

# Custom Linear Motor Stages for High Precision Applications

High Quality and Production Solutions for OEM's

aerospace  
climate control  
electromechanical  
filtration  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



ENGINEERING YOUR SUCCESS.

# High Precision Custom Linear Motor Stage Solutions for OEM's

As OEM's of various industries continue to develop new technology, their application requirements more than ever are demanding specific criteria for their motion control solutions. Typically, an ideal solution for OEM's has the smallest form factor possible while being able to maintain high speeds and high positioning accuracy. Whether if it's a single axis actuator or complex multi-axis system, linear motor stages are the ideal product to achieve these needs of the customer's application.

Parker's dedicated electromechanical business is an industry leader in servicing positioning applications that require linear motor stages. Whether you need one component or an entire integrated system, Parker has the right solution for you. When Parker's unmatched portfolio of electromechanical solutions doesn't solve an application need, we can provide a custom solution specifically designed and manufactured for an OEM customer.

Covering a broad spectrum of requirements at various levels of integration and complexity, Parker provides its customers with "Perfect Fit" solutions.



## Selectable Levels of Integration™ Offer "Perfect Fit" Solutions

Selectable Levels of Integration™ is a philosophy of product development and management. A machine builder can choose the appropriate system, subsystem, or component that meets their specific need.

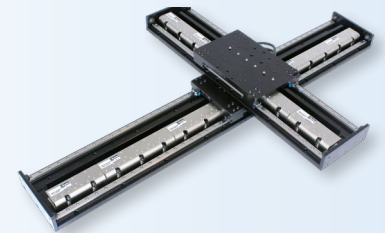
Parker designs solutions for machine builders of all types, whether you need a complete, integrated system or want to

build your own with the tailored components that match your performance and price requirements.

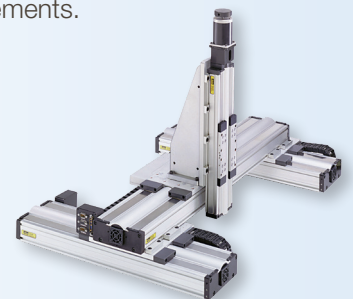
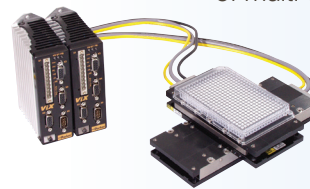
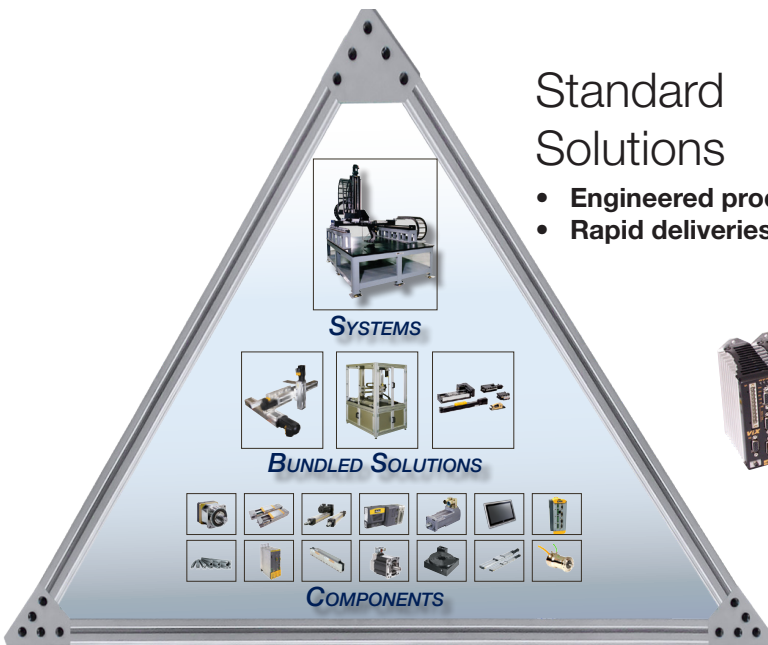
From comprehensive systems to single products, we'll help you create the best solution for your business.

### Standard Solutions

- Engineered products
- Rapid deliveries



Standard LXR's, mSR's and many other Parker linear motor positioners are pre-configured into a wide variety of multi-axis arrangements.



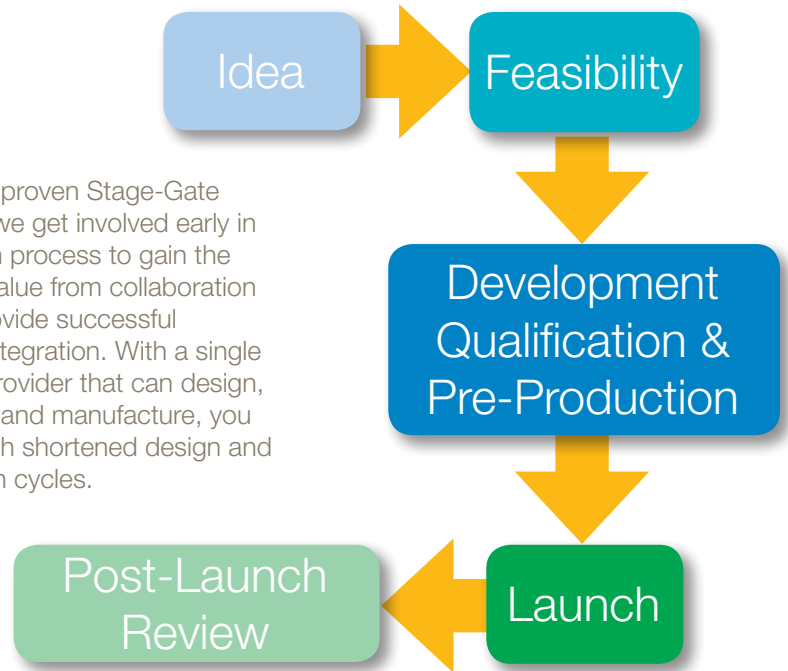
# High Precision Custom Linear Motor Stage Solutions for OEM's

From Start to Finish, Concept to Launch...  
Parker Helps Ensure Your Success.

Parker does more than just offer component parts, specific application customization, and special component testing. Our advanced manufacturing and assembly process allows us to build quality and consistency into every element of your motion system. Parker also integrates the full range of its technologies into engineered subsystems that reduce an OEM's technical risk, as well as lower its development cost.

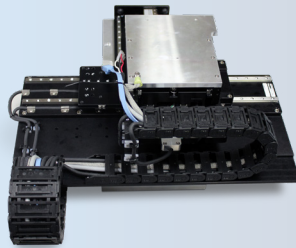
Our engineers have the industry expertise along with the manufacturing and project leadership to ensure our solutions work seamlessly in your system. They will assist you with application and product assistance throughout the stages of your project and for the life of the product.

Using our proven Stage-Gate Process, we get involved early in the design process to gain the greatest value from collaboration and to provide successful product integration. With a single solution provider that can design, prototype and manufacture, you benefit with shortened design and production cycles.



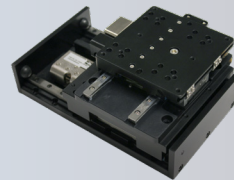
## Modified Solutions

- Bundled subsystems
- Added engineering value
- 3-6 week delivery

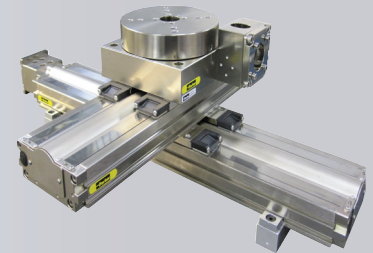
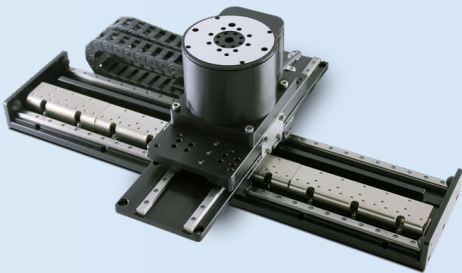


## Custom Solutions

- Engineered to specifications
- Stage-Gate Process synchronized with the OEM



Custom single and multi-axis motion control systems for servo and/or stepper motors



Specialized designs, materials, finishes, fixturing, performance...we have the technology, the capability and the expertise!

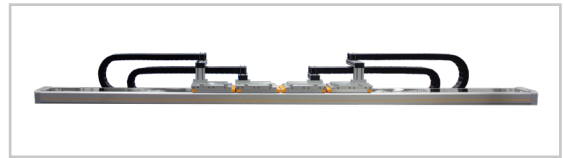
# Critical Application Characteristics Parker Provides

## Partner with Parker for Your Automation Requirements

Applications requiring a linear motor stage each have their own set of automation requirements from start to finish. Parker can fulfill these needs throughout the process.

### Types of Custom Stage Solutions

- Single Axis
- XY Stages (including Monolithic and open-framed)
- XYZ Cartesian and Gantries
- Single or Multi-axis with rotation
- Large footprint & Long Travel Systems
- Granite or steel base machines
- Contact us about your design!



### Custom Product Design Options

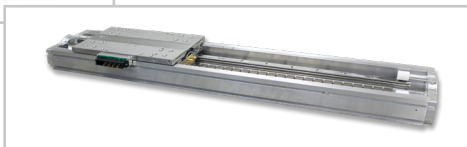
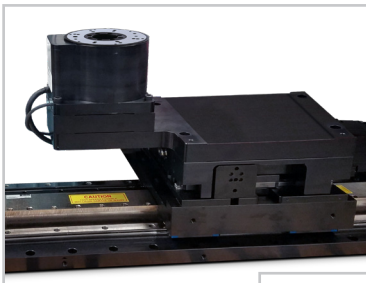
- Custom Carriages – size, multiple on one stage, etc.
- Base material (alloy vs. stainless) and size
- Special coatings (ex. electroless nickel plated or black anodized)
- Special connectors and cable management
- Custom mounting holes
- Magnetic counterbalance for vertical applications

### Custom Stage Attributes

- High precision, sub-micron positioning (laser interferometer tested)
- Meets demanding step and settle time requirements
- High stiffness of system (flatness and straightness)
- Low velocity ripple
- Low Abbe errors
- High speed motion - 5 m/s
- Low maintenance

### Environmental Options

- Clean room
- Vacuum
- High Humidity
- Extreme Temperatures
- Radiation
- Certain IP Ratings

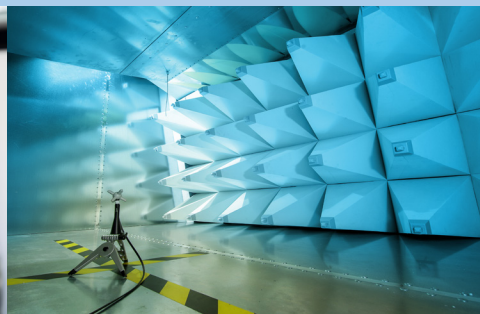


## Custom Linear Motor Stage Options Parker Provides

Parker offers product and service unrivalled in the electromechanical field. Contact our application engineering department early in your design cycle to discuss your requirements. We'll help you find the right solution and help shorten your design and product cycles



Precision Metrology



EMI Testing



Clean Room Testing

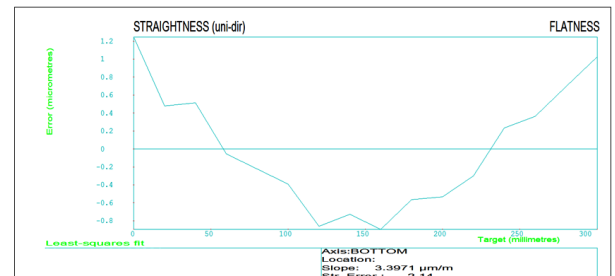
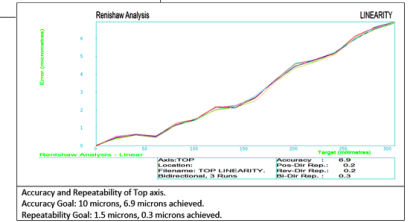
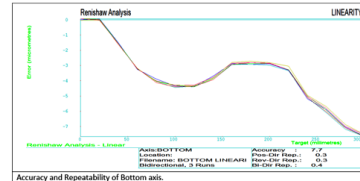
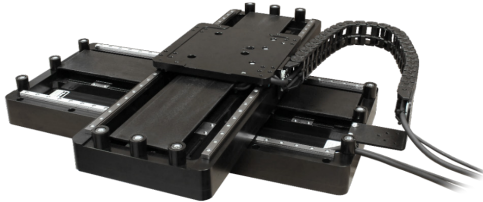
# Critical Application Characteristics Parker Provides

## Custom Design Success Story

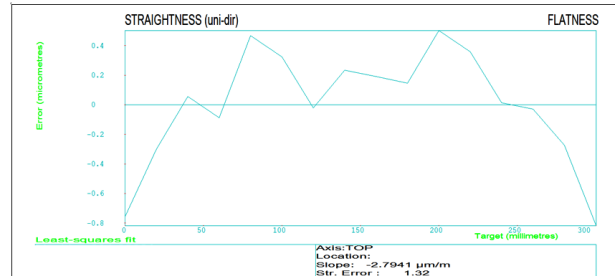
**Application:** Laser Line scanning, Digital Inspection / Metrology

**Standard solution:** Good choice for accuracy and repeatability

**Custom solution:** Provided accuracy and repeatability, plus the optimal flatness and cable management outcomes that the customer needed.



Flatness of travel of the bottom axis.  
Accuracy Goal: +/-4 microns, +/-1.2 microns achieved.



Flatness of travel of the top axis.  
Accuracy Goal: +/-4 microns, +/-0.8 microns achieved.

Performance graphs for custom XY system.

### Application Requirements

### Design Outcome

Bottom Axis      Top Axis

Flatness and Straightness less than +/- 4 µm over 300 mm x 300 mm travel zone	+/- 1.2 µm	+/- 0.8 µm
Repeatability of 1.5µm	0.4 µm	0.3 µm
Total Accuracy of 10µm	7.7 µm	6.9 µm
Additional room inside cable management	Internal cable management on X axis to maximize bearing spread	

### Design Benefits

- High stiffness machined base plates
- No sealing to optimize carriage stiffness
- Monolithic design to reduce part count and increase stiffness
- Planar cable management on Y to allow for pass through of customer cables and provide large bend radius



Life/Reliability Testing



Stage/System Burn-in



Test Stand Development

## Partner with Parker for Your Custom Linear Motor Stage Requirements

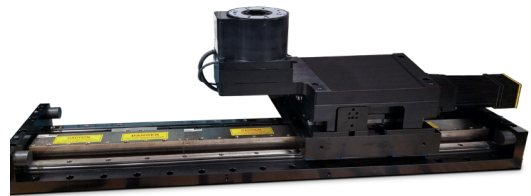
Key applications across various markets all require certain types of precision specifications to obtain the desired results. While there are some variances, the types of applications can be classified into categories. No matter the type, Parker has the ability to provide industry leading specifications required by the customer.

Parker engineering designs custom linear motor stage solutions with all critical specs considered for the application, such as those listed below.

### STATIC METROLOGY

Static Metrology is when the sample is not in motion while being measured by the metrology instrument. Key factors for these applications are precise control of settling time and stability. Parker has designed custom linear stages to specifications meeting these requirements including:

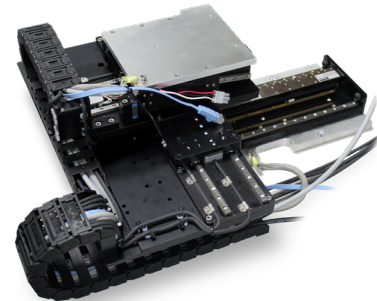
- Stability to sub 100nm
- Move and settling times in under 100msec
- Sub-micron repeatability (500nm)



### DYNAMIC METROLOGY

Dynamic Metrology is when the sample is in motion while being measured by the metrology instrument. Key factors for these applications are precise control of velocity and the stage's profile (flatness, stiffness, etc). Parker has designed custom linear stages to specifications meeting these requirements including:

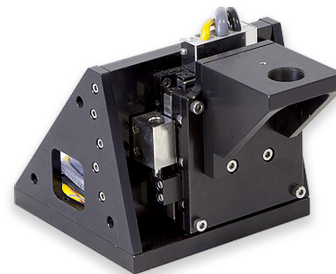
- Sub 20 arc-sec Abbe Errors (roll, pitch, yaw)
- Straightness & Flatness (+/- 3 microns)
- Constant Velocity to meet application needs



### FOCUSING

The final type are applications requiring a motion of axis for focusing on the sample being measured. Usually, this axis has a vertical orientation. Key factors for these applications are having high resolution and stability. Parker has designed custom linear stages to specifications meeting these requirements including:

- Resolution down to 50nm
- Stability to sub 100nm
- Move and settling times in under 100msec



# Linear Motor Solutions for Key Markets from Parker

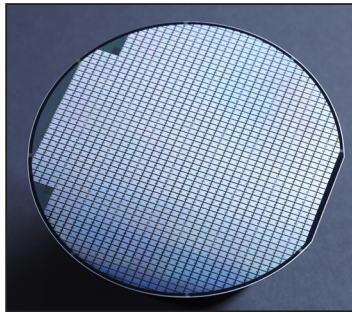
MARKET  
SOLUTIONS

## Partner with Parker for Your Custom Linear Motor Stage Requirements

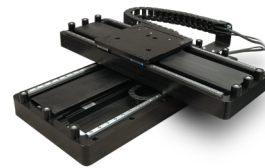
There are key markets where OEM's have a growing demand for custom linear motor stage solutions. While the application needs vary based on the market type, Parker has the technology and expertise to provide solutions for each one without jeopardizing quality. We utilize each project as a learning experience to continue improving our capabilities for the future.

Listed here are just some examples of applications our custom linear motor solutions can support.

### SEMICONDUCTOR MARKET APPLICATIONS



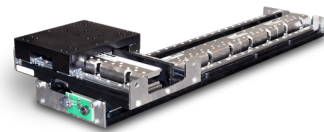
- Lithography
- Wire Bonding
- Wafer Inspection System
- Die Pick & Place
- Flat Panel Inspection
- Wet Bench Processing
- Wafer Handling Robot Tracks
- BGA Sphere Placement
- Photo-resist Processing



### ELECTRONICS MARKET APPLICATIONS



- Electronic device manufacturing
- Sensor testing
- Panel inspection
- Pick and place
- Glass (screen) inspection
- Metrology scanning
- Battery testing
- Laser line scan
- Non-contact inspection



### LIFE SCIENCE MARKET APPLICATIONS



- Medical Scanners
- DNA Micro-Array Spotter
- Microscopy
- High Content Throughput Cell Analysis
- Gene/DNA Sequencing
- Laboratory Automation
- Clean Room Assembly



MARKET  
APPLICATIONS

# Complete Automation Solutions

**PERFORMANCE.** Today's OEM applications demand customized performance in quality throughput, productivity, and precision. Miniaturization of applications has also created the need to partner with companies that have the experience and products which meet stringent specifications for smaller, more precise motion control solutions.

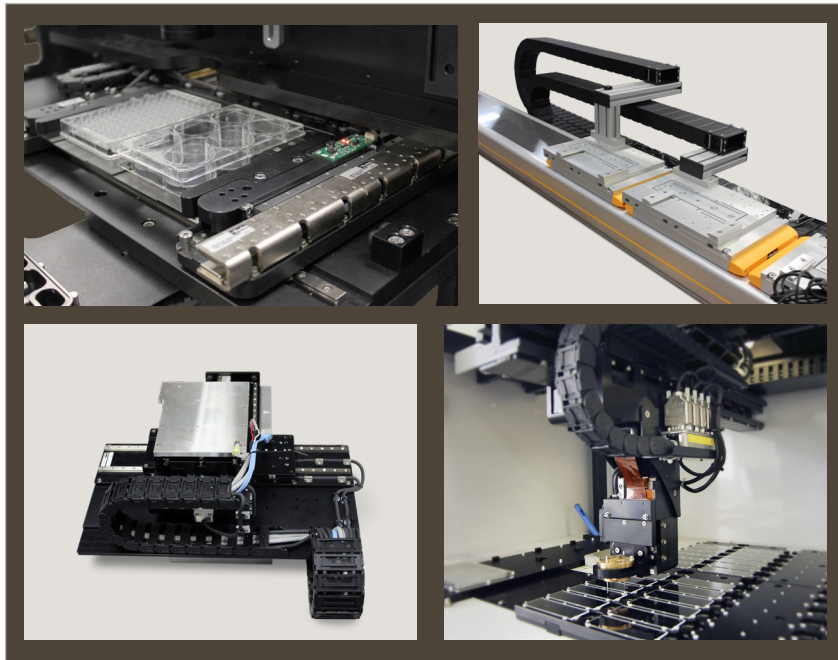
Parker offers the most comprehensive line of custom linear motor stages on the market today. Our customization ranges from highly precise specifications to designing a custom form factor. For OEM's of precision markets such as life science, semiconductor and electronics manufacturing, this means industry proven performance that is created specifically for your application.

**EXPERTISE.** Our automation expertise covers board-level electronics and single axis linear actuators all the way to complete automation solutions. We will work directly with your design team to develop motion and control solutions that seamlessly integrate to your finished products. Parker's extensive industry experience ensures that we can handle virtually any application you may have, helping to manage the risk of your instrument development.

Parker leverages its standard linear motor technologies to develop custom solutions for OEMs. We synchronize our stage-gate development process with the OEM's own timeline to ensure we meet the technical and timeline requirements. As part of the development process,

we also apply our standard Quality Management, Lean Manufacturing, and Supply Chain tools to ensure we meet the customer's reliability, target cost, and production ramp-up requirements. Plus, application and process validation support is available as needed.

**CAPABILITY.** Whether if the application is high precision, high-speed handling, or something else unique, Parker's Electromechanical Automation Division has the products and the capability to deliver a complete, custom linear motor solution for all markets.



## Why Parker?

A Fortune 250 company with annual sales exceeding \$12 billion and more than 450,000 customers in 104 countries, Parker Hannifin is the world's leading supplier of innovative motion control components and system solutions serving the life science, OEM, industrial, mobile, and aerospace markets. We are the only manufacturer offering customers a choice of electromechanical, hydraulic, pneumatic, or computer-controlled motion systems.

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