

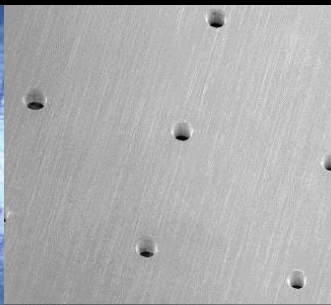
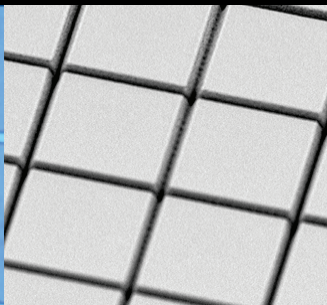
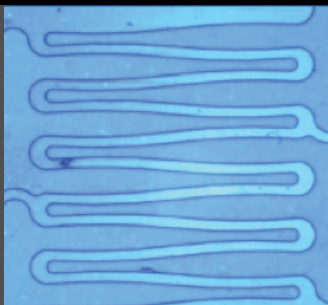
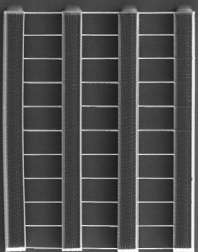
# Motion Control

## Solutions for Laser Processing

Precision Motion – *Guaranteed™*



Experience | Solutions





## Our Value

- Innovative motion solutions for the laser processing market
- Unprecedented level of motion performance - guaranteed
- Efficient operation and distribution model
- Broad product offering and application expertise

## Our Promise

At Newport, we are dedicated to continuously evolving our knowledge and experience in order to deliver innovative products and expertise that advance our customer's technologies.

## Company Overview

Established in 1969, Newport has over 40 years of industry knowledge and expertise across a broad range of technologies allowing the company to continually deliver innovative products in the areas of lasers, photonics instrumentation, vibration isolation, optical components and subsystems and precision automation to enhance the capabilities and productivity of its customer's manufacturing, engineering and research applications.

In addition, Newport has built a strong history of partnering with OEM customers delivering solutions from sub assemblies to full solutions including design, testing and manufacturing.

Understanding the specific needs of customers, Newport recognized the need for integrated expertise and solutions. Today, Newport manufactures a vast array of advanced technology products and includes industry leading brands such as Spectra-Physics®, New Focus™, Oriel® Instruments and Richardson Gratings™.

## Motion Division

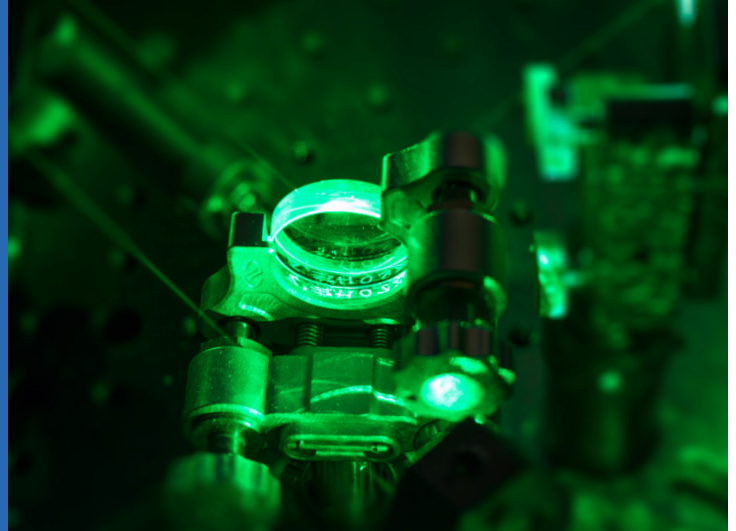
With over 50 years of precision mechanical design, fabrication and application specific motion control experience and expertise, Newport has developed an extensive catalog of motorized positioning products. The underlying technology behind Newport Motion is multi-faceted, drawing on technological innovation and evolution in design, materials, manufacturing and metrology.

Newport Motion can be found at the most prestigious research centers and leading high tech commercial centers. Newport drawing on in-house expertise in laser materials processing and motion control has driven technical development to enable fast, powerful and efficient systems integration for tool builders.



## Laser Machining - Markets

Laser processed materials go into numerous end markets from the automotive industry to medical device manufacturing. The applications need of the tools that make precision parts rely on technical information that encompasses lasers, optics and motion as well as process expertise.



## Market Solutions

Newport is driving technical innovation around market driven solutions. With unique multi-mode in-house expertise in laser materials processing, lasers and motion control; Newport can provide the most complete single-point solutions for system integrators, manufacturers and research centers.

Technical development is inspired by the synergy of all three groups working together and developing the most high value solutions that consider all aspects of the process as demanded by the market while maintaining independent expertise available to the customer along any single mode.

## Third Party Motion Control

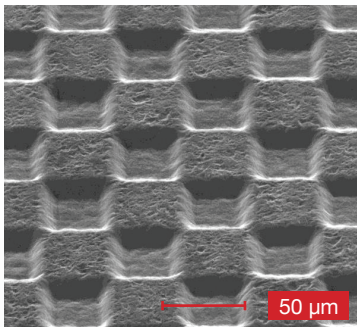
Customers already in tool production will typically not want to change controller or perform any substantive software development around new control solutions. In cases such as this, Newport can provide motor specifications, cabling, configuration as well as expert tuning assistance. Newport motor and encoder signals follow industrial standards and allow easy integration with third party controllers.

Newport stages will typically prove easier to tune than other stages because of proprietary machining processes and design. Customers developing a new process can take full-advantage of the complete Newport Laser Materials Process Ecosystem. This includes:

For many laser processing applications, the most powerful solutions in capability and cost can be found with Newport/ACS based systems. Newport can provide a complete application optimized system with both technical advantages and competitive pricing. For customers with an interest in having a complete tool conversion, Newport offers software consulting.

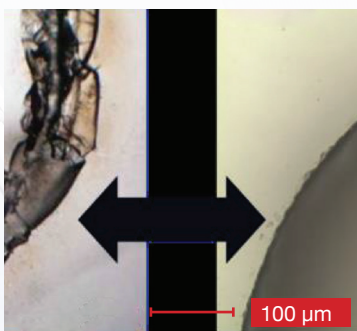
- Powerful and intuitive laser materials process software
- High speed laser trigger capability (12 mhz)
- Low latency laser synchronized motion (less than 100 ns)
- On-the-fly galvo synchronization for unconstrained field of view
- Extensive tool synchronization (autofocus, machine vision system, surface profiler, etc...)

# Laser Processing



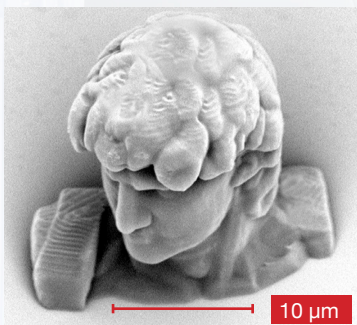
## Ablation

Precision laser ablative processes demand a combination of performances from the stage, motion controller and/or galvo as well as key software considerations. In precision industrial ablation processes we recommend IDL Stages for their debris protection, dynamic trajectory performance, repeatability as well as straightness and flatness characteristics. IDL stages can be integrated for synchronized on-the-fly processing with galvo scanners.



## Ultrafast Micromachining

Newport as a manufacturer of high performance ultrafast lasers has an in-depth knowledge and world-leading expertise in ultrafast materials processing. This expertise with lasers, motion and materials means that every motion system benefits from high-level in-house materials processing expertise.



## Laser Additive Manufacturing (LAM)

Laser Additive Manufacturing is an area of intense interest offering flexibility to manufacture complex parts in a single process sequence. Newport has developed proprietary software that can control a wide array of devices for multi-layered structures incorporating laser processes such as sintering and ablation.



## Novel Microfabrication

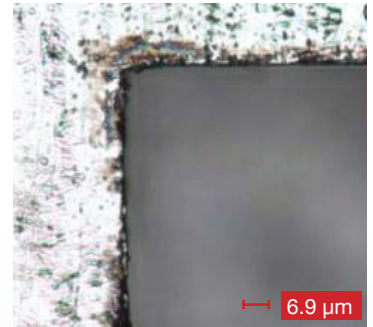
Newport has worked with a diverse array of microfabrication techniques and materials. This includes interfacing with both lasers and direct material deposition systems used in Direct Ink Writing and 3D Printing. Newport Laser Materials Process software extends to work with these devices and can be customized around novel processes for making novel microfabrication tools.



# ing Applications

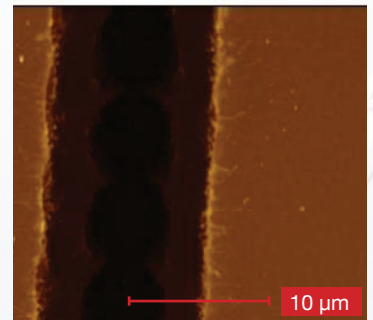
## Laser Cutting

Laser precision cutting applications with narrow kerf widths and tight cutting tolerances is where Newport Motion solutions excel. With exceptional repeatability at the sub-micron scale Newport stages can be mapped with accuracy to the sub-micron/micron scale. Using ACS XSEG third-order trajectory generation, trajectory drawing software and optimized DXF conversion; Newport offers a full-solution for systems integration.



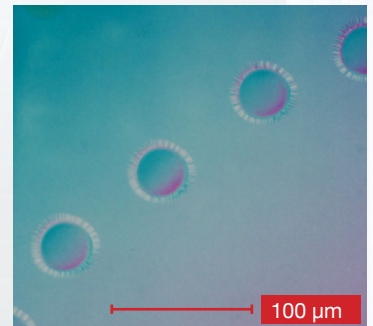
## Laser Scribing

Newport stages offer the flatness, straightness, repeatability and dynamic performance key to scribing applications with narrow scribe lines measured in microns. With vision system and Auto-Focus support in Newport Laser Machining Software, complete tools can be built efficiently and integrated quickly. Newport also has extensive materials process expertise in scribing composite materials without damaging to adjacent areas.



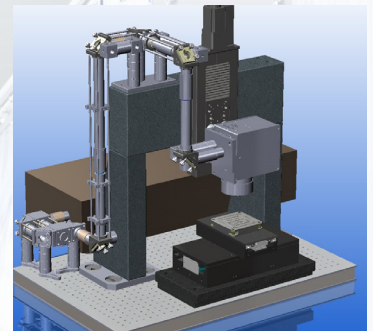
## Laser Drilling

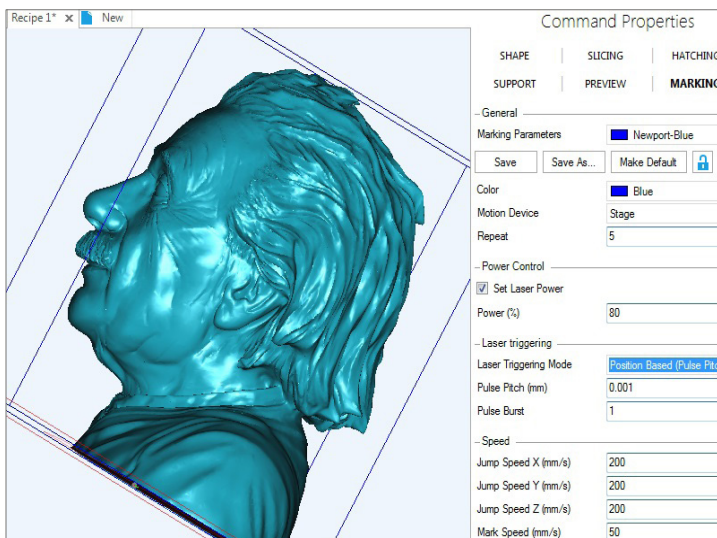
Newport offers complete synchronized process control with galvos and stages ideal for drilling accurate and repeatable hole arrays. Newport Laser Machining software also takes advantage of Newport stage performance to make precise stitching steps to with rapid step-settle times, enabling high-throughput. Newport software also provides laser drilling tools making it well-suited for drilling and other processes on a single workstation.



## R&D Tools

Newport builds multi-purpose R&D laser materials process tools. Combining expertise in lasers, motion control and software; Newport can build workstations customized to application demands in and perform materials processing validation around tool solutions.





## Newport Laser Machining Software (LMS)

LMS is a powerful and intuitive laser processing software ideal for single-point control of commercial laser systems as well as R&D tools.

## Laser Materials Processing Software

Newport Laser Machining Software (LMS) is a complete Human Machine Interface for laser materials processing tools. The software provides automated process recipe synchronization at the hardware layer for laser, stages, galvo scanners as well as machine vision systems, autofocus, surface profilers, material dispensing devices and other peripherals.

### Complete Process From Design

LMS converts CAD models directly from design in the most popular formats, including: DXF, DWG, STL and many others. The CAD conversion and compile process is highly efficient, typically requiring only seconds for even complex 3D (STL) files. The conversion is performed in the native language of the controller, allowing the most optimized methods for dynamic trajectory profiling and laser synchronization methods.

## R&D, OEM and Customer Guided Development

LMS is available on any workstation driven by an XPS-RL, XPS-Q, or ACS Controller. This allows the system integrator to choose the control solution that best fits the application and optimize cost/performance without requiring any additional development work or software modification.

LMS is also offered in multiple versions, so there is an ideal option for home-built R&D workstations as well as complete industrial production tools. The highly intuitive software is also easy to learn, easy to use and can be customized for the OEM customer with their preferred pass-through interface while providing access to core drivers, to develop proprietary modules.

### Features and Options

Complete laser workstation control software

- Standard and OEM versions available
- CAD conversion with automated process synchronization
- On-the-fly galvo synchronization
- 2D and 3d laser materials process control
- Integrated machine vision and AF support



## Benefits of ACS Partnership

ACS Motion Control is a global company providing high performance motion control systems for demanding multi-axis applications. With cutting edge proprietary technology ACS performance is unmatched in laser processing applications.



## Expert Laser Synchronized Motion

With dedicated features and products to address the most demanding applications in laser materials processing, ACS offers world-leading performance for laser synchronized motion. Integrating proprietary technology developed for use with pulsed lasers, ACS features multi-axis synchronized laser triggering with up to 12 MHz pulse output clock, less than 100 ns latency and motion synchronized laser power control. The practical result is that laser pulses are delivered at precise positions and energies, resulting in high accuracy machining true to design.

## A New Level of Performance

Newport is a world leader in the design, development and manufacturing of the highest performance stages commercially available. This experience and expertise has been combined with in-house laser/laser materials process expertise to deliver optimized solutions into the most demanding applications.

ACS is a world-leader in industrial motion control with innovative technology and differentiated performance. Newport and ACS have worked together to draw on this multi-mode expertise to

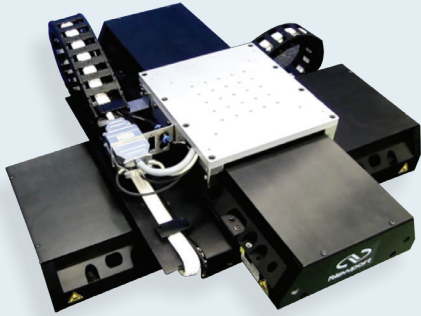
develop and deliver cutting-edge laser materials process solutions to system integrators, builders and contract manufacturers with in-house tools.

### Laser Processing Capability

- High speed/low latency motion synchronized laser trigger/pulse picking
- Synchronized laser gating
- Synchronized laser power control
- Advanced trajectory look ahead algorithm with corner detection
- Automated throughput optimization algorithms
- Newport laser machining software interface (end-user/OEM versions)
- Synchronization of supporting peripherals devices
- EtherCAT interface for real-time hardware networks
- Powerful and flexible ACSPL+ and G/M-code programming language support

### Proprietary Technology Features

- PEG / Position Event Generation
- XSEG / Advanced multi-axis motion command set
- **ServoBoost™** / Adaptive servo control algorithm
- **NanoPWM™** / Proprietary PWM drive technology



## IDL-LM Series

IDL-LM stages are a versatile laser machining stage designed for precision industrial laser processing tools.

### IDL Series

The IDL-LM Industrial Linear Stage series is a high-precision multi-purpose linear stage developed for production-scale laser materials processing. Featuring a sealed design with hard covers, glass fiber sidebands and a positive pressure air-purge, IDL stages have an IP rating of 50 and offer reliable operation in debris generating processes.

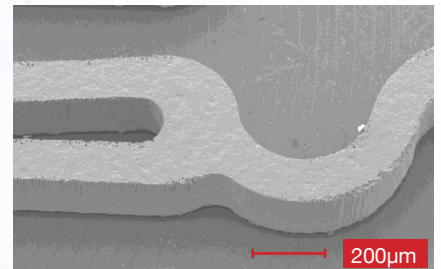
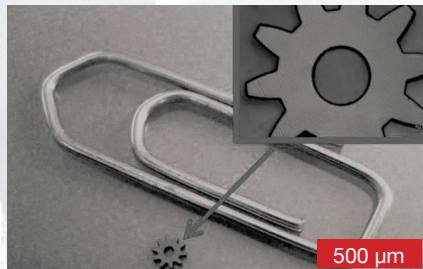
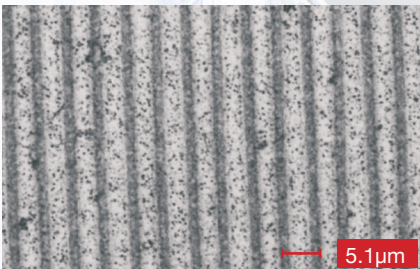
### Enhanced Performance

A combination of IDL-LM stage design, proprietary manufacturing processes and stringent tolerances result in a robust, stiff stage ideal for repeated process performance at the single micron scale. The high-level of performance allows IDL stages to be used across applications

for multi-purpose platforms/workstations with scaled requirements.

IDL-LM stages also use a large non-contact three-phase ironless linear motor enabling high-throughput and exceptional velocity stability; while also allowing easy configuration for third-party controllers. A high resolution linear scale encoder allows IDL to achieve 10 nm resolution and accuracy to a single-micron. This makes IDL an ideal platform for applications that require micron scale tolerances.

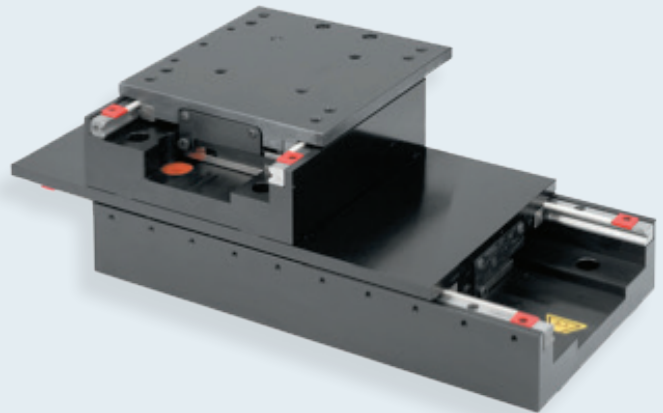
- Travel range: 100 mm to 1400 mm
- Payload capacity: 200 kg
- Max speed: 4 m/s
- Micron-scale straightness/flatness
- Micron-scale accuracy
- Sub-micron repeatability





## XM Series

Newport XM Linear Stages are used in both world-leading research and commercial production tools, active in micro and nanofabrication.



### XM Series

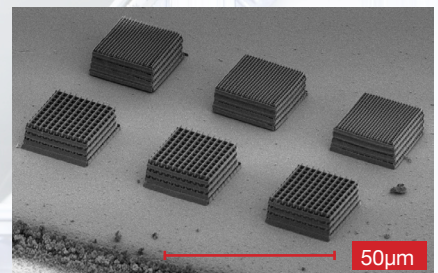
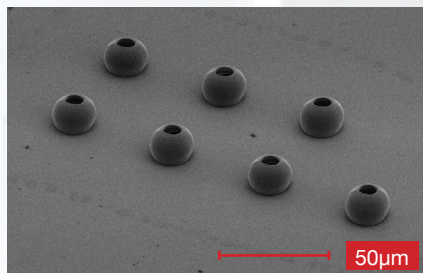
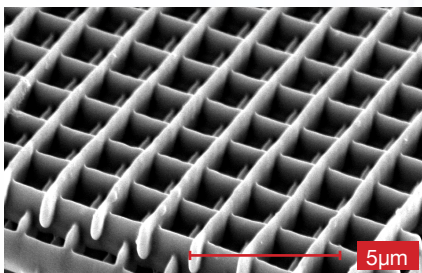
Ultra-performance XM Series Linear Stages excel in a wide array of micro/nanofabrication applications with demonstrated performance in: Ultrafast Micromachining, Laser Direct Write, Two-Photon Polymerization, FBG Writing and many other applications.

### Optimized Design and Engineering

XM stages are constructed of an airframe aluminum alloy that is both light weight and stiff. The stage undergoes numerous proprietary machining processes with very tight tolerances at a specialized machining center in France, resulting in less than 1 micron of runout over 100 mm of travel.

The XM also uses a high accuracy direct read encoder and is capable of 1 nm MIM with repeatability at the nanometer scale. Using a frictionless direct drive with an extra-large thermally-decoupled ironless linear motor, enables XM dynamic performance to achieve 0.1% velocity variation and minimal heating of the processed material; this is important for nonlinear material response and materials sensitive to heat, such as polymers.

- Travel: 50mm to 350 mm
- Resolution: 1 nm
- MIM: 1 nm
- Repeatability: 50 nm
- Straightness: <1 micron
- Flatness to <1 micron
- Velocity stability: less than <0.1 %





## ONE-XY Series

Newport's ultra-low profile XY stages enable excellent planarity for the tight focus requirements in microprocessing. With linear motor dynamic performance and simple, three-piece construction, integrated XY stages are ideal for precision laser processing.

### ONE-XY Series

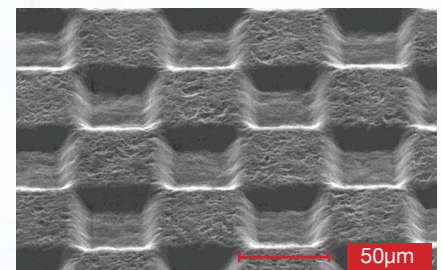
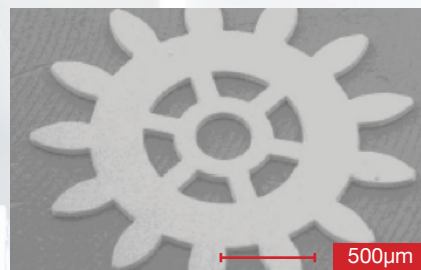
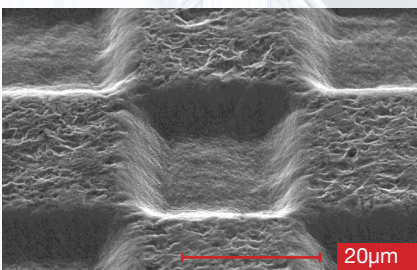
Newport's ONE-XY integrated XY stages feature low profile monolithic construction. An elegant, but simple precision machined three-plate design minimizes the number of components, enhancing stiffness and providing excellent planarity, important for focusing optics. Featuring precision guides with crossed roller bearings and tightly machined tolerances. ONE-XY stages can achieve flatness of  $\pm 1$  micron over 150 mm of travel, ideal for laser micromachining applications. Micron-scale straightness with nanometer scale repeatability also means that laser machined structures are true to design in shape, placement and size.

The low profile design also reduces Abbe error from angular deviations improving the consistency and repeatability of laser machined

structures. An open frame can allow the user to process or inspect the substrate from below or above at the same time. Integrated XY stages are ideal for micron-scale processing over substrate sizes ranging from 50 mm to 450 mm.

#### Low Profile Monolithic Design

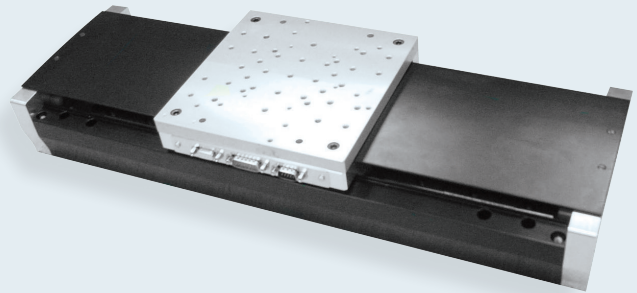
- Exceptional flatness for focusing optics
- Exceptional straightness for correct feature shape, placement and size
- High efficiency ironless linear motors provide dynamic performance
- Engineered for micron and sub-micron fabrication metrology





## IMS - LM Series

IMS-LM stages are ideal for cost-effective laser processing of light substrates with critical tolerances measured in microns. Highly dynamic with efficient ironcore linear motor, IMS-LM provides high-throughput with high-speed and acceleration.

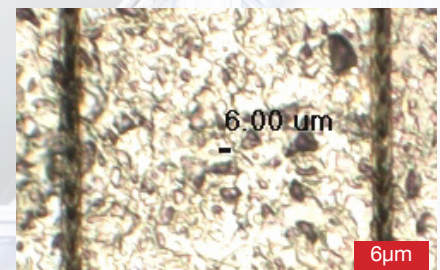
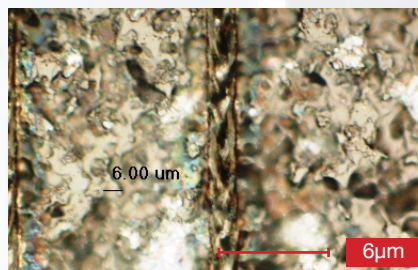
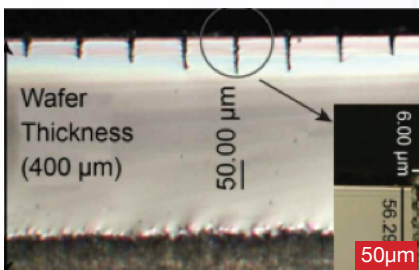


## IMS - LM Series

Newport IMS-LM stages are high-precision, dynamic and cost-effective solutions to laser processing applications with light/small loads and critical tolerances at the micron-scale. IMS-LM stages feature high-power, efficient linear motors with outstanding dynamic responsiveness in a compact form factor. The non-contact direct drive system is also ideal for robust reliable operation in heavy duty cycle environments. IMS-LM stages are ideal for scanning, providing velocity stability of less than 0.5%. This guarantees laser intensity variation from motion is minimized, providing uniform dosing and excellent structure uniformity.

A high resolution linear encoder provides accurate positioning with sub-micron repeatability and micron-scale accuracy. IMS-LM stages can be stacked and precision aligned in an XY configuration or built with integrated structures in a gantry. Sealed construction is available as an option with integrated carbon fiber sidebands.

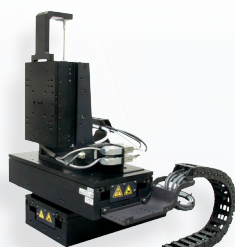
- Robust non-contact direct drive system
- Micron accuracy with sub-micron repeatability
- High throughput, speed and acceleration
- Optional sealed/industrially protected design
- Popular configurations available with 1-2 week lead time





## Additional Newport Stages

Newport has an extensive catalogue of rotation and vertical stages ideal for use in combination with the motorized XY Tables also offers low-profile vertical stages for direct integration in an XYZ stack.



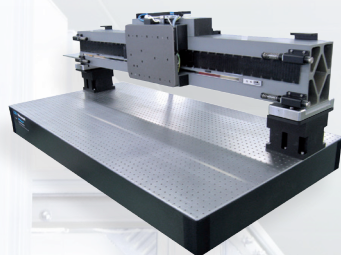
### Vertical Stages

- Multiple designs ideal for a wide range of laser processing applications
- Designs ideal for fine focus adjustments important to micron/sub-micron fabrication



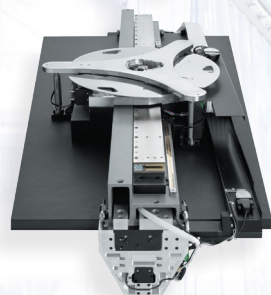
### Rotation Stages

- Extensive catalogue of rotation stages ideal for laser machining of curved substrates
- Differentiated engineering with optimized wobble/radial runout characteristics



### Air Bearing Stages

- Unmatched world-leading dynamic performance
- Tightly integrated 6-DOF compensated systems with proprietary technology features
- Ceramics engineering expertise with optimized stiff/light structures



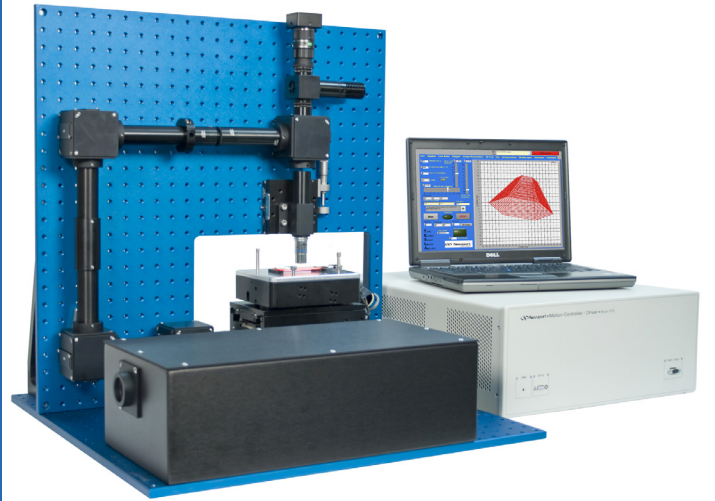
### Custom/OEM Motion Systems

- Applications specific turnkey motion systems with integrated VC structures/platforms
- Advanced laser processing features (high performance trajectory laser triggering with analog power control, etc...)



## Microfabrication Workstation

Newport's Laser  $\mu$ FAB is a customizable easy to use multi-purpose laser microfabrication/ micromachining workstation



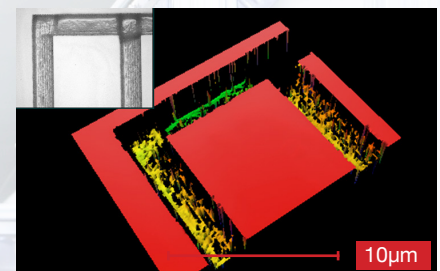
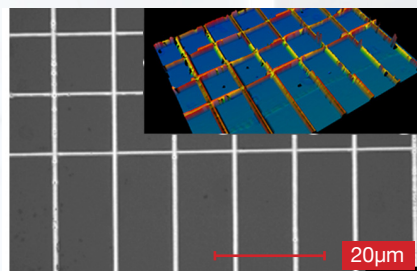
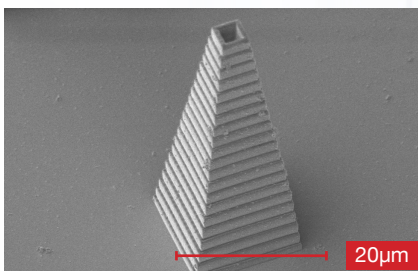
### Newport's Laser $\mu$ FAB™

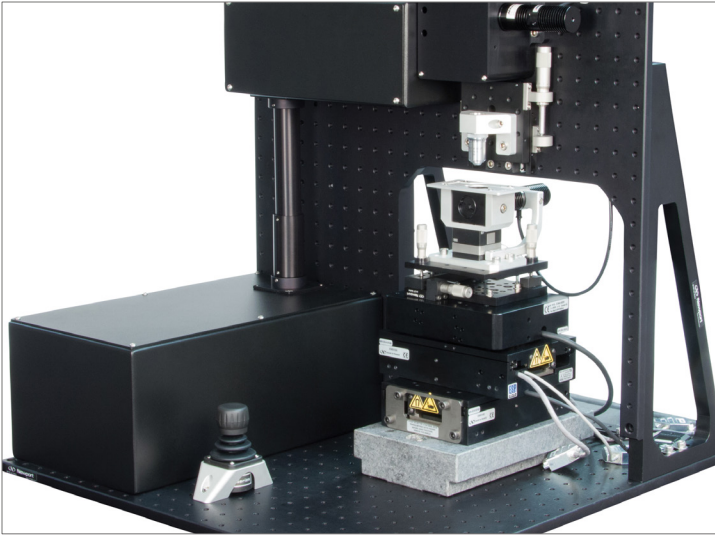
This tool combines the flexibility and accessibility of a typical research grade experimental setup with the stability, reliability, and ease of operation of a fully developed industrial fabrication system.

The Laser  $\mu$ FAB can be integrated with various types of lasers giving the user the capability to machine virtually any dielectric, conductive, and ceramic materials. With the aid of software written specifically to meet the requirements of laser micromachining, two- and three-dimensional microstructures can easily be patterned. Newport's Laser  $\mu$ FAB is the ideal solution for the most advanced research in materials science and device physics.

### Applications

- Ablation of industrially relevant materials including metals, polymers, semiconductors, glasses, ceramics, and biological targets (laser milling, dicing, scribing and selective material removing)
- Surface micro- and nano-structuring (sensors and bio-inspired materials)
- Three-dimensional microfabrication by two-photon polymerization of photonics, microelectronics, and MEMS devices
- Volume writing of waveguides and microfluidics in dielectrics
- Nanosurgery for in vivo sub-cellular investigations in model organisms





## Custom Systems

Newport Custom/OEM Motion Systems provide turnkey motion systems that are optimized to the customer's application requirements.

## Custom/OEM Systems

For over 50 years, Newport's motion team has been developing high precision application specific custom/OEM motion systems for leading research facilities and industrial manufacturing centers. Newport custom motion systems leverage this expertise along with an extensive motion product catalogue to design and build applications optimized systems collaboratively with the customer.

Newport custom motion systems are available in three broad classes:

### Technology Platforms

These systems take advantage of Newport differentiated technology and offer very specific performance enhancements. These systems are typically implemented when a standard product or control feature is not available in standard catalogue products.

## Assemblies

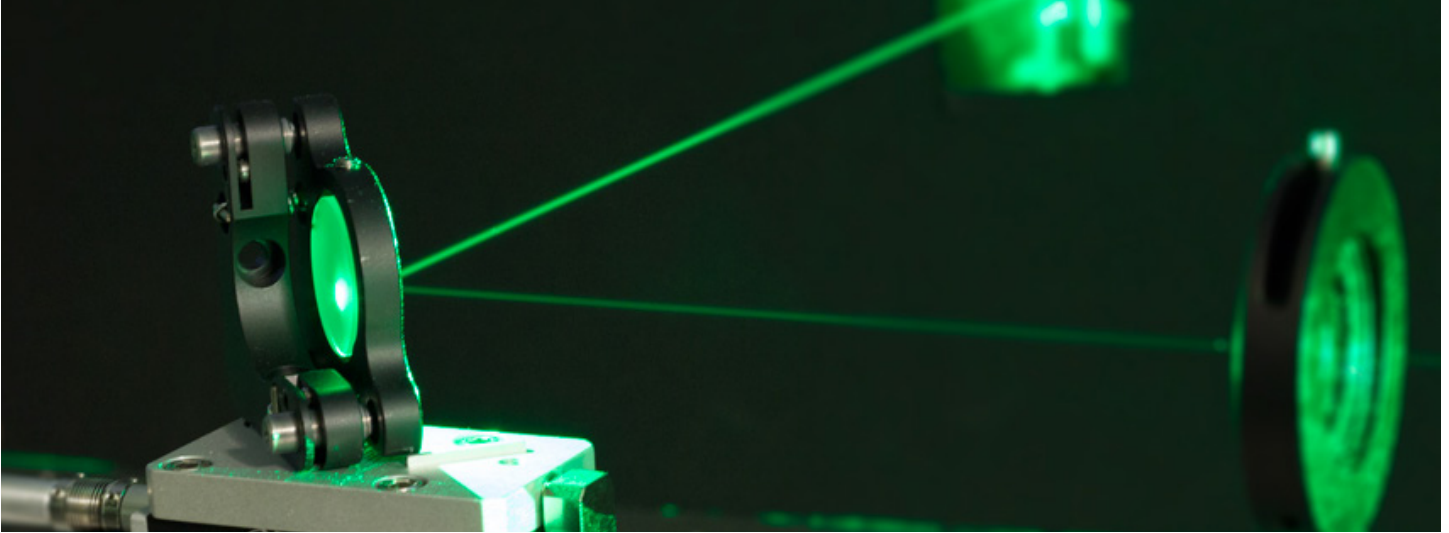
Standard catalogue products are often assembled and precision aligned with external fixtures. These system level builds are possible with almost any motorized positioning product from Newport when designed within necessary tolerances.

## Advanced Solutions

Advanced systems constitute complete multi-axis turn-key systems with software tools and application specific process steps developed in collaboration with the customer.

Newport Custom/OEM systems offer a unique single vendor structure for sourcing multiple components ideal for integrators or manufacturers. Working with the customer, Newport can design in the necessary vibration control, platforms, bridge structures, granite bases and laser mounts. Newport, as a laser supplier also offers a diverse selection of lasers from High Q, Spectra Physics, or V-Gen. Newport precision motion systems are however not constrained to these lasers suppliers and systems can be prepared to receive preferred laser source.





## TAC Capabilities

The Newport Technology and Applications Center (TAC) located in Irvine, California offers a specialization in laser micro/nanofabrication and ultrafast technology. The TAC team works directly with external customers to verify specific processes as well as providing standard research level fabrication tools. TAC expertise is multifaceted with both materials and process knowledge ranging from ultrafast micromachining to two-photon polymerization.

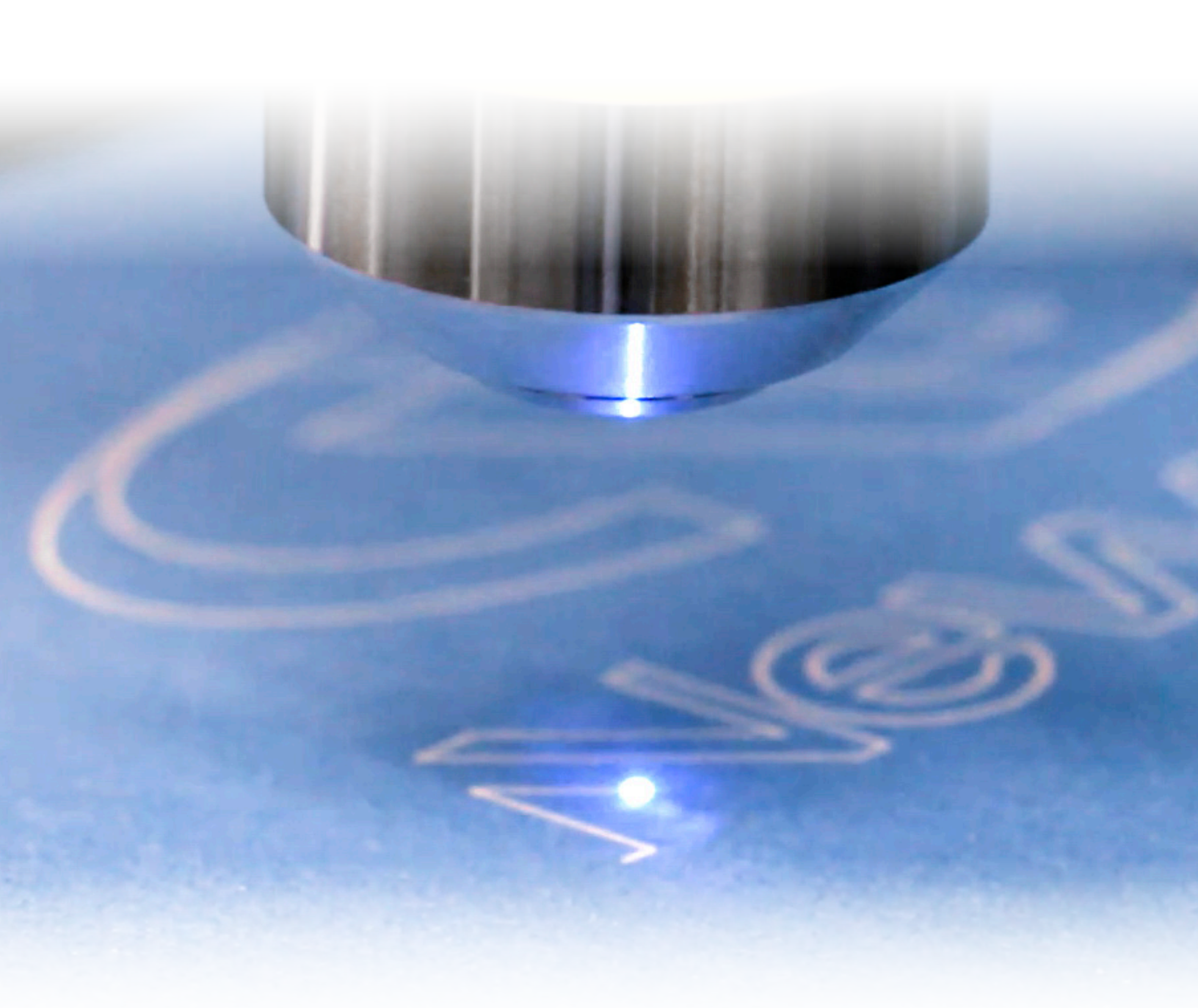
The Precision Motion team works closely with TAC to optimize application-specific motion performance in research tools, while also verifying stage performance through dedicated process studies. This combined expertise guarantees that applications specific motion impact is well-understood and verified for precision laser processing to deliver unparalleled performance.

This collaboration extends to Newport customers who build and develop laser processing tools and other novel micro/nanofabrication systems. Newport will collaborate to provide precision motion systems optimally tuned to the customer's application.

## Service and Support

Newport offers a vast array of services to match our extensive product offering. Our product service and support is focused on minimal downtime for manufacturing, engineering and research applications. Standard services include factory authorized repairs and calibrations throughout the US, Asia, and Europe. We also offer Service contracts and Field Service worldwide to support customer demand on critical projects.

Our continued success in satisfying customer needs is through a multi-site knowledge base, rapid response and standardized processes that emphasize best performance at all-times. Newport continuously improves the skill levels of our service and repair staff, with technical support and field service engineers that ensure unsurpassed service and delivery.



Experience | Solutions

Precision Motion – **Guaranteed™**

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