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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:
(visit www.nanotechsys.com for a complete listing of unsolicited Customer Testimonials)

- “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.”

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fax: 603-352-3363
www.nanotechsys.com
sales@nanotechsys.com
Welcome to Nanotech

Moore Nanotechnology Systems, LLC was established in October 1997 as a stand-alone subsidiary of the Moore Tool Company. Our initial vision remains in the continual development of state-of-the-art ultra-precision manufacturing systems and processes for the production of advanced optics - primarily for the consumer electronics, defense, aerospace, lighting, medical, and automotive sectors. We maintain an installed base of hundreds of Nanotech® ultra-precision machining systems in dozens of countries around the globe and our business continues to grow year by year.

More than any single thing, we attribute our success to our highly skilled and diversified workforce that shares a passion and common vision for excellence. We remain focused on the continuous development of new products and value-added services to meet our current and future customer requirements and strive to achieve 100% customer satisfaction in everything that we do. We welcome the opportunity to work with you to satisfy your requirements for advanced ultra-precision manufacturing systems.

Sincerely,

Len Chaloux
President & Co-founder

Recognition by the State of New Hampshire

- 2008 Company of the year
- 2010 14th fastest growing private company
- 2010 through 2014 top 100 private companies
New Hampshire facility (Established 2010)

- 3,344 m² (36,000 ft²)
- Future expansion ready
- Located on 4.5 hectares (11 acres)
- Building and systems designed for reduced energy use
- Fully temperature controlled state-of-the-art manufacturing site
2, 3 or 4-Axis Compact Diamond Turning Lathe

- Most compact ultra-precision CNC lathe style system
- Impact Resistant Porous Graphite Air Bearing Work Spindle with less than 12.5nm motion error throughout entire speed range and 0.01 arc second C-axis resolution.
- Industry leading 8 picometer feedback resolution
- Delta Tau Power PMAC Real-time 64-bit Motion Controller with 40,000 block lookahead for advanced trajectory calculations
- NanoSMART™ - Industry’s First Touch / Swipe Gesture Based Interactive HMI with numerous new value added features including ability to process up to 5GB program file sizes
- Air isolation system for advanced vibration control
- Sub-nanometer level surface finishes directly off the machine
- Automatic Detection System (ADS) that recognizes and syncs optional accessories automatically as they are added or removed from the machine to minimize downtime

Major Options Include:
- Air bearing rotary B-Axis with PTC Polar Tool Compensation
- C-Axis position control of work spindle
- Oil hydrostatic removable Y-Axis
- Fast Tool Servo system
- On-Machine Workpiece Measurement & Error Compensation System (WECS)
- NanoCAM™ 3D freeform part programming software (with 2D corrections from Form Talysurf or Panasonic UA3P measurement data)
- OTS - Optical Tool Set station
- Air shower temperature control system (for machine enclosure)
- NanoTEMP™ 16 channel precision temperature monitoring system
- Micro-height adjust diamond tool holder
### 250 UPL\textsuperscript{v2} Specifications Overview

#### General Description

- **Machining Methods**: 2 - 4 Axis Diamond Turning, 3-Axis Slow Slide Servo Machining, Tool Normal Machining, Fast Tool Servo Machining, Plano Flycutting. The following methods require addition of optional vertical removable Y-Axis: Diamond Ruling, Micro-Milling and Raster Flycutting.
- **Programming Resolution**: 0.01 nanometer linear / 0.0000001\(^\circ\) rotary
- **Functional Performance**: Material - High purity aluminum alloy. Both accuracies measured on same part. Form Accuracy (P-V): \(\leq 0.1\mu m / 75mm\) diameter 250mm convex sphere Surface Finish (Ra): \(\leq 2.0\) nanometers

#### Workholding Spindle

<table>
<thead>
<tr>
<th></th>
<th>Heavy Duty Impact Resistant Porous Graphite Air Bearing (Standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speed Range</strong></td>
<td>50 to 10,000 rpm, bi-directional</td>
</tr>
<tr>
<td><strong>Radial Working Load Capacity</strong></td>
<td>85 Kg @ 7bar (185 lbs @ 100psi) / 102 Kg @ 10bar (225 lbs @ 145psi) @ spindle nose</td>
</tr>
</tbody>
</table>
| **Motion Accuracy** | Axial: \(\leq 12.5\) nanometers (0.5\(\mu\)m)  
Radial: \(\leq 12.5\) nanometers (0.5\(\mu\)m) |

#### Linear Axes

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Z</th>
<th>Y (Optional Vertical)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Travel</strong></td>
<td>200mm (8&quot;)</td>
<td>200mm (8&quot;)</td>
<td>100mm</td>
</tr>
</tbody>
</table>
| ** Feedback Resolution** | 8 picometer (0.008 nm)  
8 picometer (0.008 nm)  
8 picometer (0.008 nm)  |
| **Straightness in critical direction** | 0.2\(\mu\)m (8\(\mu\)m) over full travel  
0.2\(\mu\)m (8\(\mu\)m) over full travel  
0.2\(\mu\)m (8\(\mu\)m) over full travel  |

#### Optional Rotational Axes

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>C (Work Spindle)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Air Bearing</td>
<td>Heavy Duty Porous Graphite Air Bearing</td>
</tr>
<tr>
<td><strong>Positioning Accuracy</strong></td>
<td>(\pm 1.0) arc seconds (compensated)</td>
<td>(\pm 1.0) arc seconds (compensated)</td>
</tr>
<tr>
<td><strong>Feedback Resolution</strong></td>
<td>0.005 arc seconds</td>
<td>0.01 arc seconds</td>
</tr>
<tr>
<td><strong>Maximum Speed (Positioning Mode)</strong></td>
<td>50 rpm</td>
<td>3,000 rpm</td>
</tr>
</tbody>
</table>

*Note: In an effort to continually improve our product performance, specifications are subject to change without notice. (Please consult your Sales Representative for our latest specifications)*
2, 3 or 4-Axis Midsize Diamond Turning Lathe

- Medium sized ultra precision CNC lathe style system with larger carriages for multiple tool setups in various configurations
- Impact Resistant Porous Graphite Air Bearing Work Spindle with less than 12.5nm motion error throughout entire speed range and 0.01 arc second C-axis resolution.
- Industry leading 8 picometer feedback resolution
- Delta Tau Power PMAC Real-time 64-bit Motion Controller with 40,000 block lookahead for advanced trajectory calculations
- NanoSMART™ - Industry’s First Touch / Swipe Gesture Based Interactive HMI with numerous new value added features including ability to process up to 5GB program file sizes
- Air isolation system for advanced vibration control
- Automatic Detection System (ADS) that recognizes and syncs optional accessories automatically as they are added or removed from the machine to minimize downtime

Major Options Include:

- Oil hydrostatic rotary B-Axis with PTC Polar Tool Compensation
- C-Axis position control of work spindle
- Oil hydrostatic removable Y-Axis
- Fast Tool Servo system
- On-Machine Workpiece Measurement & Error Compensation System (WECS)
- NanoCAM™ 3D freeform part programming software (with 2D corrections from Form Talysurf or Panasonic UA3P measurement data)
- OTS - Optical Tool Set station
- Air shower temperature control system (for machine enclosure)
- NanoTEMP™ 16 channel precision temperature monitoring system
- Micro-height adjust diamond tool holders

450mm diameter swing capacity
Increased capacity available upon request
450 UPL^v2 Specification Overview

<table>
<thead>
<tr>
<th>General</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machining Methods</td>
<td>2 - 4 Axis Diamond Turning, 3-Axis Slow Slide Servo Machining, Tool Normal Machining, Fast Tool Servo Machining, Plano Flycutting. The following methods require addition of optional vertical removable Y-Axis: Diamond Ruling, Micro-Milling and Raster Flycutting</td>
</tr>
<tr>
<td>Programming Resolution</td>
<td>0.01 nanometer linear / 0.0000001º rotary</td>
</tr>
<tr>
<td>Functional Performance</td>
<td>Material - High purity aluminum alloy. Both accuracies measured on the same part. Form Accuracy (P-V): ( \leq 0.125 ) / 75mm diameter 250mm convex sphere Surface Finish (Ra): ( \leq 2.0 ) nanometers</td>
</tr>
<tr>
<td>Workholding Spindle</td>
<td>Heavy Duty Impact Resistant Porous Graphite Air Bearing (Standard)</td>
</tr>
<tr>
<td>Speed Range</td>
<td>50 to 10,000 rpm, bi-directional</td>
</tr>
<tr>
<td>Radial Working Load Capacity</td>
<td>85 Kg @ 7bar (185 lbs @ 100psi) / 102 Kg @ 10bar (225 lbs @ 145psi) @ spindle nose</td>
</tr>
<tr>
<td>Motion Accuracy</td>
<td>Axial: ( \leq 12.5 ) nanometers (0.5µ&quot;) Radial: ( \leq 12.5 ) nanometers (0.5µ&quot;)</td>
</tr>
<tr>
<td>Linear Axes</td>
<td>X                                                                 350mm (14&quot;) 300mm (12&quot;) 100mm 8 pikometer (0.008nm) 8 pikometer (0.008nm) 8 pikometer (0.008nm) 0.2µm (8µ&quot;) over full travel 0.2µm (8µ&quot;) over full travel 0.2µm (8µ&quot;) over full travel</td>
</tr>
<tr>
<td>Optional Rotational Axes</td>
<td>B                                                                 C (Work Spindle)</td>
</tr>
<tr>
<td>Type</td>
<td>Oil Hydrostatic</td>
</tr>
<tr>
<td>Positioning Accuracy</td>
<td>( \pm 1.0 ) arc seconds (compensated)</td>
</tr>
<tr>
<td>Feedback Resolution</td>
<td>0.005 arc seconds</td>
</tr>
<tr>
<td>Maximum Speed (Positioning Mode)</td>
<td>50 rpm</td>
</tr>
</tbody>
</table>

Note: In an effort to continually improve our product performance, specifications are subject to change without notice. (Please consult your Sales Representative for our latest specifications)
3, 4 or 5-Axis Freeform® Generator

- Most versatile ultra-precision machining system. With up to 5 axes of motion, this is the most flexible freeform generator available
- Impact Resistant Porous Graphite Air Bearing Work Spindle symmetrically integrated into the center of the 150mm vertical oil hydrostatic Y-axis (with liquid cooling option)
- Industry leading 8 picometer feedback resolution
- Delta Tau Power PMAC Real-time 64-bit Motion Controller with 40,000 block lookahead for advanced trajectory calculations
- NanoSMART™ - Industry’s First Touch / Swipe Gesture Based Interactive HMI with numerous new value added features including ability to process up to 5GB program file sizes
- Air isolation system for advanced vibration control
- Automatic Detection System (ADS) that recognizes and syncs optional accessories automatically as they are added or removed from the machine to minimize downtime

Major Options Include:
- Oil hydrostatic rotary B-Axis with PTC Polar Tool Compensation
- C-Axis position control of work spindle
- 60k RPM Micro-Milling/Grinding Spindle
- Fast Tool Servo system
- On-Machine Workpiece Measurement & Error Compensation System (WECS)
- NanoCAM™ 3D freeform part programming software (with 2D corrections from Form Talysurf or Panasonic UA3P measurement data)
- OTS - Optical Tool Set station
- Air shower temperature control system (for machine enclosure)
- NanoTEMP™ 16 channel precision temperature monitoring system
- Solid tool holder, multi-axis flycut tool holders
### General Description

**Machining Methods**
3 - 5 Axis Diamond Turning, Slow Slide Servo Machining, Raster Flycutting, Plano Flycutting, Diamond Ruling, Micro-Milling, Ultra-Precision Grinding, Fast Tool Servo Machining, Tool Normal Machining

**Programming Resolution**
0.01 nanometer linear / 0.0000001º rotary

**Functional Performance**
Material – High purity aluminum alloy. Both accuracies measured on the same part.
Form Accuracy (P-V): ≤ 0.15µm / 75mm diameter 250mm convex sphere
Surface Finish (Ra): ≤ 3.0 nanometers (Test Parts cut in both the X-Z and Y-Z planes)

### Workholding Spindle

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heavy Duty Impact Resistant Porous Graphite Air Bearing (Standard)</strong></td>
<td></td>
</tr>
<tr>
<td>Speed Range</td>
<td>50 to 10,000 rpm, bi-directional</td>
</tr>
<tr>
<td>Radial Working Load Capacity</td>
<td>85 Kg @ 7bar (185 lbs @ 100psi) / 102 Kg @ 10bar (225 lbs @ 145psi) @ spindle nose</td>
</tr>
<tr>
<td>Motion Accuracy</td>
<td>Axial: ≤ 12.5 nanometers (0.5µ&quot;) Radial: ≤ 12.5 nanometers (0.5µ&quot;)</td>
</tr>
<tr>
<td><strong>Linear Axes</strong></td>
<td>X</td>
</tr>
<tr>
<td>Travel</td>
<td>350mm (14&quot;)</td>
</tr>
<tr>
<td>Feedback Resolution</td>
<td>8 picometer (0.008nm)</td>
</tr>
<tr>
<td>Straightness in critical direction</td>
<td>0.3µm (12µ&quot;) over full travel</td>
</tr>
<tr>
<td><strong>Optional Rotational Axes</strong></td>
<td>B</td>
</tr>
<tr>
<td>Type</td>
<td>Oil Hydrostatic</td>
</tr>
<tr>
<td>Positioning Accuracy</td>
<td>± 1.0 arc seconds (compensated)</td>
</tr>
<tr>
<td>Feedback Resolution</td>
<td>0.005 arc seconds</td>
</tr>
<tr>
<td>Maximum Speed (Positioning Mode)</td>
<td>50 rpm</td>
</tr>
</tbody>
</table>

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*Note: In an effort to continually improve our product performance, specifications are subject to change without notice. (Please consult your Sales Representative for our latest specifications)*
2, 3 or 4-Axis Ultra-Precision Aspheric Grinding System

- The most user friendly aspheric grinding system for carbide / SiC molds & aspheric glass lenses
- Available in either XZ or XZB tool normal parallel grinding configurations with or without C-axis
- NanoSMART™ - Industry’s First Touch / Swipe Gesture Based Interactive HMI with numerous new value added features including ability to process up to 5GB program file sizes
- Delta Tau Power PMAC Real-time 64-bit Motion Controller with 40,000 block lookahead for advanced trajectory calculations
- Single compact utilities cabinet combining pneumatics, hydraulics and electrical systems which saves floor space
- Exclusive 10K RPM Impact Resistant Porous Graphite Heavy Duty air bearing work spindle
- Precision 60K RPM air bearing grinding spindle, oil hydrostatic slides, linear motor drives
- 3 point optimally located shear damped air isolation system with self leveling

Heavy Duty Oil Hydrostatic B-axis (XZB optional machine configuration)

Major Options Include:

- Heavy Duty oil hydrostatic B-Axis with PTC Polar Tool Compensation
- C-Axis position control of work spindle
- 60K RPM grinding spindle
- On-Machine Workpiece Measurement & Error Compensation System (WECS)
- CNC controlled vertical V-axis with motorized wheel dressing spindle
- LVDT wheel measurement station
- Air shower temperature control system (for machine enclosure)
- NanoTEMP™ 16 channel precision temperature monitoring system
- Temperature controlled flood coolant pumping system. (Enclosure specifically engineered for total flood coolant containment and easy access to machine’s interior)
100 UPG<sup>VT</sup> Specification Overview

<table>
<thead>
<tr>
<th>General</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machining Methods</td>
<td>2 - 4 Axis Aspheric Grinding, XZ Cross Axis Grinding (Vertical &amp; Tilted), XZ Parallel Grind, XZB Wheel Normal Parallel Grind, XZ or XZB Diamond Turn (optional)</td>
</tr>
<tr>
<td>Programming Resolution</td>
<td>0.01 nanometer linear / 0.0000001&lt;sup&gt;º&lt;/sup&gt; rotary</td>
</tr>
<tr>
<td>Functional Performance</td>
<td>Material – Tungsten Carbide. Both accuracies measured on the same part. Form Accuracy (P-V): ≤ 0.15µm / 12.7mm diameter, 125mm convex sphere Surface Finish (Ra): ≤ 5.0 nanometers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Workholding Spindle</th>
<th>Heavy Duty Impact Resistant Porous Graphite Air Bearing (Standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Range</td>
<td>50 to 10,000 rpm, bi-directional (maximum speed in C-axis positioning mode: 3,000 rpm)</td>
</tr>
<tr>
<td>Radial Working Load Capacity</td>
<td>85 Kg @ 7bar (185 lbs @ 100psi) / 102 Kg @ 10bar (225 lbs @ 145psi) @ spindle nose</td>
</tr>
<tr>
<td>Motion Accuracy</td>
<td>Axial: ≤ 12.5 nanometers (0.5µ&quot;) Radial: ≤ 12.5 nanometers (0.5µ&quot;)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C Axis</th>
<th>Option for Work Spindle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positioning Accuracy</td>
<td>± 1.0 arc seconds (compensated)</td>
</tr>
<tr>
<td>Feedback Resolution</td>
<td>0.01 arc seconds</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grinding Spindle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Range</td>
<td>5,000 to 60,000 rpm</td>
</tr>
<tr>
<td>Axial • Radial Stiffness (@ spindle nose)</td>
<td>65 N/µm (371,000 lbs/in) • 20 N/µm (114,000 lbs/in)</td>
</tr>
<tr>
<td>Motion Accuracy – Axial &amp; Radial</td>
<td>≤ 25 nanometers (1µ&quot;)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Axes</th>
<th>X</th>
<th>Z</th>
<th>B (Optional Rotary)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Travel</td>
<td></td>
<td>360º (Bi-directional&quot;)</td>
</tr>
<tr>
<td></td>
<td>330mm (13&quot;)</td>
<td>150mm (6&quot;)</td>
<td>0.002 arc seconds</td>
</tr>
<tr>
<td></td>
<td>Feedback Resolution</td>
<td>8 picometer (0.008nm)</td>
<td>8 picometer (0.008nm)</td>
</tr>
<tr>
<td></td>
<td>Horizontal Straightness / Motion Accuracy</td>
<td>0.3µm (12µ&quot;)</td>
<td>0.3µm (12µ&quot;)</td>
</tr>
</tbody>
</table>

Note: In an effort to continually improve our product performance, specifications are subject to change without notice. (Please consult your Sales Representative for our latest specifications)
3 - 4 Axis Ultra-Precision Micro-Milling System

- Vertical oriented spindle mounted on ceramic arm providing increased rigidity, improved thermal stability and higher natural frequency
- PC based CNC motion controller with Windows operating system
- 60K RPM air bearing spindle, oil hydrostatic slides, linear motor drives
- Air isolation system for advanced vibration control
- Strategically imbedded thermistors for real time in-situ thermal monitoring
- Vertical Z-Axis features dual linear motor drive with adaptively controlled air bearing counterbalance

Major Options Include:
- Oil hydrostatic rotary B-Axis
- Spay mist coolant system
- NanoMETER™ - On screen digital amplifier
- NanoCAM™ 3D freeform part programming software (with 2D corrections from Form Talysurf or Panasonic UA3P measurement data)
- Air shower temperature control system (for machine enclosure)
- NanoTEMP™ 16 channel precision temperature monitoring system
- Optical Observation Package
- Hand held operator pendant

350 X 350 X 150mm work area volume
# 350 UPM Specification Overview

<table>
<thead>
<tr>
<th>General</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machining Methods</td>
<td>3 - 4 Axis XYZ Diamond Micro-Milling, 4-Axis XYZB Diamond Micro-Milling with optional oil hydrostatic rotary B Axis</td>
</tr>
<tr>
<td>Programming Resolution</td>
<td>0.01 nanometer linear / 0.0000001° rotary</td>
</tr>
<tr>
<td>Thermal Management Features</td>
<td>Closed Loop Chiller System providing temperature control of spindle coolant, Ceramic Spindle Mounting Arm with high structural rigidity and low thermal expansion coefficient, NanoTEMP™ 16 Channel thermal charting software for tracking machine’s thermal environmental conditions</td>
</tr>
</tbody>
</table>

## Milling Spindle

**Air Bearing (Standard)**

| Speed Range | 200 to 60,000 rpm, bi-directional |
| Axial + Radial Stiffness (@ spindle nose) | 65 N/μm (371,000 lbs/in) + 20 N/μm (114,000 lbs/in) |
| Motion Accuracy – Axial & Radial | ≤ 25 nanometers (1.0 µ") |

### Linear Axes

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z (Vertical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel</td>
<td>350mm (14&quot;)</td>
<td>350mm (14&quot;)</td>
</tr>
<tr>
<td>Feedback Resolution</td>
<td>0.034 nanometer</td>
<td>0.034 nanometer</td>
</tr>
<tr>
<td>Straightness in critical direction</td>
<td>0.2µm (8µ&quot;) over full travel</td>
<td>0.2µm (8µ&quot;) over full travel</td>
</tr>
</tbody>
</table>

### Optional Rotational Axis

<table>
<thead>
<tr>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Positioning Accuracy</td>
</tr>
<tr>
<td>Feedback Resolution</td>
</tr>
<tr>
<td>Maximum Speed (Positioning Mode)</td>
</tr>
</tbody>
</table>

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*Note: In an effort to continually improve our product performance, specifications are subject to change without notice.*

*(Please consult your Sales Representative for our latest specifications)*
2 - 3 Axis Ultra-Precision Flycutter

- Dedicated to diamond turning of plano (flat) optical surfaces
- PC based CNC motion controller with Windows operating system
- Exclusive HD 10K RPM impact resistant porous graphite air bearing work spindle, oil hydrostatic slides, linear motor drives
- Air bearing counterbalanced vertical Z-axis for optimal servo performance
- Air isolation system for advanced vibration control
- Nanometer level surface finishes directly off the machine
- Non-contact surfaces equates to long life with minimal annual maintenance

710mm travel on X
350mm diameter maximum tool swing

Optional CNC controlled air bearing A-axis for polygons

Major Options Include:
- Rotary air bearing A-Axis
- Manual tip tilt adjustment stage
- Spray mist coolant system
- NanoMETER™ on screen digital gauge amplifier
- Optical observation package
- Air shower temperature control system (for machine enclosure)
- NanoTEMP™ 16 channel precision temperature monitoring system
# 700 UPF Specification Overview

<table>
<thead>
<tr>
<th>General</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machining Methods</td>
<td>2 - 3 Axis Diamond Flycutting of plano surfaces. Polygons via optional rotary A-Axis.</td>
</tr>
<tr>
<td>Programming Resolution</td>
<td>1 nanometer linear / 0.00000001° rotary</td>
</tr>
<tr>
<td><strong>Functional Performance</strong></td>
<td>Material – Electroless Nickel Plating. Both accuracies measured on the same part. Form Accuracy (P-V): ≤ 0.125µm / 75mm diameter test part</td>
</tr>
<tr>
<td></td>
<td>Surface Finish (Ra): ≤ 3.0 nanometers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Workholding Spindle</strong></th>
<th><strong>Heavy Duty Air Bearing (Standard)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Range</td>
<td>50 to 10,000 rpm, bi-directional</td>
</tr>
<tr>
<td>Radial Load Capacity (@ spindle nose)</td>
<td>85 Kg @ 7bar (185 lbs @ 100psi) / 102 Kg @ 10bar (225 lbs @ 145psi) @ spindle nose</td>
</tr>
<tr>
<td>Motion Accuracy</td>
<td>Axial: ≤ 12.5 nanometers (0.5µ&quot;) Radial: ≤ 12.5 nanometers (0.5µ&quot;)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Linear Axes</strong></th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel</td>
<td>710mm (28&quot;)</td>
</tr>
<tr>
<td>Feedback Resolution</td>
<td>1.0 nanometer</td>
</tr>
<tr>
<td>Straightness in critical direction</td>
<td>0.1µm (4µ&quot;) per 100mm (Vertical) 0.3µm (12µ&quot;) over full travel (Horizontal)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Optional Rotational Axes</strong></th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Air Bearing</td>
</tr>
<tr>
<td>Positioning Accuracy</td>
<td>± 1.0 arc seconds (compensated)</td>
</tr>
<tr>
<td>Feedback Resolution</td>
<td>0.02 arc seconds</td>
</tr>
<tr>
<td>Maximum Speed (Positioning Mode)</td>
<td>50 rpm</td>
</tr>
</tbody>
</table>

*Note: In an effort to continually improve our product performance, specifications are subject to change without notice. (Please consult your Sales Representative for our latest specifications)*
Choose between our Standard HDL 2000 or the Heavy Duty HDL 2000HD version of this large capacity optical drum lathe

- PC based CNC motion controller with Windows operating system
- Oil hydrostatic Headstock, Tailstock spindles and bearing slideways
- Active Thermal Management System (ATMS) for both spindles
- Up to 2.0 meter wide DT optical patterns along maximum 2.6 meter long drums
- Passive pneumatic air isolation system with self leveling
- CNC controlled tailstock (W-axis) with integral “NanoLOCK” hydraulic braking system

Major Options Include:
- Oil hydrostatic rotary B-Axis
- Fast Tool Servo Systems
- Optical dual camera tool set station
- Spray mist coolant system
- NanoTEMP™ 16 channel precision temperature monitoring system
- Video microscopy for drum inspections
- Turret tooling packages
- NanoMETER™ wireless digital gauge amplifier
- Air shower temperature control system
- NanoBALANCE dual plain drum balancing
- Vacuum chip evacuation and collection system

Workpiece capacity up to 600mm diameter and 3,000 Kg on HD version

Temperature controlled air shower enclosure
## HDL 2000 Specification Overview

### General Description

**Machining Methods**
Multi-axis diamond turning of microstructure groove and pyramid patterns along with advanced fresnel patterns (on HDL2000-HD) for display industry tightest specifications.

**Programming Resolution**
1.0 nanometer linear / 0.0001º rotary

**Workpiece Capacity**
- **HDL2000** - 550mm Dia X 2600mm between chuck faces, 2000mm Optical Cutting Zone.
- **HDL2000-HD** - 600mm Dia X 2600mm length between chuck faces, 2000mm Optical Cutting Zone.

**Maximum Weight Capacity**
- **HDL2000** - 1800Kg maximum load
- **HDL2000-HD** - 3000Kg maximum load

### Headstock Spindle

**Type**
Oil Hydrostatic (Standard)

**Speed Range**
300 RPM (400 RPM on Heavy Duty version)

**C-axis Positioning Resolution**
0.02 arc seconds (0.000005°)

**Motion Accuracy (@100RPM)**
- Axial Synchronous: ≤ 100 nanometers (4μ")
- Radial Synchronous: ≤ 100 nanometers (4μ")

### Linear Axes

<table>
<thead>
<tr>
<th>Linear Axes</th>
<th>X (Tooling Infeed)</th>
<th>Z (Tooling Crossfeed)</th>
<th>W (Tailstock)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel</td>
<td>350mm (14&quot;)</td>
<td>2100mm (82.6&quot;)</td>
<td>2000mm (78.7&quot;)</td>
</tr>
<tr>
<td>Feedback Resolution</td>
<td>0.034 nanometer</td>
<td>1.0 nanometer</td>
<td>100 nanometer</td>
</tr>
<tr>
<td>Straightness in critical direction</td>
<td>0.75μm (30μ&quot;) Full Travel</td>
<td>1.0μm (40μ&quot;) per 500mm</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Optional Rotational Axis

**Type**
Oil Hydrostatic

**Positioning Resolution**
0.02 arc seconds

**Positioning Repeatability**
± 2 arc seconds (± 0.0005°)

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Glass Press Molding Technology

- Single chamber glass press molding machine with 140mm diameter capacity
- PC based motion controller that operates in either position or force mode with integrated heating and cooling loops
- Windows based front end with easy to follow touch screen and NanoPress Control Software
- Capable of utilizing multi-cavity mold inserts
- Compatible with both fixed and floating mold sets
- Molding temperatures up to 800° C
- Chamber can operate under vacuum or inert gas environment
- Maximum pressing force of 25 KN
**Functional Performance Results**

**Form Accuracy**
- WC Mold 0.081µm PV
- Molded Glass Lens 0.122µm PV

**Surface Finish**
- WC Mold 1.27nm Ra
- Molded Glass Lens 1.51nm Ra

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