Nanotech 650FG^{v2} Specification Overview

General	Description
System Configuration	Ultra-Precision three, four, or five axis CNC machining system for on-axis turning of aspheric and toroidal surfaces; slow-slide-servo machining (rotary ruling) of freeform surfaces; and raster flycutting of freeforms, linear diffractives, and prismatic optical structures
Workpiece Capacity	650mm diameter x 300mm long (Note: additional swing capacity available upon request)
Base Structure	Monolithic composite polymer granite base with integral coolant troughs and superb thermal stability
Vibration Isolation	Optimally located air isolation system. Optional Shear Damped air isolation system with Self Leveling
Computer System Specifications	Intel i5 2.4 GHz processor running Windows 7 Professional 64-bit with 16GB DDR3 1600MHz memory, 10/100/1000 Base-T external customer Ethernet connection, DVD RW Drive, 500GB 7200 RPM removeable Hard Drive. Pendant features a 22" wide projected capacitive multi-touch display. Customer USB ports provided on front of PC and also on operator pendant.
Control System	Delta Tau 1GHz PowerPMAC Embedded Real-time 64-bit Linux Motion Controller with Nanotech's NEW Windows 7 based HMI with a Touch / Swipe Gesture Interactive display.
Programming Resolution	0.01 nanometer linear / 0.0000001° rotary
Functional Performance (As measured with laser interferometer & white light interferometer on *same* part)	Material – High purity aluminum alloy. Form Accuracy (P-V): ≤ 0.15µm / 75mm dia, 250mm convex sphere. Surface Finish (Ra): ≤ 3.0 nanometers (Test Parts cut in both the X-Z and Y-Z planes) *(Important Notice: Both form and finish are measured on the same part, same surface!)*

Workholding Spindle	Heavy Duty (Standard)
Type	Exclusive HD impact resistant graphite air bearing with center mounted thrust face
Liquid Cooling (optional)	To maintain thermal stability and tool center repeatability, a closed loop chiller provides recirculating temperature controlled water to cooling channels located around the motor and bearing journals of the air bearing spindle. The chiller has an integral PID controller which maintains temperature control to ± 0.5°F. Flow is controlled by a solenoid integrated with the machine's CNC control.
Mounting	Centrally integrated within the Y-axis carriage to increase loop stiffness and minimize thermal growth. Spindle cartridge resides in an athermal housing to further enhance thermal stability
Speed Range	50 to 10,000 rpm, bi-directional
Swing Capacity	Up to 650mm diameter
Working Load Capacity (Radial)	85 Kg @ 7bar (185 lbs @ 100psi.) / 102 Kg @ 10bar (225 lbs @ 145psi.) @ spindle nose
Working Load Capacity (Axial)	197 Kg @ 7bar (435 lbs @ 100psi.) @ spindle nose
Axial Stiffness	228 N/µm @ 7bar (1,300,000 lbs/in @ 100psi) / 260 N/µm @ 10bar (1,500,000 lbs/in @ 145psi)
Radial Stiffness (@ spindle nose)	98 N/µm @ 7bar (560,000 lbs/in @ 100psi) / 140 N/µm @ 10bar (800,000 lbs/in @ 145psi)
Drive System	Frameless, Brushless DC motor
Motion Accuracy	Axial: ≤ 12.5 nanometers (0.5µ") Radial: ≤ 12.5 nanometers (0.5µ")

Linear Axes	X	Z	Y (Vertical)
Type	Fully constrained oil hydrostatic, box way slide	Fully constrained oil hydrostatic, box way slide	Fully constrained oil hydrostatic box way slide with adaptively controlled air bearing counterbalance to negate gravitational forces & varying workpiece loads.
Travel	350mm (14")	300mm (12")	150mm (6")
Drive System	Brushless DC Linear Motor	Brushless DC Linear Motor	Dual Brushless DC Linear Motor
Feedback Type	Laser holographic linear scale	Laser holographic linear scale	Laser holographic linear scale
Feedback Resolution	0.008 nanometer	0.008 nanometer	0.008 nanometer
Feed Rate (maximum)	2000mm/min	2000mm/min	2000mm/min
Straightness in critical direction	0.3µm (12µ") over full travel	0.3µm (12µ") over full travel	0.5µm (20µ") over full travel / 0.3µm (central 100mm)
Hydrostatic Oil Supply	Compact, low flow, low pressure system with closed loop servo control and pressure accumulator to minimize pump pulsation.		

Optional Rotational Axes	B	C (Work Spindle Option)
Type	Oil Hydrostatic	Porous Graphite Air Bearing (liquid cooled)
Travel	360° (Bi-directional)	360° (Bi-directional)
Drive System	Brushless DC motor	Brushless DC motor
Axial Stiffness	875 N/µm (5,000,000 lbs./in.)	See **Workholding Spindle** Specifications Listed Above
Radial Stiffness (at nose)	260 N/µm (1,500,000 lbs./in.)	See **Workholding Spindle** Specifications Listed Above
Positioning Accuracy	± 1.0 arc seconds (compensated)	± 1.0 arc seconds (compensated)
Feedback Resolution	0.005 arc seconds	0.01 arc seconds
Maximum Speed (Positioning Mode)	50 rpm	3,000 rpm
Motion Accuracy	Axial: ≤ 0.1µm (4µ") Radial: ≤ 0.1µm (4µ")	Axial: ≤ 12.5 nm (0.5µ") Radial: ≤ 12.5 nm (0.5µ")

Utility Requirements	Air	Electrical	Machine Footprint (includes electrical cabinet)
For optimal cutting results, facility thermal stability should be held within ±0.5°C (±1.0°F)	7 to 10 bar (100-145psi) 280 liters/min (10 scfm) Dry to 10°C pressure dew point and pre-filtered to 10µm	208 - 480 VAC; 3 Phase; 50/60hz (11kVA)	1.8m W x 1.8m D x 2m H; Approx. 3,180 Kg (Enclosure & Utilities Cabinet included, but not control pendant. Contact Nanotech for complete overall detailed layouts.)
Warranty	1 year full parts and labor warranty		

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)