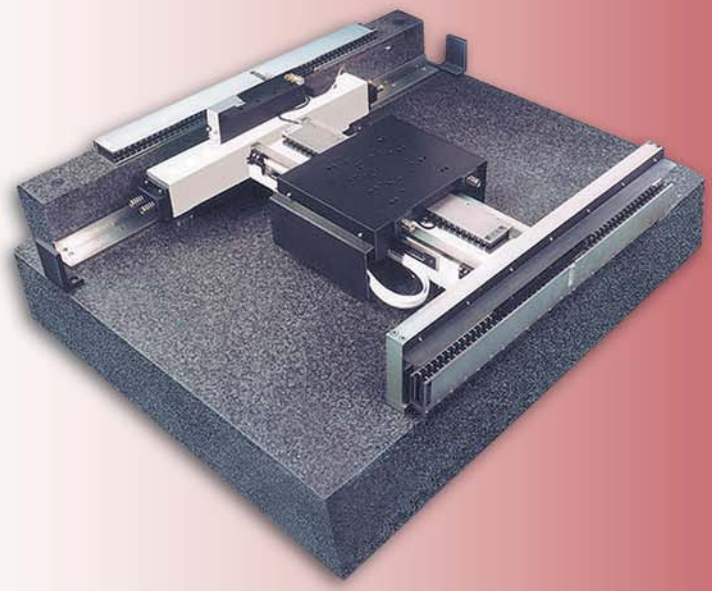
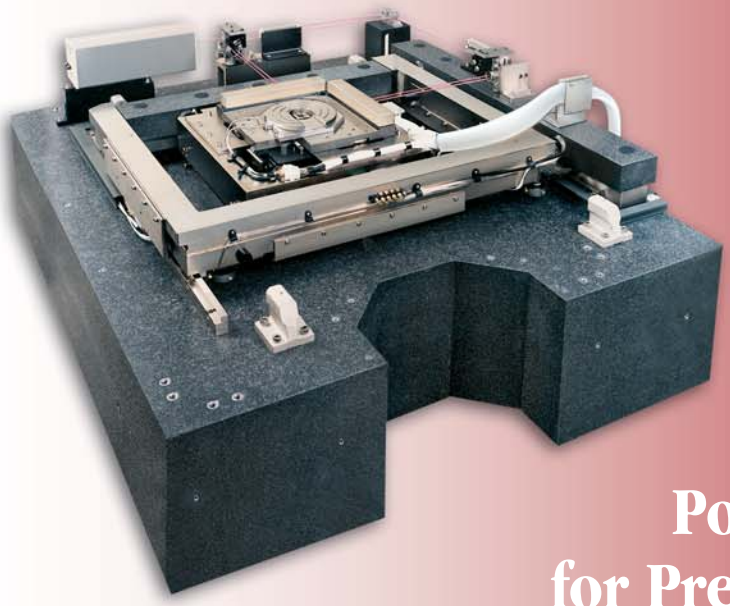
Microglide Air Bearing Systems



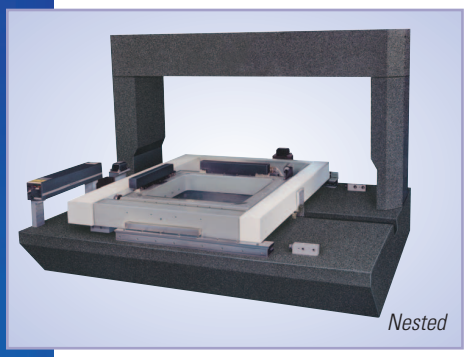


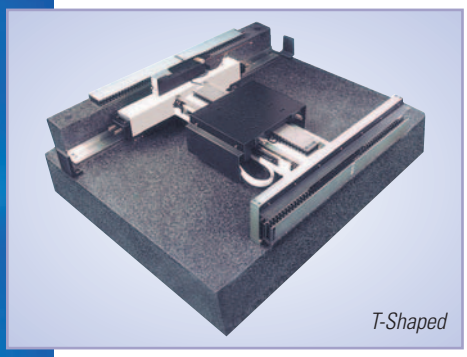
Sub-micron Positioning Solutions for Precision Applications

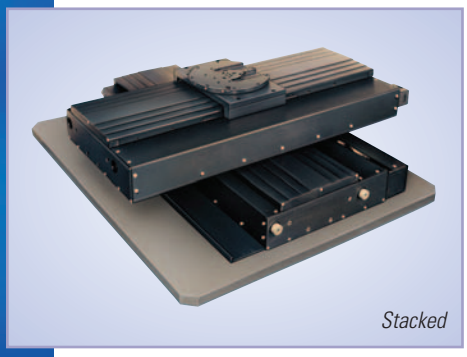


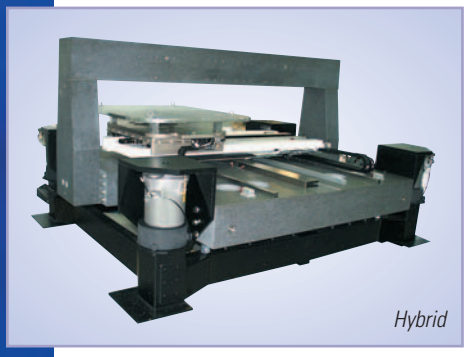
Air Bearing

Anorad Microglide™ Air Bearing Systems


Nested


T-Shaped


Stacked


Hybrid

Applications demanding sub-micron precision can be satisfied by specifying Microglide air bearing platforms:

- Lithography
- Inspection
- Metrology
- High precision assembly

An array of **configurations** are offered to optimally fit your design requirements:

- Single, split & stacked axes
- Single plane XY
  - T-Shaped
  - L-Shaped
  - H-Shaped
  - Nested
- Moving beam gantry
- Hybrid XY

High resolution feedback is matched to meet speed and accuracy specifications:

- High accuracy optical incremental linear encoders
- Retro reflector or plane mirror laser interferometers
- Signal interpolators

Laboratory grade **granite reference surfaces**:

- Structurally rigid
- Precision ground
- Lapped to optical flatness

Anorad employs stable **preload** methods for maximum dynamic performance:

- Opposing guide
- Straddling guide
- Magnetic
- Vacuum
- Balanced mass

Lightweight and rigid, hi-tech **materials** reduce mass, increase stiffness, and dampen vibration:

- Engineered ceramics
- Aluminum alloy
- Metal matrix
- Anocast™ polymer composite
- Super-Invar™

Non-contacting components assure reliability in production, minimize maintenance, and do not degrade over time:

- Optically flat air bearings
- Brushless zero-cogging motors
- Optical linear encoders or laser feedback

Microglide System Selection Guide

Anorad's Microglide platforms feature precisely engineered air bearing systems. These ultra-smooth bearings glide on a pressurized thin film of air to support an applied normal load. Repeatable precision is achieved by maintaining a constant air gap, only microns thick, using a variety of highly stable preloading techniques. Since air bearings distribute their load over a relatively large and extremely flat area, they have a built-in averaging effect that compensates for any minor irregularities in the reference surface. This enables extremely accurate, virtually frictionless motion, for extraordinary control of precision positioning and scanning processes.

Anorad's Microglide Systems offer may configuration and feedback options to solve a diverse set of applications

- The "T" shaped configurations deliver high performance and great value. Combining an engineered-ceramic beam and air bearing technology produces a precise, non-contacting positioning system, with the optimal arrangement of components for repeatable sub-micron performance.
- The nested "N" type configurations employ a frame-in-frame design. This enables full access to both sides of a workpiece fixtured to the innermost frame. The nested systems use a variety of air bearing preload methods to maintain extremely high accuracy, even in travels up to 320 mm.
- The hybrid configurations provide a cost-effective solution for step and scan motion profiles typically encountered in inspection applications. The lower (Y) axis takes discrete short steps, supported by precision ground recirculating ball linear bearings. The upper (X) axis glides on a set of Anorad air bearings, to perform extremely smooth scanning moves with negligible velocity ripple and vibration.

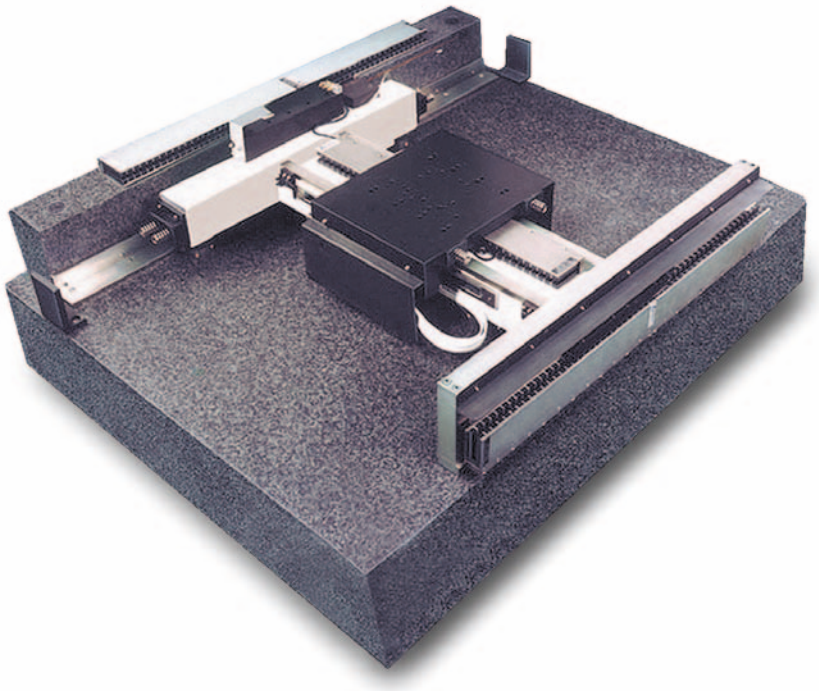
Engineered-to-order systems

In addition to the configurations already mentioned, Anorad manufactures custom, engineered-to-order, air bearing systems to meet unique OEM requirements. These exemplify the creativity and know-how that establish Anorad as the world's premier manufacturer of sub-micron accuracy air bearing positioning systems.

Microglide Section Contents

"T" Shaped Configuration
T350
Nested Configurations
N250
N320
Hybrid Configurations
FP720
FP1300
Engineered-to-Order Systems

Microglide™ T350



Product Features

- Ceramic "T" layout provides the optimal travel-to-footprint ratio
- Coplanar XY lift air bearings decouple inter-stage reactions
- Magnetically preloaded and integrally damped air bearings ensure smooth scanning and rapid settling
- Completely non-contact design maximizes system reliability
- Platforms available for both 200 and 300 mm wafer applications
- Linear encoder or laser interferometer feedback options
- Cleanroom compatible
- Ideally suited for:
  - Wafer Inspection Equipment
  - Laser Machining Systems
  - Electronic Assembly

Positioning Solution for 300mm Applications

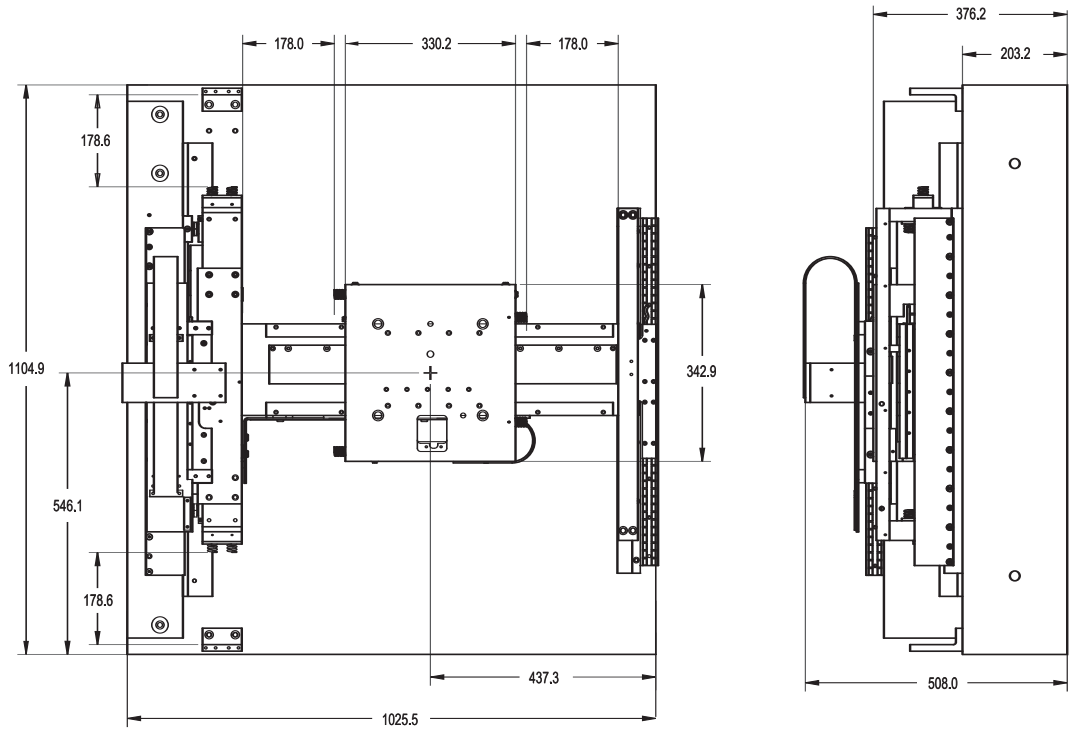
The Microglide T350 single plane XY positioning system is a high performance cost-effective platform for sub-micron positioning in a production environment. State-of-the-art motion dynamics are achieved by using optically flat linear air bearings to lift and guide the lightweight "T" shaped engineered ceramic beam. A single linear servo motor actuates the X-axis aluminum saddle directly along the ceramic beam's centerline. Two widely spaced linear servo motors work in parallel to drive the ceramic beam along the Y-axis. Angular errors of pitch and roll are minimized by the unique bearing configuration, where all lift air bearings utilize the same lapped ultra-flat granite base reference surface. Available with either high precision optical linear encoders (T350E), or plane mirror laser interferometers (T350L), the Microglide T350 motion platform can easily satisfy the different price/performance requirements encountered in semiconductor metrology and manufacturing.

Innovative Anorad technology, such as sinusoidally commutated zero-cogging brushless linear servo motors and magnetically preloaded air bearings with integral damping, provides outstanding performance for both scanning and rapid settling point-to-point motion. The platform's completely non-contacting design (brushless linear servo motors, optical encoders & air bearings) makes the Microglide T350 extremely reliable, cleanroom compatible, and virtually maintenance-free.

Options include: additional rotary, vertical, tip, and tilt axes; zero-jitter air brake; fixed overhead granite bridge; support frames; vibration isolation systems; servo controllers and custom travels.

Microglide T350 Dimensions (mm)

Carriage mounting holes are made to meet specific end user requirements.



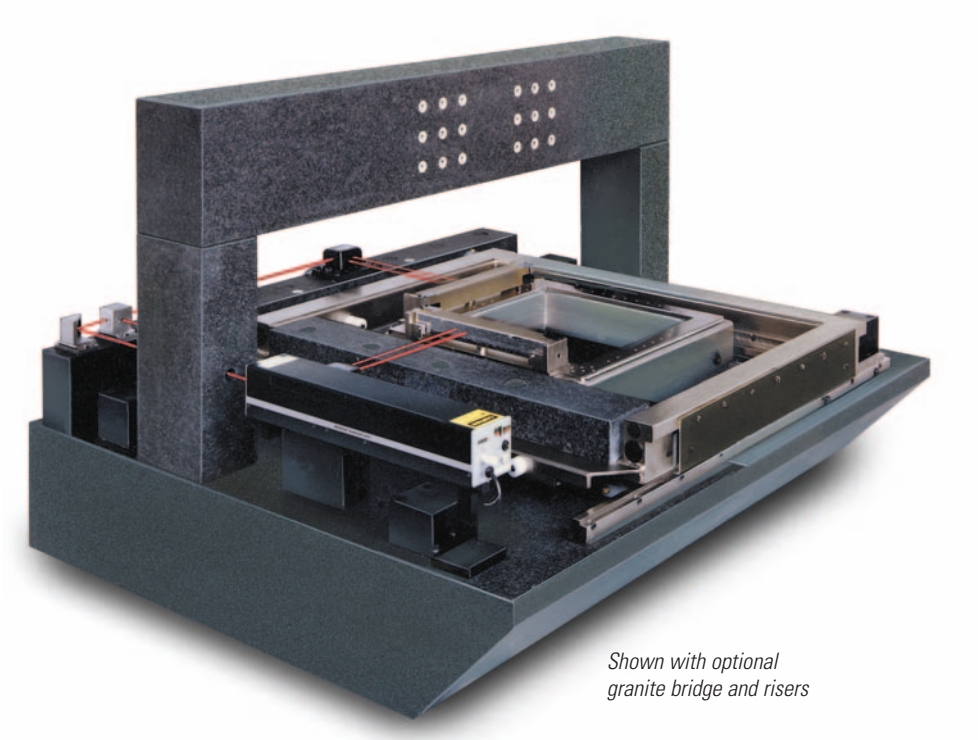
Specifications

Performance Specifications	Units	Model T350E	Model T350L
Travel [1]	mm	350 x 350	350 x 350
Feedback System	-	Optical Linear Encoder	Plane-Mirror Interferometer
Resolution [2]	nm	0.5 - 500	0.31 - 10
Repeatability	µm	± 0.15	± 0.15
Positioning Accuracy [3]	µm	± 0.3	± 0.25
Flatness of Travel	µm	± 1.0	± 1.0
Straightness of Travel	µm	± 1.0	± 0.25
Orthogonality	arc-sec	± 2.0	± 0.5
Pitch, Roll, and Yaw	arc-sec	± 1.0	± 1.0
Maximum Load Capacity [4]	kg	50	50
Maximum Velocity [5]	mm/s	500	500
Maximum Acceleration [4]	m/s^2	10	10
Scanning Velocity [5]	mm/s	350	350
Average Velocity Ripple [6]	%	< 1.0	< 1.0
Position Stability [6]	counts	± 1	± 1
25 mm Step-&-Settle Time [6]	ms	< 200	< 200

Notes: Specifications are based on overall travel of each axis (significantly better positioning accuracy is possible over shorter travels) and operation in a controlled environment with Anorad approved vibration isolation system. Additional performance, travel, and configuration options are available. Contact Anorad for details.

[1] Additional 3 mm overtravel at each end before hard-stops.
[2] Resolutions available to 0.5 nm (encoder with 8192 x multiplier) or 0.31 nm (laser with λ/2048 interpolation).
[3] After error mapping axes.
[4] Load based on lift bearing capacity. Applied load may determine maximum acceleration.
[5] Dependent upon system resolution and data rate.
[6] Typical dynamics for configured load, acceleration, velocity, resolution and data rate.

Microglide™ N250



Shown with optional granite bridge and risers

Product Features

- Open frame design for dual-sided workpiece access and fixturing
- Nested single plane XY air bearing configuration provides superior geometric accuracy
- Magnetic preload with integral damping provides smooth scanning and fast settling
- Optional granite bridge assembly for mounting overhead equipment
- Linear incremental encoder or laser interferometer feedback
- Cleanroom compatible
- Ideally suited for:
  - Optical Disk Manufacturing
  - Microelectronic Test and Inspection Equipment
  - X-Ray Lithography

Small Open Frame Positioning Platform

The Microglide N250 features a nested coplanar frame-in-frame dual axis design. This configuration allows access to the workpiece from both above and below, to facilitate the use of optics, bottom illumination, vacuum chucks or other application specific subsystems. The X and Y frames are made from precisely machined rigid electroless nickel plated meehanite iron castings. This produces exceptionally stiff slides with excellent vibration damping characteristics. The lift air bearings all reference the same optically flat lapped granite base. This minimizes flatness, pitch, and roll errors typically found in conventional stacked-stage systems, plus the frame-in-frame design reduces overall system height.

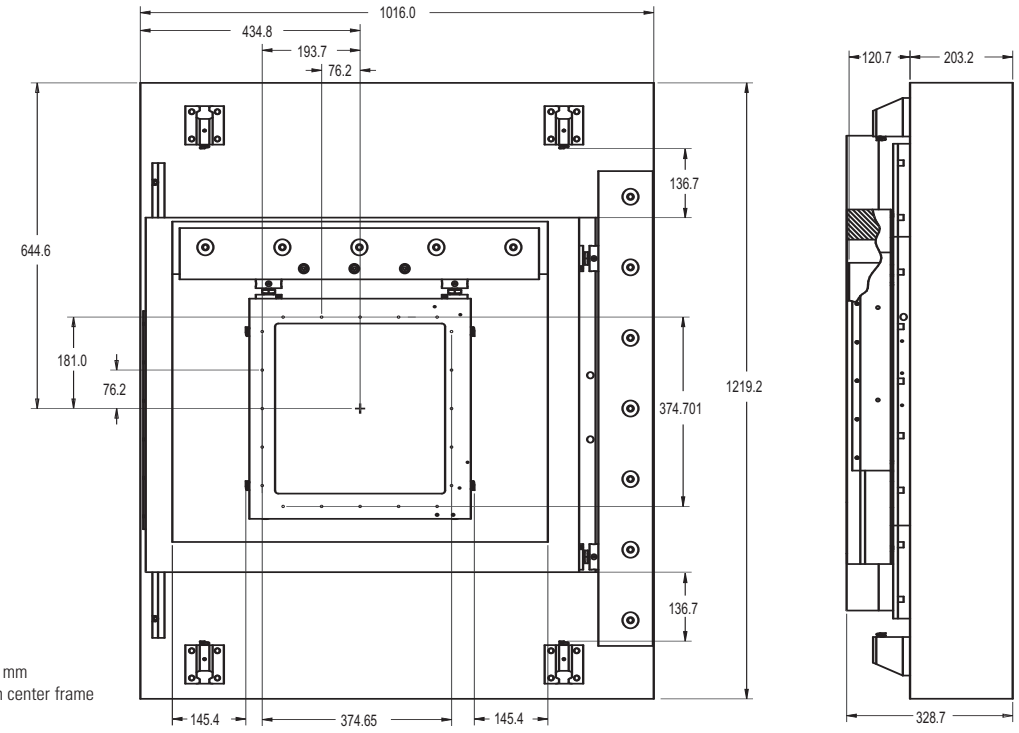
Two side-mounted zero-cogging brushless linear servo motors drive each axis of the Microglide N250. The motors operate in parallel to create a resultant central drive force while maintaining an open frame design. This technique eliminates the twisting torque inherent in single sided drives. Anorad's linear motors are completely non-contacting to eliminate the backlash, friction, and wear issues normally exhibited by conventional mechanical drives.

The laser feedback option features a frequency stabilized, double pass laser interferometer with orthogonal plane mirrors. The mirrors are mounted on the inner axis slide with the laser beams aligned to intersect at the height of the customer part, thus minimizing Abbe offset errors. Linear optical encoder feedback is available using a diffraction grating tape scale.

Options include: additional rotary, vertical, tip, and tilt axes; zero-jitter air brake; fixed overhead granite bridge; support frames; vibration isolation systems; servo controllers and custom travels.

Microglide N250 Dimensions (mm)

Carriage mounting holes are made to meet specific end user requirements.



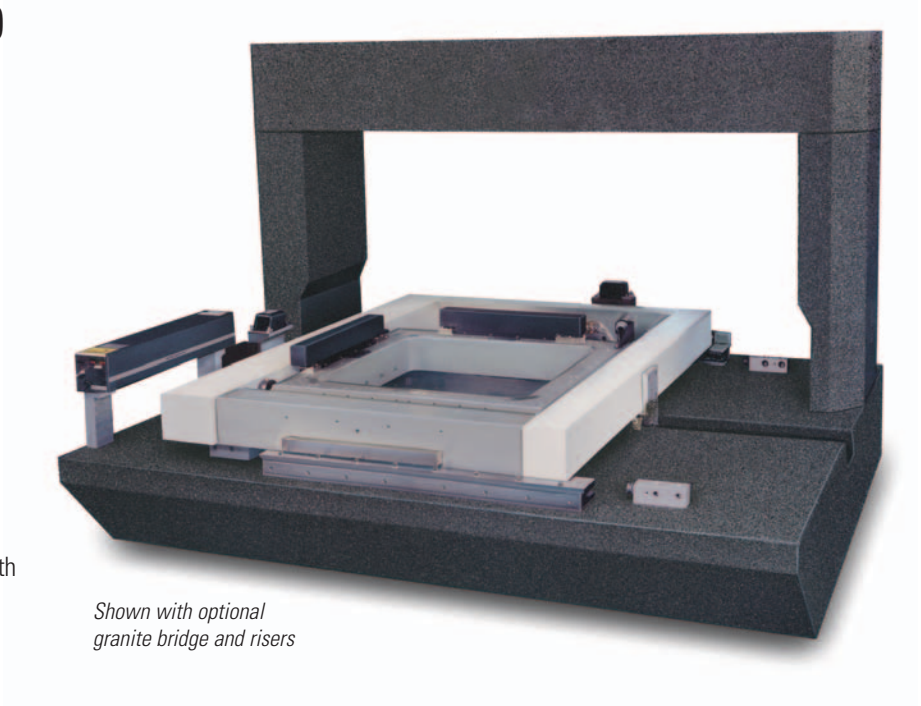
Specifications

Performance Specifications	Units	Model N250E	Model N250L
Travel [1]	mm	250 x 250	230 x 230
Feedback System	-	Optical Linear Encoder	Plane-Mirror Interferometer
Resolution [2]	nm	0.5 - 500	.31 - 10
Repeatability	µm	± 0.3	± 0.15
Positioning Accuracy [3]	µm	± 0.5	± 0.25
Flatness of Travel	µm	± 1.0	± 1.0
Straightness of Travel	µm	± 1.0	± 0.25
Orthogonality	arc-sec	± 1.0	± 0.5
Pitch, Roll, and Yaw	arc-sec	± 1.0	± 1.0
Maximum Load Capacity [4]	kg	35	35
Maximum Velocity [5]	mm/s	500	500
Maximum Acceleration [4]	m/s^2	10	10
Scanning Velocity Range [5]	mm/s	350	350
Average Velocity Ripple [6]	%	< 0.1	< 0.1
Position Stability [6]	counts	± 1	± 1
25 mm Step-&-Settle Time [6]	ms	< 300	< 300

Notes: Specifications are based on overall travel of each axis (significantly better positioning accuracy is possible over shorter travels) and operation in a controlled environment with Anorad approved vibration isolation system. Additional performance, travel, and configuration options are available. Contact Anorad for details.

[1] Additional 3 mm overtravel at each end before hard-stops.
[2] Resolutions available to 0.5 nm (encoder with 8192 x multiplier) or 0.31 nm (laser with λ/2048 interpolation).
[3] After error mapping axes.
[4] Load based on lift bearing capacity. Applied load may determine maximum acceleration.
[5] Dependent upon system resolution and data rate.
[6] Typical dynamics for configured load, acceleration, velocity, resolution and data rate.

Microglide™ N320



Shown with optional granite bridge and risers

Product Features

- Nested XY air bearing system with common reference plane
- Hybrid ceramic-aluminum frame reduces moving mass
- Open frame construction for double-sided workpiece access
- High resolution linear encoder or laser interferometer feedback
- Optional air brake for zero jitter stability at any fixed position
- Optional granite bridge to rigidly mount overhead tooling
- Custom engineering services to meet unique OEM specifications
- Cleanroom compatible
- Ideally suited for:
  - Semiconductor Processing
  - Flat Panel Manufacturing
  - Wafer Scanning

300mm Wafer Positioning Solutions

Anorad's Microglide N320 nested XY air bearing platforms were created for 300mm wafer positioning. Its open frame-in-frame design uses balanced magnetic preload on the lift and guide bearings to maintain extraordinary flatness and straightness. Both axes are actuated by a pair of Anorad zero-cogging linear motors mounted in parallel at opposite sides of each frame. The resultant motive force acts along the centerline of each axis, thereby preventing angular pitch and roll errors due to unwanted torque on the individual axes. Additionally, the outer frame is stabilized horizontally by a pair of magnetically preloaded air bearings which glide on a granite reference surface at the platform's center.

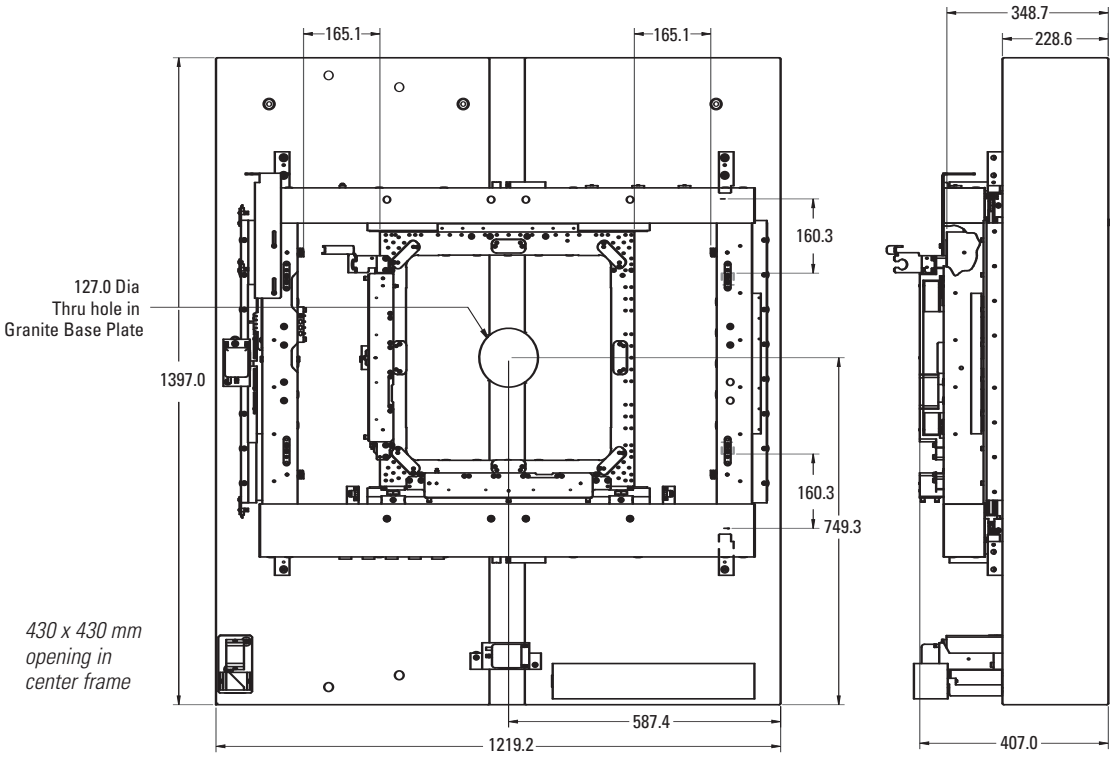
The coplanar nested XY design enables all lift bearings to float atop the same ultra-flat lapped granite reference surface. This minimizes stack up and Abbe errors typically associated with stacked multi-axis positioning systems, providing maximum accuracy while giving the system a very compact profile. The N320 also has a high performance "air brake" for nanometer-level position stability at rest during critical inspection processes.

The N320 owes its extremely smooth motion to a completely non-contacting system design. The magnetically preloaded air bearings and linear optical encoders have virtually no resistance to motion. When actuated by Anorad's sinusoidally commutated zero-cogging linear motors in conjunction with high resolution feedback, the N320 can move with minimal velocity ripple. Combining this feature with the vibration damping characteristics of the air bearings makes this platform ideal for wafer scanning and many other sensitive precision positioning applications.

Options include: additional rotary, vertical, tip, and tilt axes; zero-jitter air brake; fixed overhead granite bridge; support frames; vibration isolation systems; servo controllers, and custom travels.

Microglide N320 Dimensions (mm)

Carriage mounting holes are made to meet specific end user requirements.



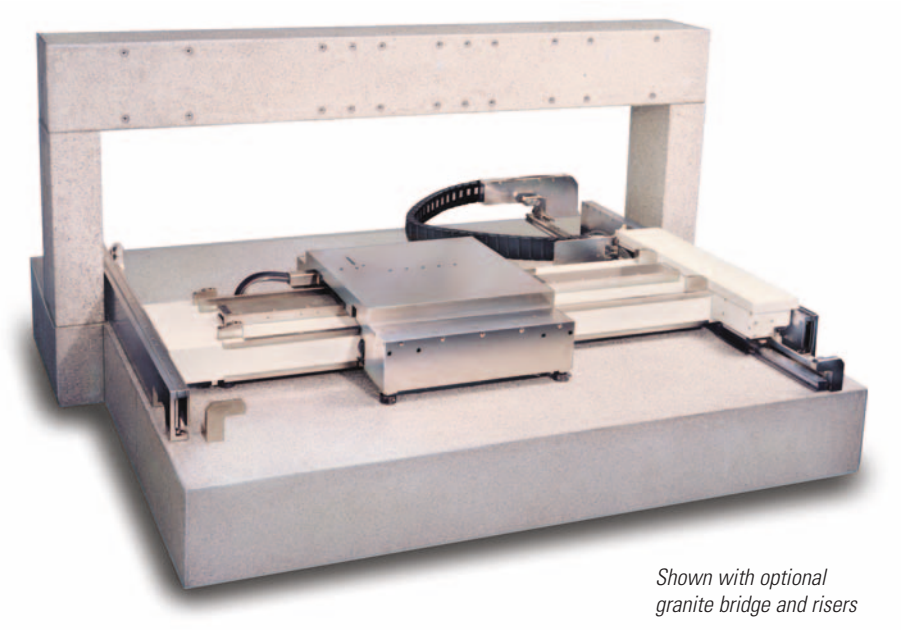
Specifications

Performance Parameters	Units	Model N320E	Model N320L
Travel [1]	mm	320 x 320	320 x 320
Feedback System	-	Optical Linear Encoder	Plane-Mirror Interferometer
Resolution [2]	nm	0.5 - 500	0.31 - 10
Repeatability	µm	± 0.3	± 0.15
Positioning Accuracy [3]	µm	± 0.5	± 0.2
Flatness of Travel	µm	± 1.0	± 1.0
Straightness of Travel	µm	± 1.0	± 0.25
Orthogonality	arc-sec	± 2.0	± 0.5
Pitch, Roll, and Yaw	arc-sec	± 1.0	± 1.0
Maximum Load Capacity [4]	kg	35	35
Maximum Velocity [5]	mm/s	500	500
Maximum Acceleration [4]	m/s^2	10	10
Scanning Velocity [5]	mm/s	350	350
Average Velocity Ripple [6]	%	< 1.0	< 1.0
Position Stability [6]	counts	± 1	± 1
25 mm Step-&-Settle Time [6]	ms	< 400	< 400

Notes: Specifications are based on overall travel of each axis (significantly better positioning accuracy is possible over shorter travels) and operation in a controlled environment with Anorad approved vibration isolation system. Additional performance, travel, and configuration options are available. Contact Anorad for details.

[1] Additional 3 mm overtravel at each end before hard-stops.
[2] Resolutions available to 0.5 nm (encoder with 8192 x multiplier) or 0.31 nm (laser with λ/2048 interpolation).
[3] After error mapping axes.
[4] Load based on lift bearing capacity. Applied load may determine maximum acceleration.
[5] Dependent upon system resolution and data rate.
[6] Typical dynamics for configured load, acceleration, velocity, resolution and data rate.

Microglide™ FP720



Shown with optional granite bridge and risers

Product Features

- Single plane XY air bearing configuration provides superior geometric accuracy
- Magnetic preload with integral damping provides smooth scanning and fast settling
- Hybrid bearing system offers excellent value and performance
- Overhead beam option for mounting process equipment
- Travel to 1020 mm
- Velocities to 300 mm/s
- Linear encoder feedback
- Cleanroom compatible
- Ideally suited for:
  - Flat Panel Equipment
  - Laser Machining Systems
  - Electronic Assembly

Precision Solution for Flat Panel Applications

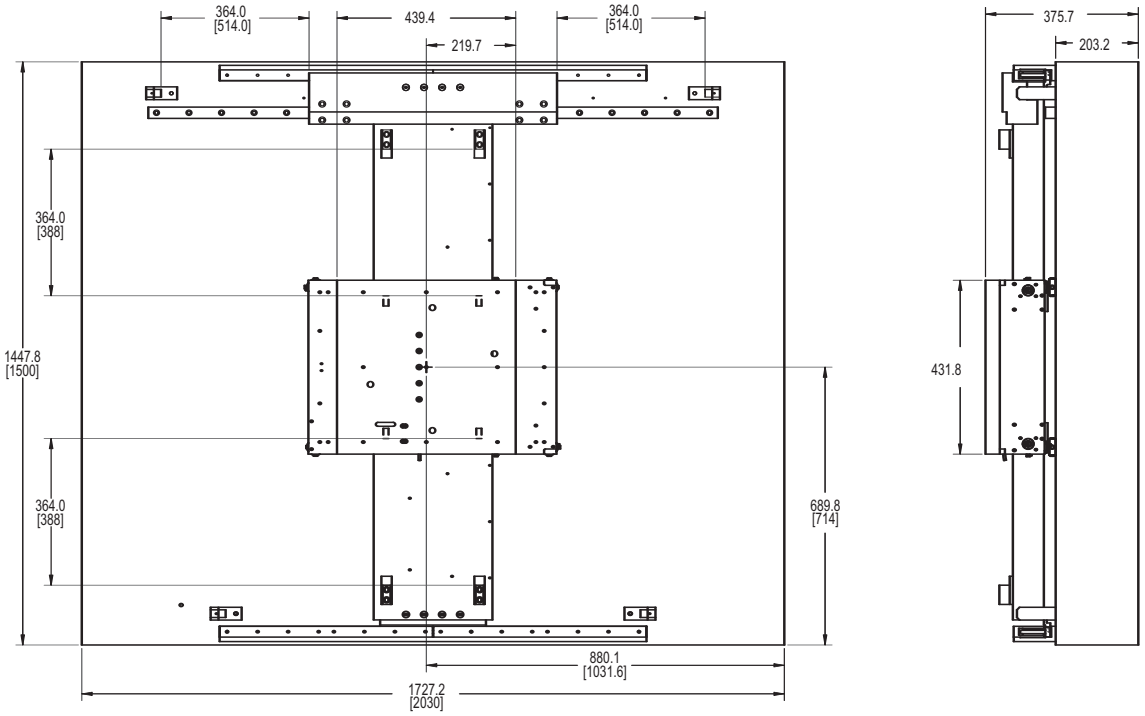
The Microglide FP720 is a single plane XY hybrid air-mechanical bearing system that provides a cost-effective solution for high precision positioning of flat panel displays. Extremely smooth motion dynamics are achieved by utilizing optically flat linear air bearings and a "T-shaped" engineered-ceramic beam with an optimized stiffness to weight ratio. A single linear servo motor actuates the preloaded air bearing X-axis aluminum saddle directly along the ceramic beam's centerline. Two widely spaced linear servo motors work in parallel to guide the ceramic beam in the Y-axis direction. Angular errors of pitch & roll are minimized by the unique air-bearing configuration, where the X-axis lift and the ceramic beam's outer-support air bearings utilize the same lapped ultra-flat granite base reference surface. High-precision optical linear encoders are available in a broad range of resolutions to satisfy the different accuracy and speed requirements typically encountered in flat panel metrology and manufacturing.

Innovative Anorad engineering combines sinusoidally commutated zero-cogging brushless linear servo motors and magnetically preloaded air bearings with integral damping to deliver excellent performance in both scanning and rapid settling point-to-point motion. The primarily non-contact nature of the system makes the FP720 and FP1020 platforms extremely reliable and essentially maintenance-free.

Options include: additional rotary, vertical, tip, and tilt axes; zero-jitter air brake; fixed overhead granite bridge; support frames; vibration isolation systems; servo controllers and custom travels.

Microglide FP720 Dimensions (mm)
[FP1020 Dimensions]

Carriage mounting holes are made to meet specific end user requirements.



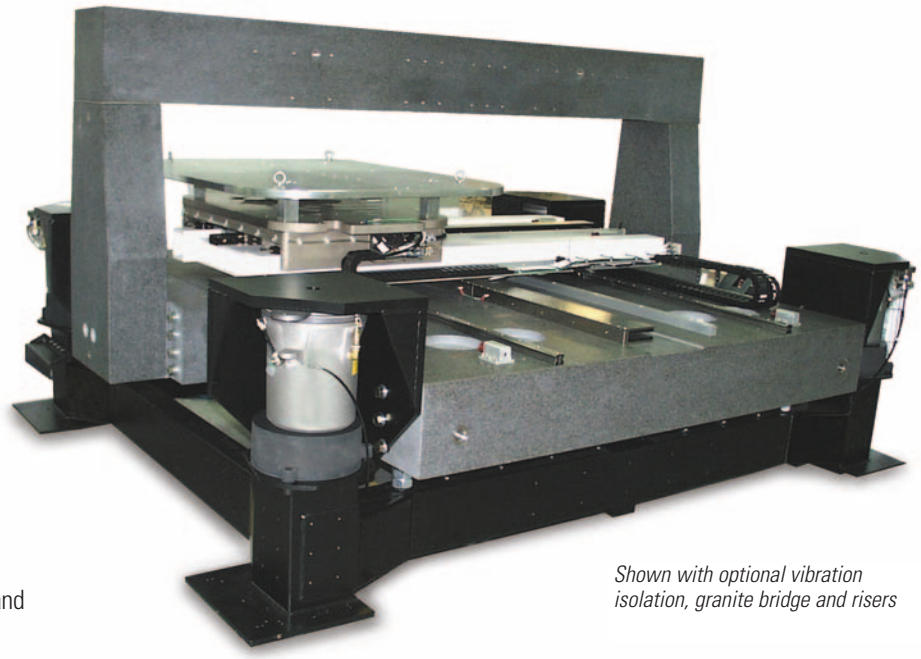
Specifications

Performance Parameters	Units	Model FP720E	Model FP1020E[7]
Travel [1]	mm	720 x 720	1020 x 765
Feedback System	-	Optical Linear Encoder	Optical Linear Encoder
Resolution [2]	nm	0.5 - 500	0.5 - 500
Repeatability	µm	± 0.4	± 0.5
Positioning Accuracy [3]	µm	± 0.5	± 1.0
Flatness of Travel	µm	± 3.0	± 3.0
Straightness of Travel	µm	± 3.0	± 3.0
Orthogonality	arc-sec	± 1.0	± 1.0
Pitch, Roll, and Yaw	arc-sec	± 2.0	± 3.0
Maximum Load Capacity [4]	kg	80	80
Maximum Velocity [4]	mm/s	500	500
Maximum Acceleration [4]	m/s [2]	10	10
Scanning Velocity Range [5]	mm/s	350	350
Average Velocity Ripple [6]	%	< 1.5	< 1.5
Position Stability [6]	counts	± 2	± 2
25 mm Step-&-Settle Time [6]	ms	< 450	< 450

Notes: Specifications are based on overall travel of each axis (significantly better positioning accuracy is possible over shorter travels) and operation in a controlled environment with Anorad approved vibration isolation system. Additional performance, travel, and configuration options are available. Contact Anorad for details.

[1] Additional 3 mm overtravel at each end before hard-stops.
[2] Resolution available to 0.5nm (8192x encoder multiplier) .
[3] After error mapping axes.
[4] Load based on lift bearing capacity. Applied load may determine maximum acceleration.
[5] Dependent upon system resolution and data rate.
[6] Typical dynamics for configured load, acceleration, velocity, resolution and data rate.
[7] FP1020 dimensions [in square parenthesis].

Microglide™ FP1300



Shown with optional vibration isolation, granite bridge and risers

Product Features

- Large 1360 x 1150 mm travel for optical workpiece inspection
- Hybrid XY design maximizes value and performance
- Magnetically preloaded air bearing system on scanning axis
- Precision ground rolling element recirculating bearings on step axis
- Integral vibration damping system
- Ceramic and aluminum construction for rigidity and fast settling
- Cleanroom compatible
- Ideally suited for:
  - Flat Panel Inspection

Precision Solution for Large Workpiece Inspection

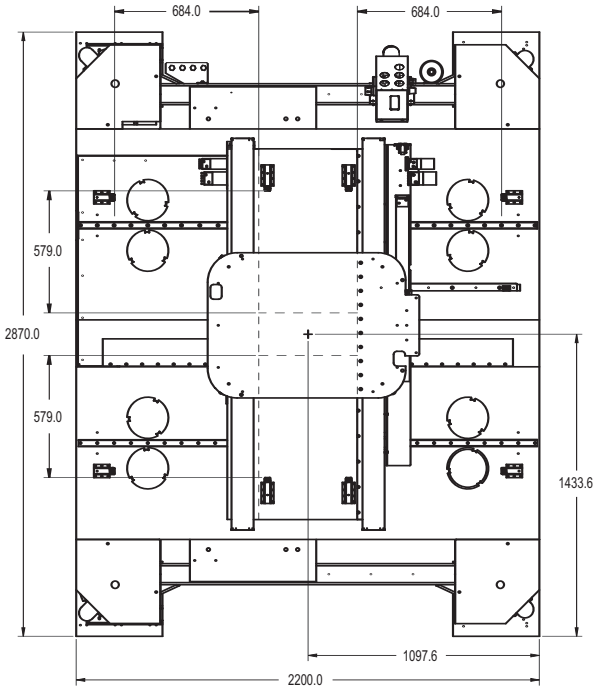
Anorad's Microglide FP1300 is a high capacity positioning system designed for optical inspection of large flat panel displays. Its hybrid design combines the ultra smooth velocity control of air bearings with the high rigidity of precision ground recirculating bearings. The result is a high performance system that is smooth enough to handle scanning applications yet responsive enough to achieve fast point-to-point indexing moves. The system has a load capacity of 100 kg, an Y-axis travel of up to 1360 mm, and fits within an area of only 2.2 x 2.9 meters.

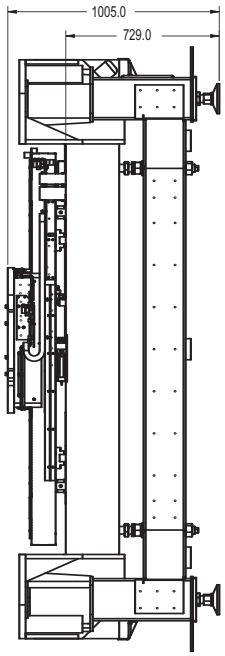
The hybrid XY configuration consists of an upper scanning X-axis mounted on a lower stepping Y-axis. The scanning axis features a sturdy aluminum carriage that smoothly glides along a rigid engineered-ceramic beam. The carriage is magnetically preloaded and supported by lift, and guide air bearings, which reference optically flat surfaces ground along the length of the beam. The lightweight ceramic beam is mounted to the lower stepping axis via four preloaded carriages, that accurately track along a pair of precision ground linear rails. Both the X and Y axes are actuated by Anorad's patented linear servo motors, and receive feedback via linear incremental optical encoders capable of 0.5 nm resolution. The zero-cogging brushless linear servo motors act along the centerline of each axis, and are sinusoidally commutated to maximize smooth scanning performance.

Optional features of the Microglide FP1300 include; a rigid granite bridge with 200 kg capacity for mounting overhead optics; passive or active vibration isolation systems; optional Z, theta, tip and tilt axes; and XY error mapping for sub-micron absolute positioning accuracy.

Microglide FP1300 Dimensions (mm)

Carriage mounting holes are made to meet specific end user requirements.





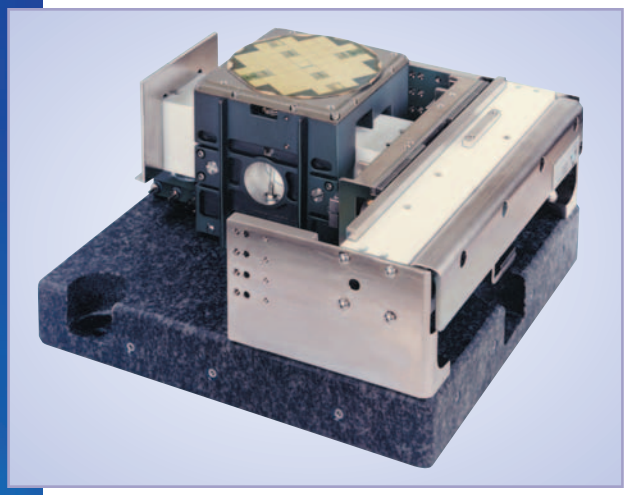
Specifications

Performance Specifications	Units	Model FP1300
Travel [1] (X-Y)	mm	1150 x 1360
Feedback System	–	Optical Linear Encoder
Resolution [2]	nm	0.5 - 500
Repeatability	µm	± 0.5 X ± 1.0 Y
Positioning Accuracy [3]	µm	± 1.5 X ± 2.5 Y
Flatness of Travel	µm	± 3.0 X ± 6.0 Y
Straightness of Travel	µm	± 3.0 X ± 4.0 Y
Orthogonality	arc-sec	± 3.0
Pitch, Roll, and Yaw	arc-sec	± 5.0, ± 5.0, ± 2.5
Maximum Load Capacity [4]	kg	100
Maximum Velocity [5]	mm/s	500
Maximum Acceleration [4]	m/s [2]	10
Scanning Velocity [5]	mm/s	350
Average Velocity Ripple [6]	%	1.0
Position Stability [6]	counts	± 2

Notes: Specifications are based on overall travel of each axis (significantly better positioning accuracy is possible over shorter travels) and operation in a controlled environment with Anorad approved vibration isolation system. Additional performance, travel, and configuration options are available. Contact Anorad for details.

[1] Additional 3 mm overtravel at each end before hard-stops.
[2] Resolutions available to 0.5 nm (8192 x encoder multiplier).
[3] After error mapping axes.
[4] Load based on lift bearing capacity. Applied load may determine maximum acceleration.
[5] Dependent upon system resolution and data rate.
[6] Typical dynamics for configured load, acceleration, velocity, resolution and data rate.

Engineered-to-Order Systems



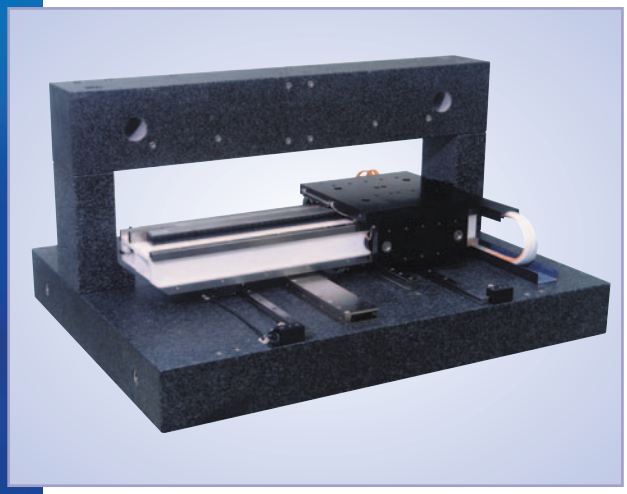
Fast-Turn Gate Array Prototyping

- Coplanar XY air bearing system
- Compact design with 50 mm x 50 mm travel
- Rigid ceramic beams with lapped granite base
- Interferometric encoders with 2 nanometer resolution
- Zero-cogging linear motors
- Class 10 cleanroom compatible



Hi-Resolution Computer-to-Plate (CTP) Stage

- 1000 mm travel single axis stage
- 0.01% constant velocity control
- Magnetically preloaded air bearings
- Sinusoidally commutated zero-cogging linear motor
- Completely non-contacting design

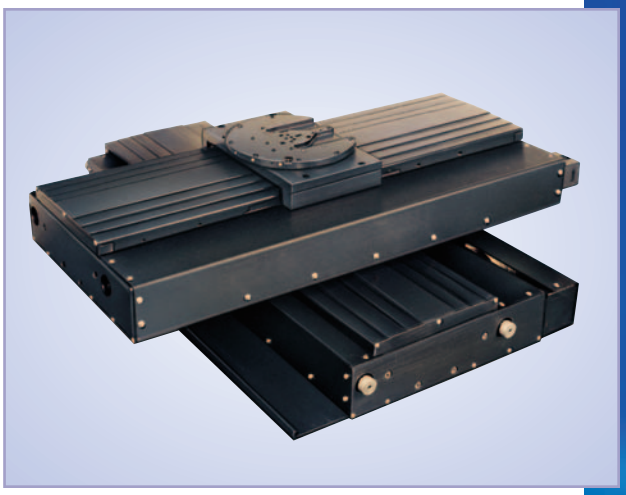


Bumped Wafer Inspection System

- Cost effective hybrid bearing design
- Air bearing scan axis and mechanical bearing step axis
- Engineered ceramic matrix composite beam for maximum stiffness
- SEMI S2, S8, and CE compliant
- Class 100 cleanroom compatible

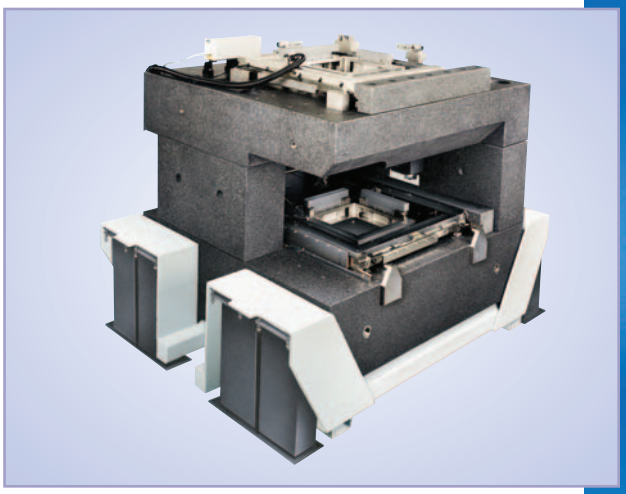
Wafer Inspection XY Stage

- Modular stacked air bearing stage assembly
- Integral wafer chuck
- Internal cable management



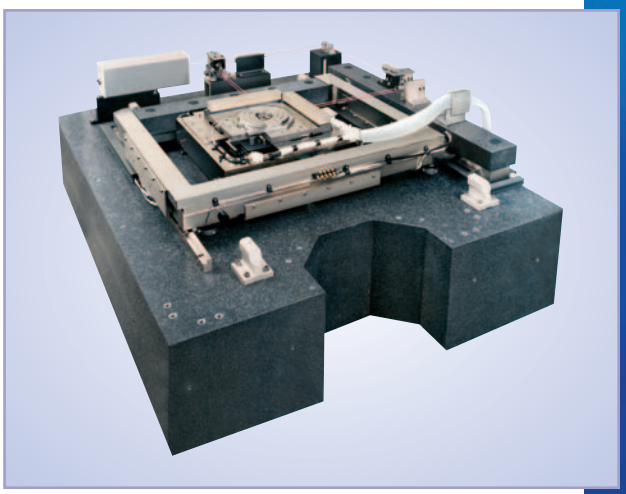
Wafer Stepper Lithography System

- Dual, parallel, nested coplanar XY air bearing stages
- Plane mirror laser interferometer feedback
- Active damping minimizes vibrations
- Dynamic environmental isolation

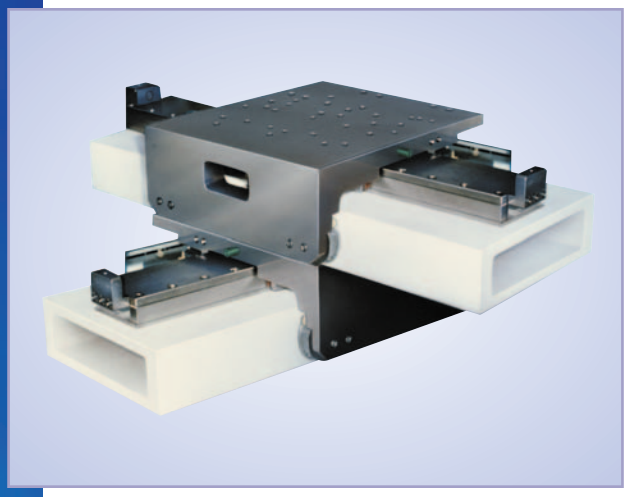


Six-Axis Wafer Stepper

- High accuracy nested coplanar XY platform
- Integral Z, theta, tip, and tilt axes
- Custom vacuum chuck for automated wafer handling
- Plane mirror laser interefometer feedback

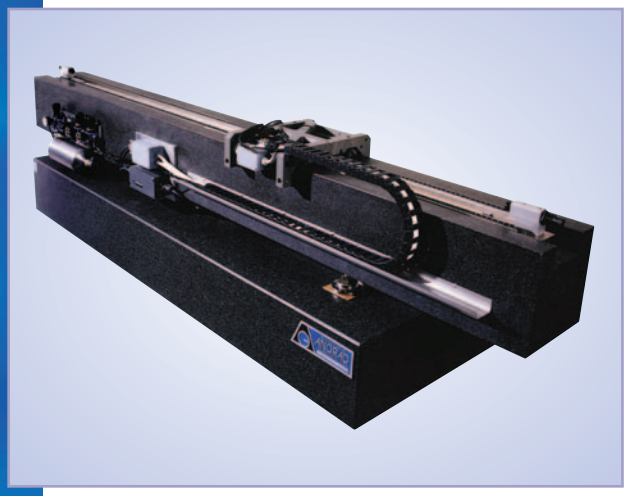


Engineered-to-Order Systems



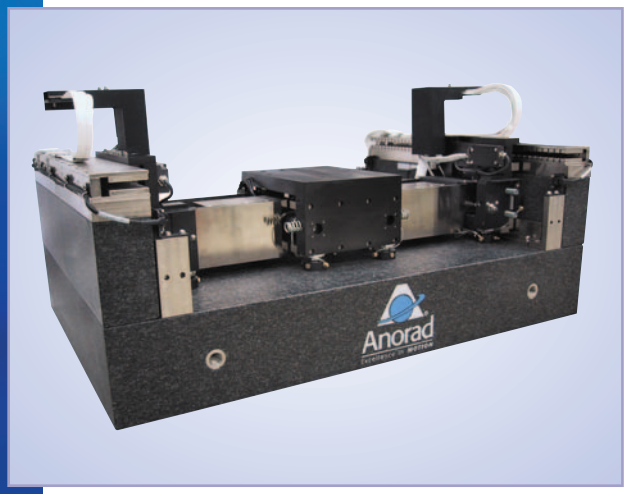
Thin Film Measurement Stage

- Ultra-precision stacked XY air bearing system
- Completely non-contacting design
- Magnetically preloaded air bearings, optical encoders, and zero-cogging linear motors
- Precision lapped, ceramic matrix structure for maximum stiffness and tight geometric tolerances



High Speed Product Life Testing Stage

- 2000 mm travel single axis air bearing stage
- Velocity to 8 m/s
- Acceleration to 60 m/s^2
- Dual zero-cogging epoxy core linear motors
- Light weight, high stiffness aluminum carriage
- Stable granite base



XY Theta Wafer Positioning Stage

- Three axis coplanar air bearing system (XY Theta)
- One degree theta motion via engineered flexures with dual independently driven Y axes
- Eliminates separate theta axis for wafer alignment
- Dynamic yaw and straightness compensation
- Resolution to 1 nm with 1 m/s maximum velocity via proprietary 4096x encoder multiplication

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