

nanoline™



nano XY



C-MAX 100

nanoline™ Ceramic Servo motor driven positioning systems are useful for any application which demands precision and reproducibility at nanometer or even sub-nanometer levels. These applications include numerous types of microscopy and nano-alignment, micro and nano-manufacturing and optical positioning

- **Ultra-high precision guiding system provides stable trajectory across long travel in all nanoline™ configurations.**
- **Ceramic servomotors are used in the nanoline™ series positioning stages. A range of motor sizes allows precision matching of driving forces to various payloads and motion profiles.**
- **High-resolution encoders systems are incorporated to allow precise position feedback and closed loop digital servo control.**
- **Low single digit nanometer positioning and stability capability.**

Features and Benefits nanoline™ Positioning Stages

A great advantage of piezo motors is their intrinsic steady-state auto-locking capability. It does away with servo dither and the accompanying heat generation, an undesirable characteristic of electromagnetic linear motors. Ceramic servomotors are in principle nonmagnetic and vacuum-compatible, a requirement for many applications in the semiconductor industry. With a very compact size direct-drive ceramic motors allow design of ultra-compact translation stages.

Low Inertia allows high acceleration, speed and resolution. The nanoline™ stages achieve velocities to 200 mm/sec. They are also very stiff, a prerequisite in any fast step to-and-settle in position application. Settling time can be on the order of a few milliseconds with position resolution 10 nm. The absence of a leadscrew means no lubricant contamination and material relaxation causing observable sub-micron creep.

The nanoline™ series stage automatically create a powerful braking force when not energized without causing the position shift common with conventional mechanical brakes. This feature eliminates servo dither and steady-state heat dissipation providing rock solid in-position stability.

Vacuum compatible versions of nanoline™ positioning stages are available as standard options.

Applications

The Piezo drive is a low power drive engineered for precision actuation of light loads where the stage mass and user payload is typically below 20 kg. Applications include small and high precision systems in semiconductor, optics, metrology, micro-machining, MEMS laser, photonic biomedical and other leading edge deployments with high precision positioning requirements.

Available in wide range of sizes with slides ranging from 50-150 mm wide, and stage travel ranges from 10mm up to 1000 mm, nanoline™ series linear stages are based on a high true trajectory crossed roller or patented hybrid bearing guide system. A non-contact linear encoder provides a position feedback signal enabling closed loop position control. Encoder system resolution ranges from 1 µm to 10 nm depending on customer requirements.

The nanoline™ Stages

Specifications	ALL nanoline™
Travel	10 mm- 1000mm 360 continuous rotation
Drive Elements	1- 8 elements per axis
Drive Type	Ceramic Servomotor
Accuracy	1-5 micrometers/meter
Repeatability	± 1 encoder count
Material	Aluminum Alloy
Finish	Hard coat anodize Grey Bare metal for vacuum Electro-less Nickel

Drive Capacities	M-100	M-200	M-400	M-800
Peak Force (N)	3.5	7.0	15	30
Static holding force (N)	3.5	7.0	14	28
Resolution	<100 nm	<100 nm	<100 nm	<100 nm
Lifetime (hours)	20,000	20,000	20,000	20,000
Max.Velocity (mm/sec)	200	200	200	200

Linear Motion X-trim nanoline™

Configuration	Model
Single Axis	XT 25, XT 50, XT 75 and XT 100
Dual Axis (3-tier design)	XT 2525 and XT 5050
Dual Axis (Modular)	X 7575 and XT100100

Z-axis Motion ES nanoline™ Compact Elevator Stage

Configuration	Model
Standard 10 mm travel	ES n 10
Long Travel 40 mm travel	ES n 40
High Precision	ES n 10 Hp

Rotary Motion C-Max nanoline™ Low Profile Rotary Stage

Configuration	Model
100 mm hub x 38 mm high	C-Max 100
50 mm hub x 38 mm high	C-MAX 50
150 mm hub x 38 mm high	C-MAX 150

nanoline™ Accessories

A range of specialized configuration positioning stages, are based on the essential components of the nanoline™ stages. The nanoline™ series stages operate as a single-axis or in multi-axis configurations. Some examples are; the XY table configuration executed in a 3-tier design, a 3-axis XY& Z configuration including our wedge driven elevator system and an extremely low-profile C-Max rotary positioning stage. Vacuum rated and non-magnetic versions are standard options. Variants of these stages can be adapted for use in either clean rooms or vacuum chambers while preserving all of their desirable high performance characteristics. These positioning stages can be factory equipped, tuned and tested with user supplied payloads or custom fabricated tooling.

Stage Resolution

Resolution is defined as the smallest incremental position value, which can be detected by the evaluating electronics as the saddle or hub moves relative to the base. Resolution is developed by the combined effect of the scale grating period specified, in microns per increment and an electronic multiplying factor determined by the counting electronics.

Three configurations of electronic pulse counting systems are available in the nanoline™ product. All nanoline™ positioning stages share the same native analogue 1 Volt P-P encoder read head. This output is directly compatible with our MICROMATIC series controllers and most other high-performance servo controllers.

Lower cost and performance controllers may require direct TTL encoder input signals. The nanoline™ series accomplishes this with either an in-line analogue to TTL pulse converter or a high performance signal conditioning box. The In-line TTL conversion is achieved with a defined interpolation factor, 1x, 25x, or 50x. The external signal conditioning box is used where higher resolution is required and operates with interpolation factors of 100x, 200x and 400x.