

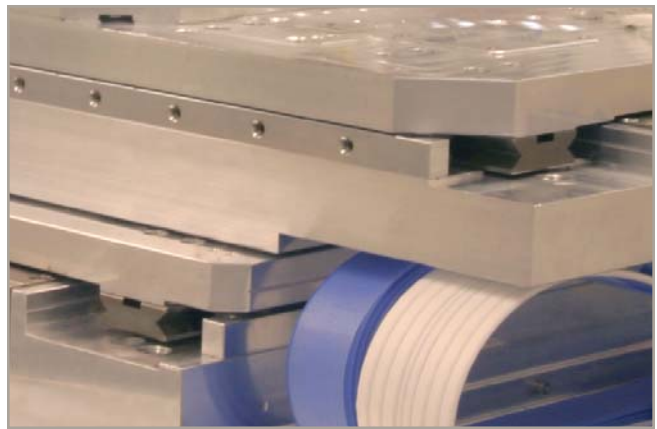
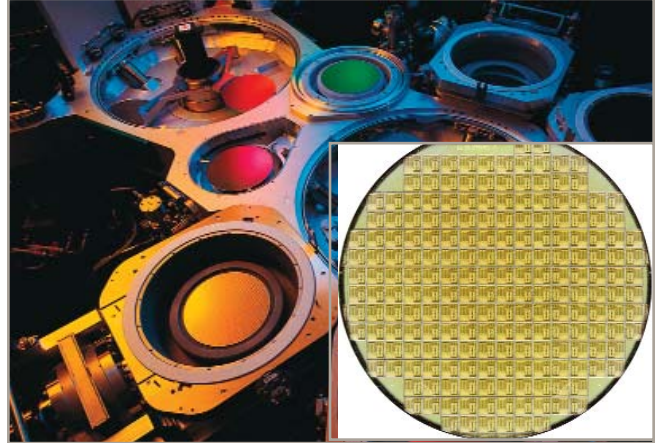
# The Aerotech Vacuum Advantage

Aerotech's vast application experience, unmatched product scope, and extensive engineering capabilities make us the partner of choice for vacuum-compatible motion systems. Since its inception, Aerotech has designed and manufactured the highest-performance motion control and positioning systems available, and our vacuum-compatible platforms are no exception. Aerotech's precision motion control products provide the critical performance for today's demanding vacuum applications in markets such as semiconductor manufacturing and inspection, optics fabrication, and military/aerospace.

Always guiding our vacuum system development effort is Aerotech's motto: "*Dedicated to the Science of Motion.*" This means that Aerotech is constantly developing motion control products and services that provide:

- **The lowest cost of ownership**
- **Highest throughput**
- **Highest accuracy**
- **Best return on investment**

A wide variety of standard Aerotech motion products are available in vacuum-prepared versions. In addition to standard platforms, Aerotech routinely manufactures custom systems designed to meet application specific needs. All Aerotech's vacuum compatible motion platforms minimize pump downtime, chamber contamination, and



*XY linear motor driven motion system showing several key design elements that allow stage operation in high vacuum.*

## Aerotech Has Specific Experience with Vacuum-Compatible Motion Platforms

- **Material selection**
- **Surface preparation**
- **Hardware venting and elimination of trapped volumes**
- **Lubricant selection**
- **Thermal management**
- **Magnetic field control**
- **Cleaning**
- **Bakeout**
- **Handling and packaging**

## Aerotech's Vacuum Experience Includes a Wide Variety of Applications

- **EUV Lithography**
- **Scanning Electron Microscopy (SEM)**
- **Ion-Beam Profiling**
- **E-Beam Inspection**
- **Ion implantation**
- **Deposition**
- **Satellite Component Testing**
- **Optics Polishing**

## Vacuum Preparation

thermal issues. In addition, these systems can incorporate key application considerations like reduction of magnetic fields.

Vacuum options available from Aerotech:

- **Low Vacuum Option ( $10^{-3}$  torr)**
- **Standard Vacuum Option ( $10^{-6}$  torr)**
- **High Vacuum Option ( $10^{-8}$  torr)**

Most Aerotech stage products are available with modifications for either low vacuum ( $10^{-3}$  torr) or standard vacuum ( $10^{-6}$  torr) use. Custom designs are available that are certified to high vacuum ( $10^{-8}$  torr).

### Material Selection

Because acceptable materials vary according to vacuum level, application, operating temperature, etc., Aerotech offers a broad array of options that control total mass loss (TML) and collectible volatile condensable materials (CVCM). For key design components, Aerotech does the following:

- **Lubricants:** Low vapor pressure lubricants are selected to be compatible with the vacuum level and the customer's process (e.g., elimination of hydrocarbons).
- **Cable Management System (CMS):** CMS construction and materials typically utilize Teflon® insulated wires (MIL-C-27500) along with specialized electrical connectors that utilize a variety of materials including PEEK™. Other cable and connectorization options are available depending on the application requirements.
- **Surface Finish:** Surface finish options include bare aluminum, electroless nickel, or vacuum-compatible paint (Aeroglaze Z306).



*Star Tracker Tester. Standard vacuum ( $10^{-6}$  torr) AOM360 series gimbal mount.*

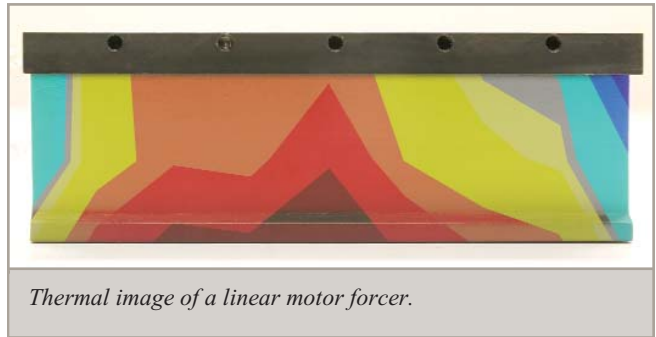
- **Hardware:** Systems use vented stainless-steel fasteners for all blind holes and all potential air traps are vented.

Aerotech has always worked very closely with our customers to ensure that the system meets or exceeds outgassing requirements.

### Thermal Management

Thermal management is key in vacuum systems because they cannot rely on convection for the removal of heat from the motors and bearings. Without thermal management methods, stage performance and life can be reduced from that of an equivalent system operated in atmosphere. This is why Aerotech has put forth a considerable effort in the development of thermal isolation methods and passive and active cooling techniques. These techniques help to maximize conduction modes of cooling and reduce or eliminate heat sources inside the chamber.

### Servomotors



*Thermal image of a linear motorforcer.*

Design of linear and rotary servomotors is critical to vacuum system operation because they are the primary heat source. This is why Aerotech designs and builds motors to specifically address the issues associated with motors in vacuum. From special materials of construction to magnetic circuit design, Aerotech servomotors are optimized for minimal outgassing, high force/torque per unit volume, and long life.

### Magnetic Field Management



*Example of a shielded linear servomotor.*

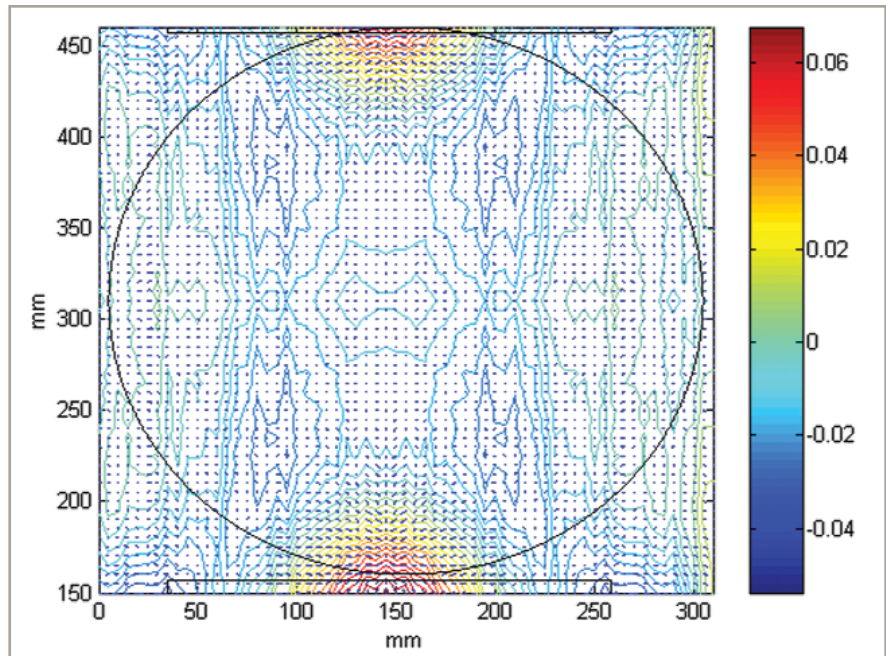
## Vacuum Preparation

Certain vacuum applications require very low magnitude magnetic fields as well as minimal field fluctuation at the system work point. Existence of either of these conditions can cause process related problems. Aerotech addresses these “AC” and “DC” field issues through use of specialized shielding techniques, special magnet track design, and use of non-magnetic materials. In addition, the mechanical system is designed to keep the motor coils and magnets well away from process work points.

### Handling/Cleaning

Handling is critical in maintaining the integrity of a vacuum stage system. Vacuum systems are assembled in Aerotech’s expansive cleanroom by precision assemblers wearing polyethylene, powder free gloves. All parts are thoroughly cleaned to remove oils and other contaminants. Following cleaning, components are packaged in heat-sealed nylon or particle-free polyethylene bags. Where required, component-level bake-out is available.

For more information regarding Aerotech’s Vacuum Advantage, please contact a member of our knowledgeable sales staff.



*Actual magnetic field measurement over a 300 mm diameter target zone.*



*Aerotech’s expanded cleanroom facility is ISO 14644- 1 Class 6 (Federal Standard 209E Class 1000) with cell specific ISO Class 5 (Class 100) capabilities. The large active area includes pre-/post-dressing areas, dedicated product transfer, and large main product assembly areas.*