



**OXFORD
LASERS**

Enabling Scientific and Production Breakthroughs Since 1977

www.oxfordlasers.com



Laser Micromachining Systems



Expertise with Each System

We manufacture custom-built, industrial-grade laser micromachining tools that operate with our Cimita™ software and used around the world as high through-put production and versatile R&D tools.

As manufacturing and research organisations strive for higher precision, we supply them with the advanced laser tools and services they need to achieve their goals. With nearly 50 years of expertise in lasers and photonics, we have the knowledge to guide our customers to the right solution.



A Series

Compact and Capable

Designed as a turnkey laser micromachining tool for R&D or production, the A Series delivers an impressive capability with a smaller footprint than the C or J Series.

- Femtosecond, nanosecond
- Wavelengths 355nm/532nm/1064nm
- Cutting, milling, drilling, scribing, texturing, thin-film patterning



C Series

Heavy Duty Production Tool

The C Series is designed for 24/7 operation in high through-put production environments.

- Femtosecond, picosecond, nanosecond
- Wavelengths 355nm/532nm/1064nm
- Cutting, milling, drilling, scribing, texturing, thin-film patterning



J Series

High-Powered Multiwavelength Option

Designed to be proficient in technically challenging applications, the J Series is the wholly customisable multi-laser, multi-wavelength option.

- Up to any two of femtosecond, picosecond, nanosecond
- Up to any two wavelengths of 355nm/532nm/1064nm
- Cutting, milling, drilling, scribing, texturing, thin-film patterning



SamplePrep™

Purpose-Built Tool to Prepare Samples for XRM

Preconfigured to enable users to target specific areas in a macro sample of rock, ceramic, metal (or other) and create a microsample for use in X-ray microscopy (XRM).



T-Series Trimmer

Active Wafer Level Processing

Modular tool to process wafers up to 300 mm, depending upon prober model. Integrates with probers and tester hardware.

- Laser 1342 nm, spot size 6-10 μm
- Frequency up to 10 KHz (other laser options available)
- 10 mm x 10 mm laser scan area
- Accuracy of trim to <1 μm over the full laser scan area
- Metrology to guarantee performance 24/7 operation

Guide Plates for Semiconductor Wafer Test

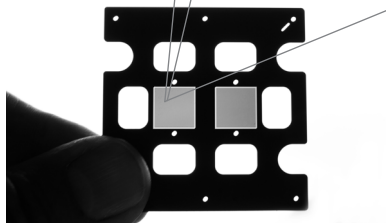
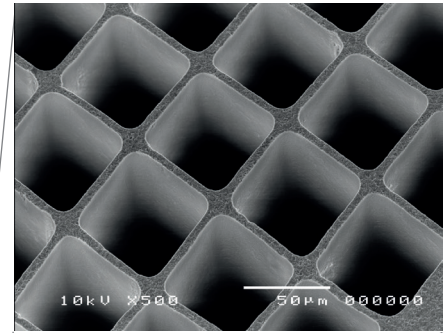
World-Class Precision Products

We operate our laser drilling facility 24 hours a day, 7 days a week throughout the year to provide world-class guide plate production for rapid delivery to our global customer base.

Ultra-Precise Guide Plate Holes

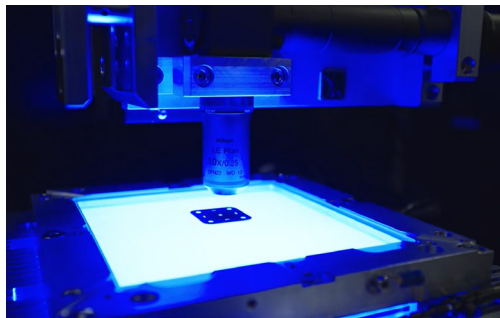
Dedicated to innovation, we invest heavily in R&D to stay at the forefront of technology. Achieving tighter tolerances, smaller features and smaller corner radii to support the probe card industry as it moves to ever smaller probes and tighter pitch.

- Hole size and type beyond the range of other drilling techniques
- Ultra-high positional accuracy
- All ceramic materials including Silicon Nitride and Photoveel
- Expert support and advice on laser drilling
- Feasibility studies, R&D, pilot production, full production



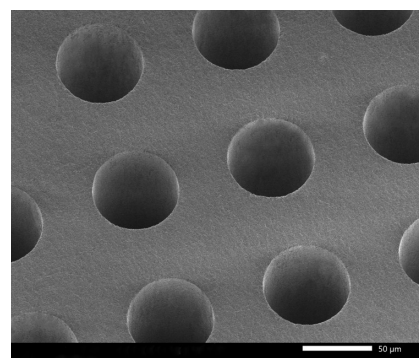
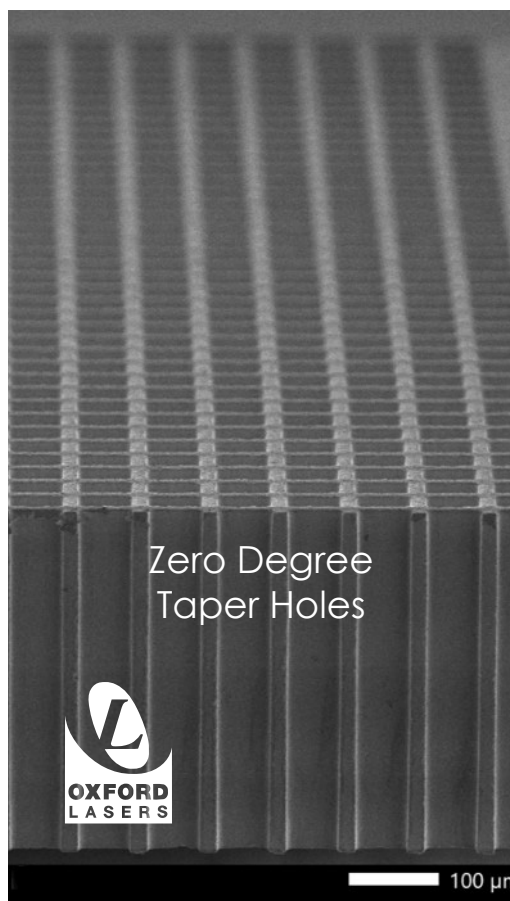
Ultra-High Precision Laser Drilling

Tight pitch	< 5 μm web
Hole size	< 20 μm
Corner radii	< 3 μm
Higher hole count	200,000 holes
Hole shapes	Square, round, elliptical, rectangular, asymmetrical
Range of materials	Ceramics, polymers, glass



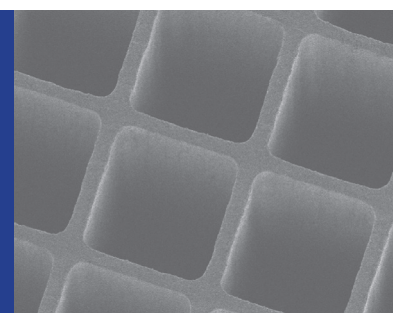
Machine Learning for Productivity Benefits

Oxford Lasers have built a machine learning system that provides a closed feedback loop in the manufacturing of Guide Plates. From initial design through to measurement of positional accuracy we have shown that with the use of AI we can enhance productivity and performance each time a plate is produced.



Zero entrance
rounding

Tight Corner Radius
< 3 μm corner radius
achievable



Precision Laser Drilling of Pharmaceutical Packaging

Positive Controls for CCI Testing (CCIT)

Calibrated micro holes down to 2 µm

Oxford Lasers are a world-class supplier of laser-drilled positive controls for deterministic container closure integrity testing (CCIT) in pharmaceutical packaging. Because of our in-depth experience and methodology, we produce precise and consistent positive controls that align with USP 1207, EU Annex 1 Best Practice guidelines and support FDA CGMP regulations.



How does it work?

Oxford Lasers will laser drill a calibrated micro hole into your packaging to create a 'positive control package'. These positive control packages are placed back into your production line for quality control measures – enabling you to test, calibrate, and confirm your leak detection monitoring system.



We laser drill all your primary and secondary packaging over a variety of categories, forms and materials.

Types of Packaging We Laser Drill

- Vials and bottles (glass and polymers including cryogenic materials)
- Syringes (all formats including luer lock and slip tip hubs)
- Autoinjector PFI syringes and cartridges
- Ampoules
- IV bags
- Laminate pouches
- Blister packs

Types of Material

- Glass
- Polymers
- Metals

Capabilities

- Laser-drilling of samples with hole size down to 2 µm ($6 \times 10^{-4} \text{ cm}^3/\text{s}$ per USP 1207) in glass and stainless steel
- Polymers directly down to 5 µm
- Leak detection index classification 3 to 6

Pinhole Discs

If drilling your packaging is not practical (or not needed), we supply laser-drilled stainless steel pinhole discs with hole size down to 2 µm for application onto your own packaging.

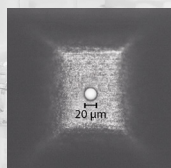
Consistency, Accuracy and Repeatability

Oxford Lasers' micromachining technique creates precise micro-holes. We use ultrafast lasers to produce consistent feature size and shape that are free from stress cracking. We ensure not just the flow effective diameter is consistent, but the micro-hole profile is consistent as well – giving you assurance of repeatable quality testing from batch to batch and site to site.

Confidence and Traceability – Certificates of Conformity (CoC)

We ensure all samples are consistent and provide fully traceable certificates of conformity resulting in a robust audit trail for your manufacturing and quality assurance needs. We meet rigorous measurement standards and offer several certification options:

- Optical microscopy
- Flow effective diameter (FED)
- By Individual part or by batch



View down into a square laser-drilled counterbore with round exit hole in center.

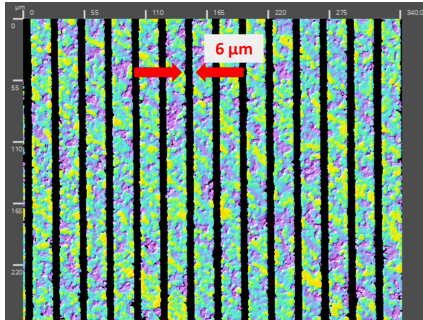


Laser Micromachining Contract Services

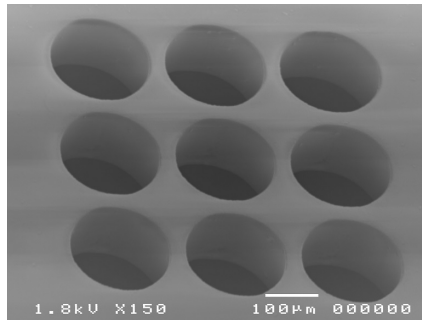
When Precision Counts

Our contract services for high and ultra-high precision laser micromachining laboratory continuously produce thousands of machined parts in a variety of materials with extreme accuracy. We work with features at the micro level. We pride ourselves in the work we do for our customers that demands precision execution from in-depth knowledge of laser tools and techniques to support our customers applications.

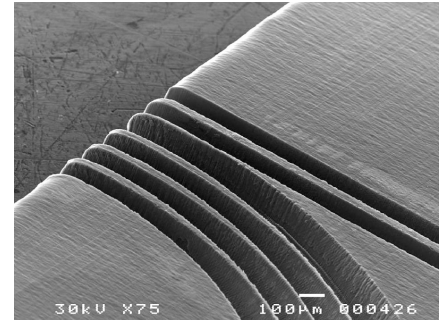
micro drilling | micro cutting | micro texturing | micro scribing | micro welding | thin-film patterning



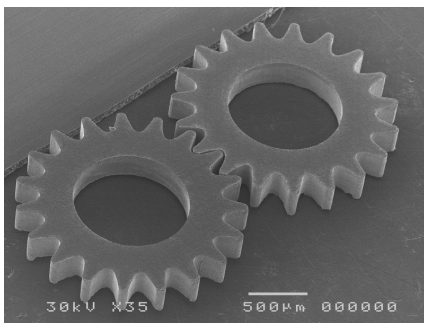
Micro scribing 6 µm tracks in PZT ceramics for ultra-high frequency ultrasound



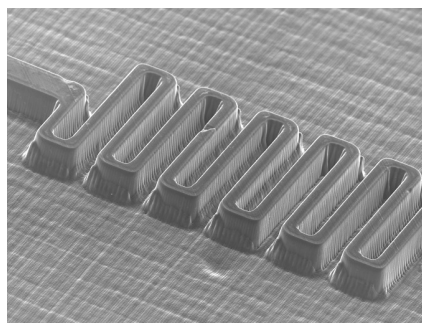
Micro drilling borosilicate glass 200 µm round holes



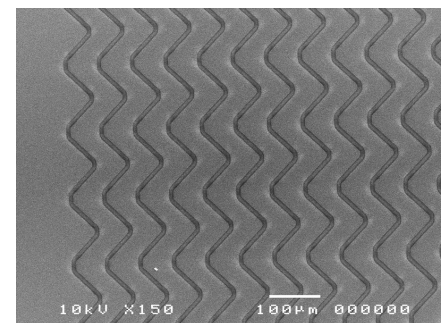
Micro cutting 100 µm curved channels in polyimide



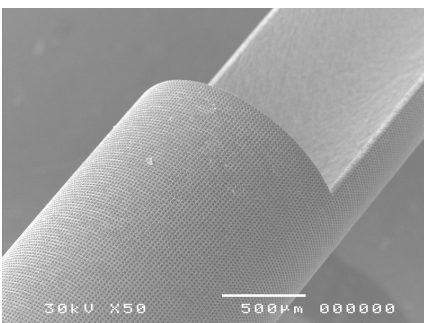
Micro cutting hardened steel gears



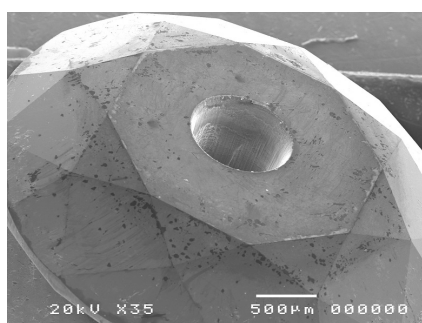
Micro milling diamond meander device



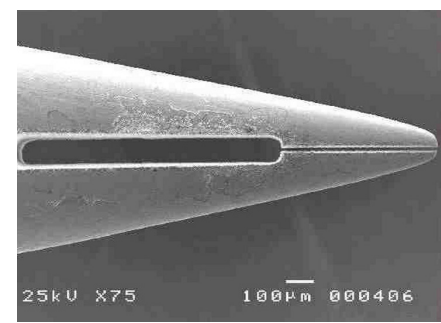
Thin-film patterning - ITO on glass 10 µm tracks



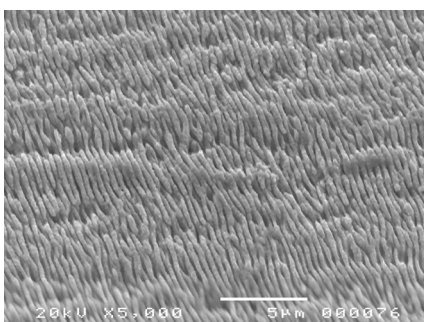
Micro drilling stainless steel 40,000 holes - 5 µm



Micro drilling diamond 500 µm deep blind pocket



Micro cutting tungsten DNA pin
15 µm x 600 µm slot through 150 µm thick material, 100 µm x 1000 µm reservoir channel



Surface micro texturing stainless steel



Micro welding quartz to stainless steel

High-Precision industries depend upon Oxford Lasers

- Semiconductor
- Electronics
- Automotive
- Pharmaceutical
- Biomedical
- Air & Space
- R&D and Universities





Short-Pulsed Laser Illumination for High-Speed Imaging

Oxford Lasers continues to be a leader in the development of high-speed imaging techniques and technologies with the FireBIRD and FireFLY short-pulsed laser illumination products. Our powerful systems synch with high-speed cameras to create images of the highest quality. The laser systems are ideal for Back and Front illumination as well as advanced imaging techniques to capture bright events, energetic events and dynamic processes such as Schlieren and particle image velocimetry (PIV).



FireBIRD 1000 W laser
illumination system

FireBIRD

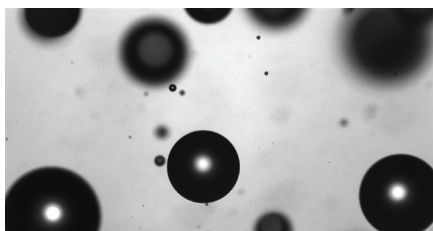
The FireBIRD is a top-performance short-pulsed laser illumination system. Compact, and powerful at 1000 W, the FireBIRD gives you the advantage of the fastest, brightest, synchronised illumination source for capturing images that demand precision and accuracy.



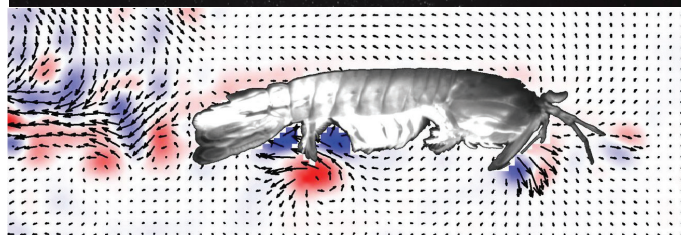
FireFLY 500 W laser
illumination system

FireFLY

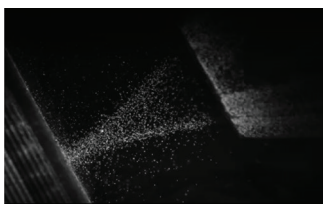
The 500 W FireFLY is a compact, great all-around laser illumination system enabling highly detailed imaging. The FireFLY comes in two models: the FireFLY-S (Standard) and the FireFLY-LS (Light Sheet) designed for flow visualisation and imaging of fluid dynamics. It has a uniform light-sheet thickness for increased clarity across the imaging field of view like no other.



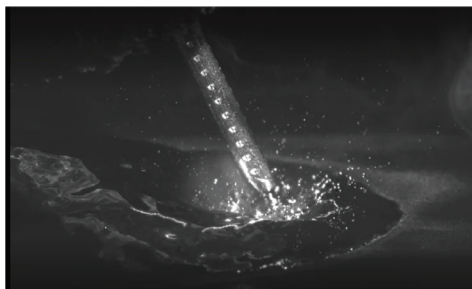
High-speed particle imaging with
FireBIRD and FireFLY laser illumination



Example light-sheet illumination for
biolocomotion evaluation of Mantis shrimp



Processes in additive
manufacturing like laser
cladding can now be
viewed and therefore
optimised



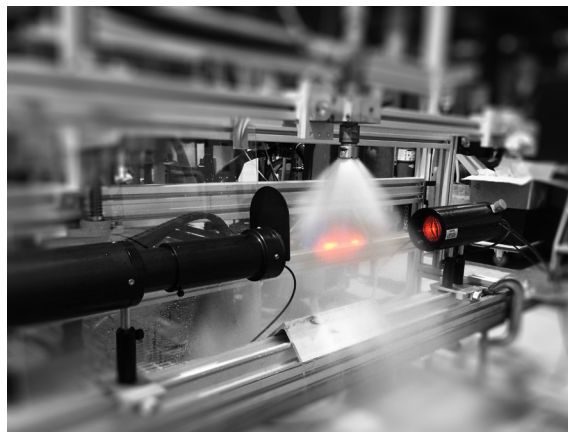
Bright events such as welding processes
can be easily imaged with the power of
the FireBIRD or FireFLY laser illumination

High-speed Imaging Contract Services

We also provide imaging contract services, systems rentals, R&D and technical support using our own in-house imaging laboratory or at your designated location. We offer you a complete imaging solution.

Systems for Characterisation of Sprays, Droplets and Particles

The VisiSize systems use advanced imaging technology and software to provide detailed particle and spray characterisation. All our systems have simple intuitive controls and provide greater insight into analysis of sprays, droplets and particles by measuring particle size, velocity and distribution in real time. Our systems support a wide variety of industrial applications in agrochemical, fire suppression, automotive and food & drink industries.



VisiSize P15+ Portable Particle Sizing System

The VisiSize P15+ system is a portable particle sizing system with IP67 Ingress Protection rating that can be used in-field, on the shop floor or in the lab for measurement of size, velocity and distribution of sprays and droplets. The most compact of our VisiSize systems, the P15+ provides lab-quality results in an easy-to-carry format. The VisiSize P15+ comes pre-calibrated to dependably measure spray droplets without requiring expensive re-alignment.



VisiSize N60 - high-velocity particle sizing system

The VisiSize N60 is a high performance, Class 1 laser-safe system for analysis of high velocity sprays. It provides the most advanced real-time analysis of micron-size particle and droplets providing size and velocity measurements of fast-moving, high-volume or high-density sprays.



VisiSize N60maX - high-velocity particle sizing system

The VisiSize N60maX is the extended version of the VisiSize N60. With a longer working distance, the VisiSize N60maX provides the real-time particle analysis of high-velocity, high-volume or high-density sprays.

Sizing Contract Services

Oxford Lasers have worked on a wide range of applications from drug delivery system characterisation through to particle sizing and velocity for agrochemical and fire suppression systems. We provide our customers with in-depth evaluation in high-speed imaging applications for actionable insight using our illumination and particle sizing systems.

Industry Applications: Agrochemical



- **Spray Quality Assessment:** real-time insight into spray drift and spray characterisation
- **Crop Protection Training Tools:** Our VisiSize systems are used by manufacturers as part of their educational programs and good stewardship initiatives - easy to use for hands-on demonstrations
- **Nozzle Development:** VisiSize droplet measuring systems enable manufacturers to understand the effect nozzle design has on the product being sprayed



Who We Are

From our origins as a spin-out from Oxford University in 1977, we have enabled scientific and production breakthroughs to industry and academia through our expertise with high-precision laser-based solutions. For nearly 50 years, our in-depth knowledge of photonics, optics and industry has ensured that our customers harness the advantage of advanced, high-precision laser technologies.

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