

NANOMETRIC LAB PRINTER

Plug & Play Solution for ultra-precise printing of conductive lines in nano-scale



shaping global nanofuture

Nanoprinting system designed by XTPL makes it possible to precisely apply to the printing surface a special ink formulated for this purpose in the company's laboratories. Under the influence of an external electric field, the nanopar-

ticles in the ink create conductive lines according to the specified parameters. As such, the thickness of the individual lines – even below 100 nm - their length and the distance between them all vary depending on a specific application.

TECHNOLOGY CORE – PRINTING HEAD + NANO-INK

The heart of the XTPL technology is designed by company's specialists innovative printing head. It operates on the basis of a unique algorithm & enables ultraprecise application of the ink with nanoparticles and formation of conductive lines. This revolutionary construction is subject to modifications that allow for dedicated application and optimization for a given application field. Basing on the customers' requirements the company is providing versions adapted to obtain outstanding results, i.e.: pressure version offering versatile method of dispensing that functions across a wide range of viscosities, it ensures fine and repeatable dots and lines and is suitable for a wide range of applications, from inline to batch dispensing to open defect repair process, whole construction is fully controlled

by XTPL own electronics; capillary version – specially designed for ultraprecise and demanding applications, small, robust and easy scalable device that allows for dispensing of the XTPL ink and formulation of electrical signal at the same time, it is used to create submicron & nanometric conductive lines with very small amount of ink (processes where minimum contamination is required - washing & drying no longer needed); multi-electrode version – signal electro-mechanic module controlled by comprehensive & pioneering algorithm created by XTPL as the answer to marked demand for high printing density, allows for creating simultaneously two or more lines, main advantage of this solution is increased speed of printing due to multiplication of electrodes in one compact feature.

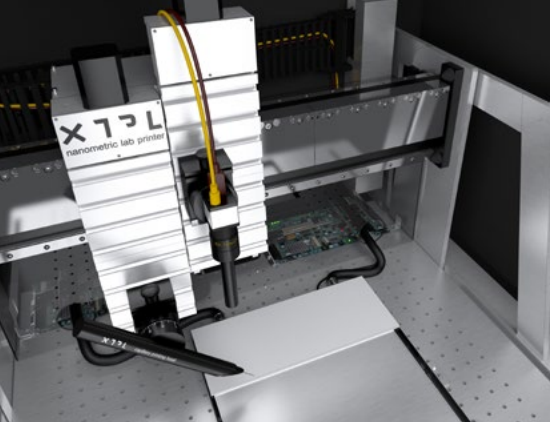


XTPL NANOMETRIC LAB PRINTER

XTPL's printing head, electronics and software algorithms are the core of the system driving the electric field and the assembly process of nanoparticles. This comprehensive solution is implemented in designed & constructed by XTPL team Nanometric Lab Printer. It is a device that offers necessary functionalities to test, evaluate and use XTPL line-forming technology with nanometric precision and enables positioning of the printing head with micrometric resolution. Printer's electronics is a top-class control and measurement system ensuring that the process of printing is controlled both by software provided by XTPL and user systems. We deliver the printer with a set of inks, test substrates and a table that ensures proper fixing of samples and thermal control of the printing process. XTPL's technology sets revolutionary standard in nanoprinting.

XTPL Nanometric Lab Printer is dedicated for:

- R&D centres both scientific & commercial
- Joint development projects with potential business partners
- Further development & defining new functionalities in line with application areas



GENERAL SPECIFICATION

- printer's external dimensions designed for applications on a laboratory table: 840 (W) x 720 (D) x 660 (H) mm
- weight approx. 100 kg with the printing head & ink set installed
- wide & comfortable working area
X: 300 mm, Y: 300 mm, Z: 100 mm
- positioning accuracy: 5 μ m
- positioning repeatability: 5 μ m
- positioning resolution: 1 μ m - XYZ axes combined with optical tracking of the printing area
- USB & ETH Ports for communication with control unit (Computer)

MECHANICS

- XY-axes ensuring fast & precise positioning
- two separate Z-axes enabling separation of the ink dispensing process from the line forming process
- precise vision system including high resolution camera
- substrate table with cooling & heating
- adaptable printing head modules

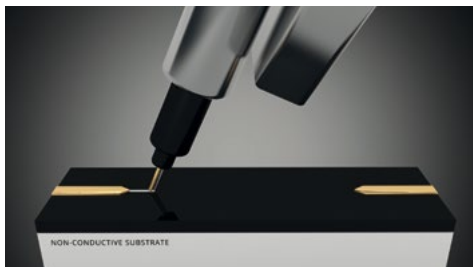
ELECTRONICS

- fully designed & developed own comprehensive solution
- FPGA based technology that provides the best & the fastest currently available electronic control technology
- system architecture based on a 32-bit ARM chip
- integrated motion control system for all axes

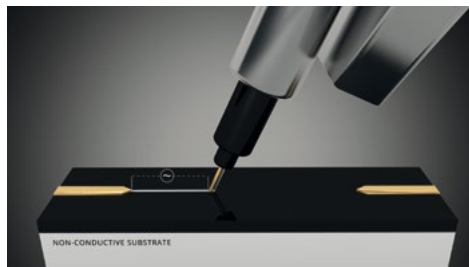
SOFTWARE

- intuitive and well known Windows 10 OS
- rich set of documented commands for control & guidance
- interface in the form of libraries & examples of connection with PC applications as well as C/C ++, python, Matlab & other languages
- software development kit for the video system

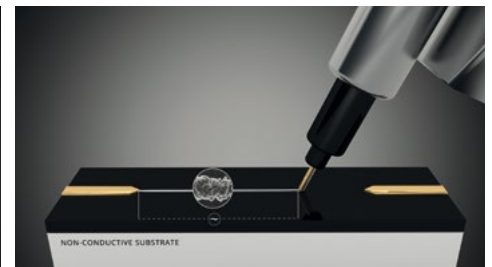
PRINTING PROCESS



During the process of line formation, the printing head deposits a properly formulated ink - nanoparticles in a mixture of solvents - on a non-conductive substrate, in example such as glass or flexible foil.



An external alternating electric field causes nanoparticles to assemble in a clearly defined and controlled way to form a line. The process takes place between a stationary and movable electrode.



Movable electrode: guides the formation of the line, which becomes an extension of the stationary electrode. Finally, the printing head short-circuits with a metallic pad, and the line connects to the pad while the printing head takes in an excess ink.

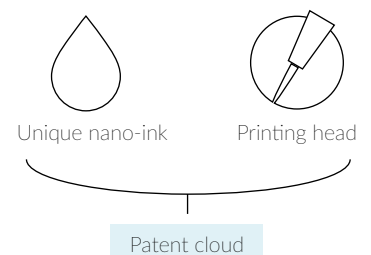
PROPERTIES OF XTPL LINES

Functionality: electrically conductive, optically, biologically & chemically active
 Nanomaterials: Ag, Au, Cu, CdS(QD), TiO₂, ZnO
 Line width: from 100 nm to 15 μ m
 Line length: up to 25 cm
 Aspect ratio: 1, in the single run of the printing head

Very low voltage applied: 5-20V
 Substrates: glass, Kapton, PEN, PC, PDMS, PET
 Resistivity: 2 Ω / μ m (for the line with the thickness of 1 μ m), PoC manufactured featuring up to 20-40% bulk Ag (thickness 100-400 nm)

INTELLECTUAL PROPERTY

XTPL offers a complete solution for printing electrically conductive lines/structures in nano-scale. This includes proprietary technology, innovative printing-head and dedicated nanoinks (covered by patent applications submitted in collaboration with the British law firm, Gill Jennings & Every LLP. The patent protection will be extended to around 30 countries).



Open for cooperation:

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XTPL is constantly optimizing its innovative technology and adapting the process to different implementation requirements. XTPL aims to build partnerships and strategic alliances with well-established partners in selected sectors and cooperate in the form Joint Development.

Contact us on:
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