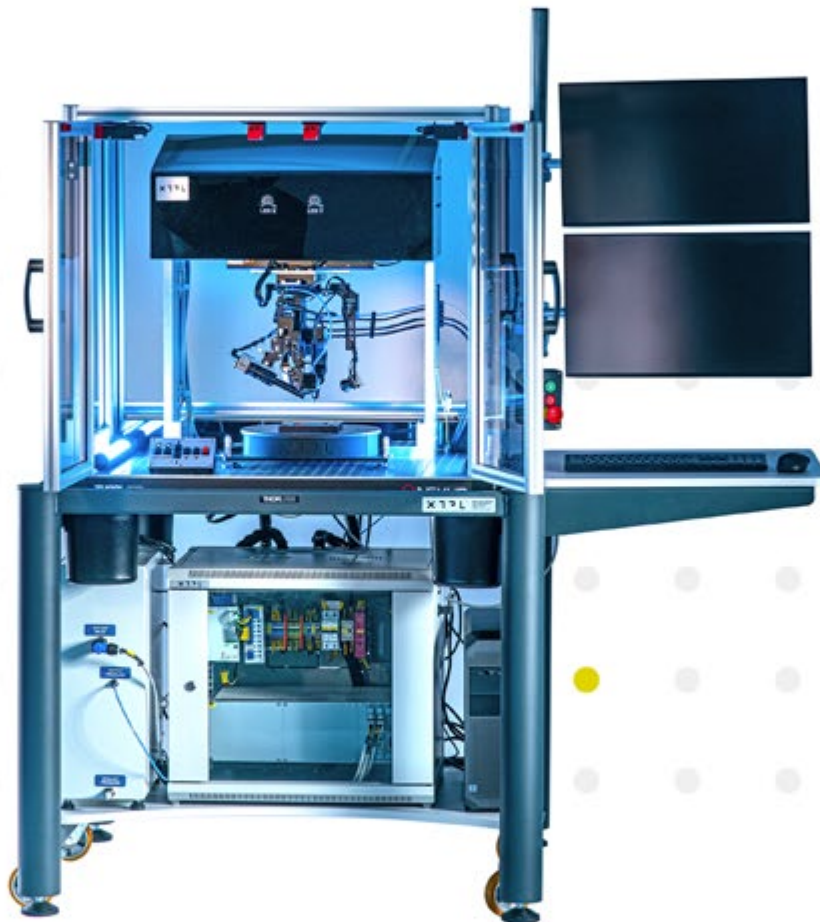


XTEL[®]

Delta Printing System



First truly additive method for printing
single micron functional structures

Award
Winning
Technology



The 23th
International Display Workshops
IDW '20



Benefits and advantages

- Feature sizes down to submicron scale
- Wide range of material support
- Printing on heterogeneous materials and 3D topographies
- Uniform & clean feature geometries: no overspray, high linewidth homogeneity
- Fast & easy exchange of cartridges & nozzles
- Only 0.1 ml of ink required to start printing
- Up to 100% ink utilization

Ultra-Precise Dispensing (UPD) technology

- Ultra-high-resolution printing on various substrates
- High-viscosity materials along with small feature sizes
- High aspect ratios just after a single pass
- Wide range of printable materials: metallic nanoparticle inks and pastes, quantum dot inks, dielectrics, polymers, photoresists, organic, liquid metal alloys and more
- Uninterrupted interconnections on highly complex topographies

Revolutionize your industry with the power of UPD



Semiconductors

- High precision with submicron feature size
- A wide range of materials supported for varied semiconductor fabrication needs
- High aspect ratios, ideal for conductive power interconnections
- Quick process enhances efficiency and ensures uniform, reliable end products
- Printing on complex 3D surfaces More-than-Moore devices



Flexible Hybrid Electronics

- Superior precision for Flexible Hybrid Electronics manufacturing
- Reliable 3D chip interconnections directly on vertical slopes
- Conductive and non-conductive materials for complex circuit patterns and reliable interconnections
- High aspect ratios in a single pass
- Uniform, clean geometries promote FHE device performance and Radio Frequency (RF) capabilities



Biosensors

- Biosensing pattern fabrication on flexible substrates, vital for wearable sensors
- Functionalized materials to prototype biosensors targeted at specific markers
- Unparalleled precision for swift biosensor prototyping
- Ability to print structures through different types of microchannels



Displays

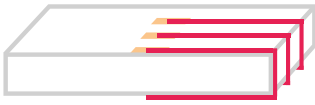
- Ultra-high resolution printing for OLED and microLED displays
- Precision ideal for interconnections, microcavity filling, and defect repair
- Dispensing of various display architecture elements, such as color conversion layers and interconnectors
- Single-step, high-precision additive process increases yield and reduces production time and costs



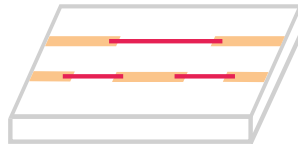
Printed Circuit Boards

- A wide variety of materials facilitating specific PCB structure creation and integration
- High aspect ratio structures in a single pass
- Printing on complex 3D

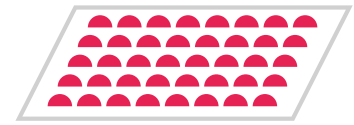
Unleash the power of cutting-edge technology!



Edge interconnections printing



Open defect repair



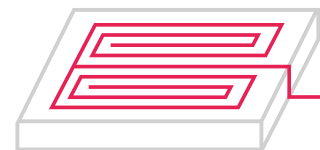
Microdots dispensing



Chip interconnection on flexible substrate



Filling the microwells and TSV



High-frequency structures

What sets technology apart and makes it the ideal choice for you?

Open platform for prototyping

- Versatile technology for a range of R&D applications
- Diverse resolutions
- Expanding library of materials
- Adjustable parameters
- Continuous R&D innovations

Reliable, repeatable, and durable results for specific materials

- Groundbreaking precision with high-resolution 3D printing - guaranteed 1 μ m line printed during setup
- Extensive compatibility with high-resolution third-party inks
- High precision and flawless uniformity in your printed traces
- Unmatched electrical conductivity in printed traces, validated by pre-delivery and field-based proof-of-concept

Easy to operate and maintain

- Seamless printing with our intuitive and simple-to-set printing parameters
- Straightforward, rapid procedure for cartridge and nozzle installation
- No need for post-printing cleanup
- Delta design fits perfectly to any setting
- System updates and development of new features



Hear more about UPD from industry experts

Prof. Norbert Fruehauf, Director of IGM at University of Stuttgart

"The XTPL's ability to directly dispense (in a mask-less approach) electrically conductive structures in the minimum feature size range of 1.5 – 10 micrometers is unique. In my view the XTPL's ultra-precise dispensing technology offers truly unique properties, which are an excellent fit to the future needs in the field of printable high-resolution and foldable OLED displays."

Prof. Ravinder Dahiya, The Leader of the Bendable Electronics and Sustainable Technologies (BEST) Research Group at Northeastern University

"Our research revolves around the development of high-performance printed electronics and sensing systems on large area flexible substrates. We used these printed systems to develop flexible electronic skin (eSkin) and explore its application in healthcare, wearable systems and robotics. In our projects we also use micro/nanofabrication tools and align them with processing on flexible substrates. We decided to purchase the Delta Printing System for our labs, after performing initial tests with the team at XTPL over the last several months. This appears to be a great enabling tools and we are looking forward to including it in our daily research work."

DPS device details

Item	Value
Feature size range	ultra-high resolution from 0.5 μm to 1 μm
	high resolution from 1 μm to 10 μm
	medium resolution from 10 μm to 50 μm
Viscosity	from 10 to over 1 000 000 cP
Substrate alignment	3-point levelling table with rotation error correction
Printing area	200 mm x 200 mm
Maximum printing speed	10 mm/s
Process preview	Video feedback from 2 high-resolution and 1 top view cameras
XY motor movement accuracy / repeatability	2 μm / 0.5 μm
Z motor movement accuracy / repeatability (vertical adjustment)	0.5 μm / 0.5 μm
Printer cabinet dimensions (excluding peripherals and Printing Workstation)	1100 mm x 950 mm x 1925 mm

Contact our team

✉ sales@xtpl.com

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XTPL S.A.
Stabłowicka 147
54-066 Wrocław, Poland

xtpl.com

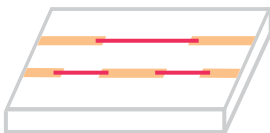
Ultra-Precise Dispensing Technology

XTPL. Powering the microelectronics of tomorrow.

Key features

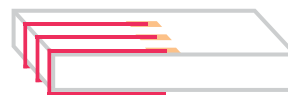
XTPL Ultra-Precise Dispensing (UPD) technology offers an unparalleled set of features that are not available in any other additive method. These include high-resolution printing (down to submicron feature size), the ability to use high-viscosity materials (up to 1 000 000 cP) and precise printing in 3D. The combination of these features makes it possible to achieve capabilities that were previously impossible with any other additive method.

Open defect repair



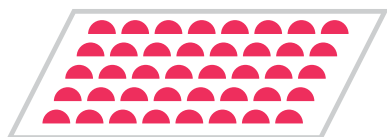
- Dispensing of ultra-high resolution features: $< 1 \mu\text{m}$
- Photonic sintering enabling resistance: $< 1 \Omega/\mu\text{m}$
- Materials compatibility

Edge interconnections



- High resolution traces, below $10 \mu\text{m}$
- Possibility to print over the edge of glass, silicon and flexible foils

Microdots dispensing



- Microdots printing
- Excellent height to width aspect ratio
- Capability to use conductive and non-conductive adhesives

Filling of microwells and TSV



- Precise filling of microlavities, high aspect ratio vias, microwells
- Variety of materials like: conductives, dielectrics, photoresist, quantum dots
- Use-cases like QD color conversion, high-density TSV, RDL interconnection, sacrificial layer in MEMS fabrication

Printing through microchannels



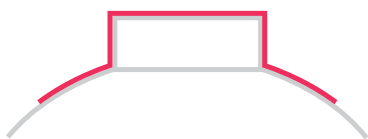
- Printing structures across different types of microchannels
- Direct dispensing of conductive electrodes or photoresist (ex. SU-8)
- Fast and reliable solution for microfluidic, med-tech and MEMS

Redistribution layer prototyping



- All printed RDL structure
- Down to 1 μm / 1 μm L/S density
- Variable materials possible to use in one system, for example metallic nanoparticle paste and high viscous polyimide

3D micro-electronics printing



- Directly on vertical step
- No ramps needed
- Reliable connection for flexible hybrid electronics and advanced IC packages

High-frequency structures



- High resolution antenna on-chip
- No satellite droplets and high uniformity to prevent high frequency signal losses
- Wire-bonding interconnection alternative

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High-Performance Materials

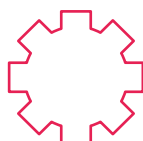


XTPL® Nanoinks Benefits

Explore XTPL's metallic nanoinks benefits — enabling swift development cycles and ensuring optimal resolution and conductivity. Our innovation propels your project forward in any field.



Up to 50% silver
bulk conductivity



High content of
conductive component



Superior
stability

High-Performance Materials



Ag Nanoink IJ36 Conductive Silver Ink

- Stable printing for >1 month without clogging
- Exceeds 40% bulk Ag conductivity
- High aspect ratios with single-pass printing



Ag Nanoink CL34 Conductive Silver Ink

- Up to 50% bulk silver conductivity
- Ideal for printing on foils for flexible electronics
- Suitable for low aspect ratio profile applications



Ag Nanoink CL60 Conductive Silver Ink

- High-viscosity for fine, high-aspect printing
- Facilitates easy dispensing and LIFT blading
- Ensures smooth deposits and donor surfaces



Ag Nanopaste CL85 Conductive Silver Paste

- High-viscosity enables ultra-fine, high-aspect ratio printing
- Exceptional non-clogging properties allows >1 month, 2.5 μm nozzle lifetime
- Dispenses through 1 μm nozzles for uniform thin lines
- Suitable for printing on vertical surfaces

Typical properties

Properties	Ag Nanoink IJ36	Ag Nanoink CL34	Ag Nanoink CL60	Ag Nanoink CL85
Silver content (wt. %)	34 \pm 2	30 \pm 2	54 – 63	82 \pm 2
Average nanoparticles size [nm] (TEM)	35 - 50	35 - 50	35 - 50	35 - 50
Shape of nanoparticles	Spherical	Spherical	Spherical	Spherical
Electrical resistivity [$\mu\Omega \cdot \text{cm}$]*	3.95	3.25	5.11	4.20
Viscosity (25°C, shear rate = 0.2 s ⁻¹) [cP]	26 - 30	200 - 400	30 000 - 50 000	> 1 000 000
Solvent(s)	Glycol ether	Glycol(s)	Glycol(s)	Glycol(s)
Compatible printing method	• Inkjet printing	• Aerosol printing (pneumatic atomizers) • LIFT • XTPL® Ultra-Precise Dispensing	• LIFT • XTPL® Ultra-Precise Dispensing	• LIFT • XTPL® Ultra-Precise Dispensing

*For recommended sintering conditions

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High-Performance Materials

Tailor-made electronic materials



Experts in developing customized nanomaterials

By combining expertise in material engineering and additive technologies, we transform unique concepts into reality by crafting tailored electronics materials.



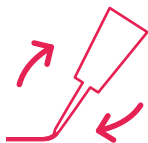
Contract manufacturing based on in-depth knowledge and experience

Materials expertise



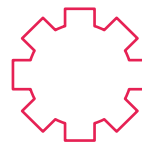
- Synthesis of customized nanomaterials
- Formulation of tailor-made inks and pastes (manufactured nanomaterials, solvents and additives)
- In-depth product characterization
- Scaling up and optimizing production

Printing know-how



- Acquisition of tools, development and optimization of waveforms
- Improving printing resolution and sequences on multiple substrates

Processing proficiency



- Screening of multiple sintering technologies
- Optimization of sintering parameters on different substrates
- Characterization of sintered & final products

Elevate your innovations with XTPL



- 01** Reliable contract research partner
- 02** Highly concentrated materials for maximum performance
- 03** High repeatability in the printing process

Enhance your products with our high-performing nanomaterials, eliminating the need to navigate their complex production processes. We manage the intricate creation, allowing you to focus solely on your product development and improvement.

Contact our team

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