

250

precitech

Nanoform® 250 ultragrind Ultra Precision Machining System

This revolutionary, flood coolant compatible 2, 3 or 4-axes ultra precision freeform machine is designed for diamond turning, and deterministic freeform milling and grinding the most challenging applications.

Overview

| | |
|----------------------|---------------------------------|
| Slide Travel: | 220 mm |
| Max Feedrate: | 4,000 mm/min |
| Swing Capacity: | 440 mm |
| | 220 mm over optional B-axis |
| Load Capacity: | SP-150 = 60 Kg |
| Spindle Speed: | SP-150 = 7,000 RPM |
| Grind Spindle Speed: | Either 15,000 RPM or 50,000 RPM |

Configuration & Process Capabilities

Single Point Diamond turning (2 or 3-axes)

Direct lathing of optics and optical molds including freeform non-axi-symmetrical designs

Tool Normal diamond turning (3 or 4-axes)

Utilizing a contouring B-axis for freeform shapes in challenging materials, such as silicon

Precision grinding and milling (2 or 3-axes)

Utilizing a 15,000 rpm spindle in the vertical orientation for cross-axis grinding for the direct machining of precision glass optics

Freeform grinding and milling (3 or 4-axes)

Utilizing a 50,000 rpm spindle and a rotary B-axis for parallel grinding or 45° grinding for optical mold inserts, such as tungsten carbide for glass pressing applications

Design Features

QNX real time Operating System with industry leading 0.01 nanometer programming resolution

Linear holographic glass scales with 16 picometer feedback resolution

Completely sealed stainless steel enclosure

Sealed natural granite base providing exceptional long term machine tool stability

Linear motors coupled to true analog linear amplifiers

FEA optimized dual sub-frames for the ultimate in environmental isolation

Modular design for future capability upgrades

On-machine workpiece balancing system

MAJOR COMPONENTS DESIGNED AND MANUFACTURED BY PRECITECH INC.

- Hydrostatic oil bearing slideways with optimized stiffness and damping characteristics
- Liquid cooled slides for thermal stability
- Motorized air bearing spindles

AMETEK®
ULTRA PRECISION TECHNOLOGIES



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Technical Product Specification Nanoform® 250 ultragrind

| Machine Base and Control | Description |
|--------------------------|---|
| Machine Base | Natural, high-stability, sealed granite, with flood coolant stainless steel enclosure |
| Machine Type | Ultra precision, two, three or four axes CNC contouring machine |
| Vibration Isolation | FEA optimized dual sub-frames for the ultimate in environmental isolation |
| Control System | UPx™ Control System with Optional Adaptive Control Technology |
| Operating System | QNX real time operating system |
| Programming Resolution | 0.01 nanometer linear / 0.0000001° Rotary |
| File Transfer Storage | USB, CD-RW, Ethernet, On-board data storage backup |
| Performance (SPDT) | Surface Roughness (Ra) < 1.5nm, Form Accuracy (P-V) < 0.1µm |
| Performance (Grinding) | Surface Roughness (Ra) < 10nm, Form Accuracy (P-V) < 0.15µm Tungsten carbide |

| Linear Hydrostatic Slideways | Description |
|------------------------------|---|
| Type | Hydrostatic oil bearing slideways with symmetrical linear motor placement |
| Material | Durabar cast iron |
| Travel | X and Z: 220mm (8.6") |
| Maximum Feedrate | 4,000mm/min. (157"/min) |
| Drive System | AC linear motor |
| Motor Location | Located centrally and mounted vertically eliminating offset drive forces and minimizing thermal distortions |
| Position Feedback Resolution | 16 picometers (0.016 nanometers) |
| X-axis Straightness | Horizontal: 0.2µm (8µ") full travel 0.05µm/25mm (2µ") |
| Z-axis Straightness | Horizontal: 0.2µm (8µ") full travel 0.05µm/25mm (2µ") |
| Vertical Straightness | 0.375µm (15µ") full travel |

| Workholding/Positioning Spindle | High Performance SP150 Spindle |
|---------------------------------|---|
| Type | Slot-type thrust bearing |
| Material | Steel shaft/Bronze journal |
| Standard Swing Capacity | 250mm (9.8") diameter |
| Motor | Integral brushless motor |
| Load Capacity | 60 Kg (133 lbs) 50mm (2") out from spindle nose |
| Axial Stiffness | 230N/µm (1,314,000 lbs./in.) |
| Radial Stiffness | 130 N/µm (743,600 lbs./in.) |
| Motion Accuracy | Axial/Radial ≤ 15nm (0.6µ") |
| Thermal Control Optional | Liquid cooled chiller +/- 0.1C Accuracy |
| C-axis Feedback Resolution | 0.010 arc-sec |
| C-axis Position Accuracy | +/- 2 arc-sec |
| C-axis Max Speed | 1,500 RPM |
| Work Holding Spindle Max Speed | 7,000 RPM |

| Rotary B-axis | HydroRound Rotary B-axis |
|------------------------------|--|
| Type | Bi-conical, self compensated, Oil hydrostatic bearing, DC Brushless direct drive motor |
| Material | Stainless Steel |
| Tabletop Size | 330mm (13") |
| Standard Swing Capacity | 220mm (8.75") diameter over tabletop / 440mm otherwise |
| Load Capacity | 225 Kg (500 lbs.) |
| Maximum Speed | 10 RPM continuous / 50 RPM intermittent |
| Motor Torque | 36 in-lbs/ 4.0 N-m |
| Position Feedback Resolution | 0.004 arc-sec |
| Position Accuracy | +/- 1 arc-sec |
| Radial Error Motion | 0.10µm (4µ") @ 1" above table and can be improved with optional error mapping |
| Coning Error | 1.0nm/mm (1.0µ"/in.) |
| Radial Stiffness | 225N/µm (1,280,000 lbs./in.) |
| Axial Stiffness | 600N/µm (3,428,000 lbs./in.) |
| Moment Stiffness | 3.4 N-m/micro radian (30 in-lbs/micro radian) (144 in-lbs/arc-sec) |

| High Speed Milling/Grinding Spindle | High Speed SP75FF Spindle | High Speed PI ISO 2.25 Spindle |
|-------------------------------------|---------------------------|--------------------------------|
| Air Supply Pressure | 690 KPA (100 PSI) | 690 KPA (100 PSI) |
| Air Consumption | 2.8 l/s (6.0 SCFM) | 0.9 l/s (2.0 SCFM) |
| Radial Load Capacity | 20.5 Kg (45 lbs) | 10 Kg (20 lbs) |
| Axial Stiffness | 70N/µm (400,000 lbs./in.) | 69N/µm (392,000 lbs./in.) |
| Radial Stiffness | 22N/µm (125,000 lbs./in.) | 23N/µm (130,000 lbs./in.) |
| Axial Error Motion | < 0.05µm (2µ") | < 0.05µm (2µ") |
| Radial Error Motion | < 0.05µm (2µ") | < 0.05µm (2µ") |
| Maximum Speed | 15,000 RPM | 50,000 RPM |

| Facility Requirements | Nanoform® 250 ultragrind |
|-----------------------|--|
| Power | 208 +/-10% or 230 +/-10% VAC - 3.0 KVA 1 phase - 50/60Hz |
| Air Supply | Typical: 12 SCFM @100 PSIG |
| Machine Footprint | 914mm x 2120mm x 1700mm (36" x 83.5" x 67") |