systems • ISO 14001: Environmental Management Systems