As the automotive industry integrates advanced optical technologies at an unprecedented pace, we assist the transformation with our world class series of Ultra Precision Machines.

**Nanometer Machining for the Automotive Photonics Revolution**

- Head Up Displays (HUD)
- LED Interior Lighting
- Lane Departure Cameras
- Light Detection and Ranging (LiDAR) Systems
- Autonomous Driving Sensors
- Self Parking Cameras
- Infrared Imaging Optics
- Back Up Camera Optics
- BEF Films for LCD Displays

Optical Molds
Exterior Lighting
Micro-Milling Optical Features

One of the most meaningful applications for our systems within the automotive industry is in the ultra precision micro-milling of complex optical molds for some of the newest generation of exterior lighting designs. In particular, our 5-axis 650FG has become the leading resource to achieve the best surface form and finish possible directly off the machine.

When configured with our optional PI ISO 2.25 60K RPM micro-milling spindle, this specific machine package enables the ultra fine machining of complex optical features that were previously difficult to achieve.

The 650FG has been proven by independent companies worldwide to outperform any other Y-axis machine. In side by side sample testing, the unique engineering principles embodied in our symmetric Y-axis design elevates performance and reliability to the highest level. We challenge any other system to match the optical results off our flagship machine.

Superior Micro-Milling Performance

Part Description: Fly-Eye Lens Array
Material: Brass
Lenslet Shape: Rectangular
Surface Type: Concave Spherical Array

Surface Form: 0.06µm PV!
Surface Finish: 2.83nm Ra!

The PI ISO 2.25 (60,000 RPM) Air Bearing Auxiliary Spindle is ideal for high speed and extreme accuracy applications such as conventional / raster flycutting and optical mold micro-milling or grinding. The combination of spindle central stiffness, extremely low error motion and powerful brushless DC motor performance can not be matched by any other spindle manufacturer in the world.

With radial and axial runout of < 25 nm, this spindle is ideal for small ball nose diamond milling tools which require such speed & accuracy for sustainable tool life. In addition, its compact size allows mounting in various configurations on our Oil Hydrostatic Rotary B-Axis.
From 2-Axis Turning to 5-Axis Micro-Milling, the 650FG does it all. When fitted with a raster flycut wheel, for example, this freeform generator can successfully produce complex surfaces that are impossible with other methods.

Raster machining is typically a final option as it is more time consuming. However, when specific surface features eliminate other machining options, typically due to tool clearance requirements, rastering has proven to be another value added alternative method for lights out completion of an advanced profile.

The ability to quickly change between multiple configuration options on the 650FG has provided electro-optics companies the necessary competitive manufacturing advantage needed for new market opportunities. Don’t be left behind. Let us place you on the right road!
What is Slow Slide Servo Machining (S³) ?

Our machining method utilizing coordinated motion of X, Z and C axes to enable the turning of non-rotationally symmetric optical profiles. We deliver superior results via our unique Robust Control Technology (RCT). RCT seamlessly employs automatic gain scheduling for continuous optimum total servo performance with aggressive but stable gain and phase margins. System naturals can also be identified and compensated with tuning tools and high order filters.

In addition to RCT, our exclusive customizable NanoSMART ® HMI control features our Block Lookahead function. Lookahead is an in-situ trajectory preprocessor that automatically optimizes command-ed feedrates and accelerations so that following errors are minimized. Lookahead was pioneered in early versions of Nanotech’s C-axis systems, but greatly expanded over time through our continuous product improvement initiatives.

Our systems of today include 40,000 trajectory moves ranging from ten seconds to 40 seconds of preprocessed move segments, allowing much faster C-axis motion in Slow Slide Servo programs. When combined with a rapid 4,000 blocks/second processing speed, we are able to realize superior surface definition with faster cycle times. S³ capability, featuring RCT and Block Lookahead, is available on any Nanotech lathe style system simply by ordering the C-axis option.

Brass Heads-Up Display (HUD) Molds

Automotive Reflector Molds

Freeform HUD Surface Finish: 0.46nm Ra!

High Phosphorous Nickel Plated
Freeform HUD Mold Insert

Our Complete Suite of 2 - 5 Axis Lathes

Pioneer of Freeform Servo Performance - Slow Slide Servo (S³)
Driving Technology with Innovative Machine Enhancements

NEW! Y-Axis CNC Tool Holder
Programmable height adjustment for up to 3 diamond tools. This precision stage has a bidirectional repeatability of 0.1um and a linear resolution of 1.2nm. It also includes side mounting for optional measurement probes. This CNC tool holder increases productivity by enabling faster, easier diamond tool setups.

NEW! Solid State Air Shower
The intricate optical features of many automotive optical lens designs can require machining cycle times measured in hours, not minutes. As a result, precise thermal management of the entire process is critical in achieving the desired results.

NFTS-6000 Fast Tool Servo on top of Oil Hydrostatic Rotary B-axis
Advancements Nanotech has made over many years in optical micro-milling have largely eliminated the need for Fast Tool Servo devices for our automotive customers. Our micro-milling process surpasses FTS performance with better resulting form accuracies and steeper slopes that are simply not possible with any FTS device on the market. As a result, FTS devices today are mainly used in the contact lens industry. When the need does arise, customers utilize our closed loop NFTS-6000 Fast Tool Servo option.

60K RPM Micro-Milling Spindle
The PI 2.25 Air Bearing Spindle is our most popular accessory option for the automotive industry. When integrated to the 5-axis 650FG, the addition of this highly precise auxiliary air spindle allows the use of micro ball nose diamond mills to produce the most demanding & complex optical features.

For very small micro end mills, it is necessary to reach 50K RPM speeds for tool life. Of equal importance are the specifications for the spindle runout errors to ensure smooth steady motion. The PI 2.25 has guaranteed radial and axial runout accuracies of less than 25nm throughout its entire speed range.

Sequential Dynamic Part Indexing (DPI)
This intriguing patented technology, offers a 2-axis ultra precision machining option for aspheric and diffractive lens arrays. Wielandts upmt, located in Belgium, purchased the Nanotech 450UPL system on which to operate their innovation. Markets served include Automotive, Defense, Ophthalmology, and Instrumentation. The device was demonstrated live at SPIE Optifab 2015 in Nanotech’s exhibition booth.

Ultra-Sonic Machining of Steel Molds
From among the choices of diamond turning machines available, Son-X purchased the Nanotech 250UPL for the best demonstrations of their device. Only our robust box style slide designs maintain constant horizontal stiffness regardless of vertical load, taking the machine out of the equation leaving behind true absolute accessory performance.

Main application of the Son-X device is for optical molds. Often it can be advantageous to create molds for optics directly into hardened steel alloys. Son-X states that Ultra Sonic machining of steel averages < 3nm Ra Surface Finish & < 200µm PV Form Accuracies directly after machining. Son-X demonstrated live at SPIE Photonics West 2016 in Nanotech’s exhibition booth.

Our newest Air Shower Temperature Control System can provide a 20:1 improvement in temperature variation for the machine’s upper enclosure. This design also features Solid State Thermo Electric Control technology (TEC) thereby eliminating any need for a refrigerant coolant! Capable of heating or cooling the plenum air, the system input interface accepts multiple additional caged air, surface mount, or immersible probes for use with our exclusive NanoTEMP Precision Air Temperature Monitoring Software, which is included. Available on 250UPL, 450UPL or 650FG systems.
Global Representation Network

United States
Nanoptic Solutions
Tel: 603-352-3030
sales@nanotechsys.com
www.nanotechsys.com

Europe
Nanoptic Solutions
Tel: +31-40-8424746
frank@nanoptic-solutions.com
www.nanopticsolutions.com

Japan
Enable K.K.
Tel: +81-48-227-4688
hideki.ogawa@enablekk.com
www.enablekk.com

China
DKSH (China) Co., Ltd.
Tel: +86-10-6500-4308
xin.xin.huang@dksh.com
www.dksh-machinery.com

Taiwan
DKSH Taiwan Ltd.
Tel: +886-2-8752-6666
pei.yuan.huang@dksh.com
www.dksh.com.tw

Singapore / Malaysia
Laser 21 Pte., Ltd.
Tel: +65-6565-1221
sales@laser-21.com
www.Laser-21.com

Korea
Moonatech
Tel: +82-2-501-4977
henry.jung@moonatech.co.kr
www.moonatech.co.kr

UK / Ireland
Nanotech
Tel: +44-1509-416850
chapman@nanotechsys.com
www.nanotechsys.com

Defined by our Customers’ Success

As a Nanotech customer, you will benefit from our professional pre / post sales technical expertise - for life. At all levels of our organization, we have unmatched hands-on industry experience for critical value added process development and application support. Here’s what just a few of our customers have to say:

- "As always, we are very pleased with the recent addition / install of our new 250UPL. Everything went very smoothly with zero issues, questions or concerns. Your Service Engineers performed a superb job, upholding the high level of quality, service, and accuracy we have come to know and expect from Moore Nanotech. We look forward to a future of growth and expanding our business with Moore Nanotech products."

- "As I’ve mentioned in the past, our Nanotech machines have performed flawlessly. We have not experienced any lost production time with a Nanotech machine period, regardless of age, date of installation, or type of work we are running on the machine."

- "The most remarkable and excellent service & support I have ever seen".

- "I’ve been in this business for a long time, and response time like this is unheard of."

- "FANTASTIC support we received from your team as we worked through a difficult problem solving process. Top notch all the way."

- "I’ve said it before and I’ll say it again. I believe you guys are building the best diamond turning machines in the world. The quality and performance is truly amazing."

April 2015 - Celebrating customer acceptance of our 100th 350FG / 650FG Y-axis Freeform Generator!