

The Nanoform X *ultra grind* is the only fully flood coolant compatible small frame ultra precision machine. It's designed for diamond turning and ultra precision milling and grinding. It can be configured with up to 5 axes (X, Z, C, B, and W(Fast Tool Servo)).

Common applications include grinding of aspheric and freeform glass lenses and mold inserts for pressing glass lenses.

The *ultra grind* is also very beneficial for turning infrared materials that require water-based coolant, such as silicon.

Since 1962, Precitech has delivered complete ultra precision solutions and maintains an installed base of over 1,500 systems worldwide. We continue to define the state-of-the-art, enhancing accuracy, productivity, and ease of use.

Precitech is ultra precision machining solutions.



Key Features



Fully sealed stainless steel enclosure protecting the machine from flood coolants



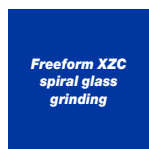
Enlarged upper enclosure accommodates the Levicron spindle in any grinding configuration (horiz., vert., 45°)

Capabilities:

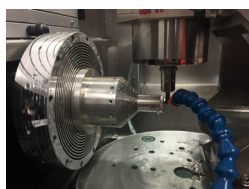
- Single point diamond turning (2 or 3 axes) including non-axi-symmetrical designs of optics and optical molds
- Tool normal diamond turning (3 or 4 axes) utilizing a contouring B axis for freeform shapes in hard-to-machine materials, such as silicon
- Precision grinding and milling (2 or 3 axes) utilizing a 15,000 RPM spindle in a 45° or 90° orientation for cross-axis grinding of precision glass optics
- Freeform grinding and milling (3 or 4 axes) utilizing a 80,000 RPM spindle and a rotary B axis for parallel grinding or 45° grinding of optical mold inserts such as tungsten carbide for glass pressing applications

- ▶ **Expand your capabilities with full flood coolant compatibility in a small frame machine**
- ▶ **Maximize flexibility with diamond turning and ultra precision grinding capabilities in a single machining system**
- ▶ **Assure your part quality with guaranteed turning and grinding specifications on our standard test parts**

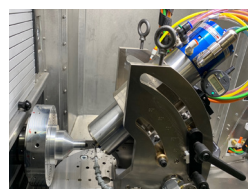
Example Applications



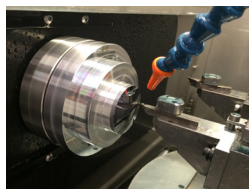
Freeform XZC spiral glass grinding



45° tool normal grinding XZB SiC/WC part



XZ diamond turning of silicon diffractive using water based coolant



NXug with safety windows for laser assisted machining



Key Specifications

Turning performance	Surface roughness ≤ 1.5 nm Sa Form accuracy ≤ 0.15 μm P-V
Grinding performance	Surface roughness ≤ 5 nm Sa Form accuracy ≤ 0.2 μm P-V
Swing capacity	440 mm over X & Z axes 220 mm over B axis
Load capacity	SP-150 spindle: 114 kg (250 lbs) HS-75 spindle: 38 kg (85 lbs)
Position feedback resolution	8 μm (0.008 nm)
Programming resolution	0.01 nm

Machine Base and Control	Description
Machine base	Natural high-stability sealed granite with flood coolant stainless steel enclosure
Machine type	Ultra precision two, three, four, or five axis CNC contouring machine
Vibration isolation	FEA optimized dual sub-frames
Control system	UPx™ control system with Windows® and optional Adaptive Control Technology II
Operating system	QNX real time OS with 64-bit floating point decimal precision
Programming resolution	0.01 nm linear / 0.0000001° rotary
File transfers	USB, CD-ROM, Ethernet
Turning performance	Surface finish: <1.5 nm Sa; Form accuracy: <0.15 µm P-V
Grinding performance	Surface finish: <5 nm Sa; Form accuracy: <0.15 µm P-V

Linear Hydrostatic Slideway	Description
Type	Hydrostatic bearing slideways with symmetrical linear motor placement and liquid cooling
Travel	X & Z axis: 220 mm
Maximum feedrate	4000 mm/min. (157 in./min.)
Drive system	AC linear motors
Position feedback resolution	8 µm (0.008 nm)
X and Z straightness	Horizontal: 0.2 µm (8 µin.) full travel; 0.05 µm/25 mm (2 µin./in.) Vertical: 0.375 µm (15 µin.) full travel
Hydrostatic oil supply system	Hydro-7 Smart Servo Control, low pulsation pump, optional thermal control

Workholding Air Bearing Spindle	High Performance HS-150 Spindle (3 year warranty)
Spindle air bearing type	Slot type thrust bearing
Materials	Steel shaft; bronze journal
Standard swing capacity	250 mm (9.8 in.) diameter
Ultimate load capacity @ spindle nose	136 kg (300 lbs.) @ 100 PSI; 204 kg (450 lbs.) @ 150 PSI
Axial stiffness	230 N/µm (1,314,000 lbs./in.)
Radial stiffness	130 N/µm (743,600 lbs./in.)
Motion accuracy	Axial/radial ≤ 15 nm (0.6 µin.)
Thermal control	Liquid cooled chiller ±0.1°C accuracy
C axis feedback resolution	0.010 arc-sec 16,200 line encoder (0.018 arc-sec 9,000 line encoder available on request)
C axis positioning accuracy	± 1 arc-sec
C axis max speed	2,000 RPM (4,000 RPM with 9,000 line encoder)
Workholding spindle max speed	10,000 RPM

Rotary B Axis	HydroRound II Rotary B Axis with Hydrolock
Type	Patented self compensated oil hydrostatic bearing, bi-conic, integral brushless DC motor
Load capacity	225 kg (500 lbs.)
Tabletop size	330 mm (13 in.) diameter
Maximum speed	3,600°/min.
Hydrolock holding torque	> 108 N-m (80 ft-lbs.)
Feedback resolution	0.004 arc-sec
Positioning accuracy	± 0.1 arc-sec
Radial error motion	0.10 µm (4.0 µin.) @ tool height (4.4 in. above table top). Can be improved with optional error mapping
Axial error motion	0.10 µm (4.0 µin.)
Coning error	1.0 nm/mm (1.0 µin./in.)
Radial stiffness	225 N/µm (1,280,000 lbs./in.)
Axial stiffness	600 N/µm (3,428,000 lbs./in.)
Moment stiffness	3.4 N-m/µrad (30 in-lbs./µrad)

Optional Milling/Grinding Spindles	SP75FF Spindle	Levicron High Speed Milling Spindle
Air supply pressure	690 kPa (100 PSI)	610 kPa (88 PSI)
Air consumption	50 l/min (1.7 SCFM)	70 l/min (2.5 SCFM)
Radial load capacity	32 kg (70 lbs.) ultimate	29 kg (65 lbs.) ultimate
Axial stiffness	70 N/µm (400,000 lbs./in.)	50 N/µm (285,000 lbs./in.)
Radial stiffness	22 N/µm (125,000 lbs./in.)	35 N/µm (200,000 lbs./in.)
Axial/radial error motion	< 0.05 µm (2 µin.)	< 30 nm asynchronous
Maximum speed	15,000 RPM	80,000 RPM (stiffness increases 50% with 60k RPM model)

Facility Requirements	
Power	208 or 230 VAC - 1 phase - 50/60 Hz - 4.5 kVA
Compressed air supply	Typical: 12 SCFM at 100 psig, filtered to 50 µm and dry to 10°C dew point
Machine footprint	929 mm x 2152 mm x 1790 mm (36.6 in. x 84.8 in. x 70.5 in.)

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