



**Clean Assembly and Manufacturing Solutions  
for the Scientific, Medical and  
Analytical Industries**





 DELIVERIES  
(OTHER THAN  
RAW MATERIAL) 

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 RECEPTION

# Company Introduction

## A specialist engineering company

Welcome to Reliance Precision, an independent family-owned company offering tailored engineering services for the design, manufacture and test of complex, precision mechanical components and assemblies. We are a specialist engineering company, unique in our offering of both catalogue products and fully bespoke solutions. We are an established supplier to a diverse range of markets including scientific, medical, semiconductor, photonics, defence, aerospace and space, capable of providing not only mechanical solutions but electro-mechanical, opto-mechanical and high-vacuum.

Founded in 1920, we have maintained a programme of investment to keep at the forefront of modern manufacturing and precision engineering. Our close working relationship with our customers continues to be an important factor in helping us understand how our equipment is used in their particular fields, allowing us to be continually innovative in our manufacturing processes and development of unique technical capabilities.



## Quality assured

Reliance is committed to providing high standards of quality in product and service delivery. We are approved to BS EN ISO 9001, AS9100 and have achieved the SC21 Supply Chain Programme's silver award for business excellence. We pursue an active environmental policy with accreditation to ISO 14001.



*"We chose Reliance because of their quality of work and responsiveness to tight deadlines, which were essential for our new product development."*

Vice President  
Operations and Technology  
Advion Inc.



# Products and Applications

## High performance systems

Reliance Precision is a specialist supplier of tested sub-systems to major equipment manufacturers in the scientific and analytical instruments, medical and laboratory automation, semi-conductor and photonics industries. A longstanding and successful track record in these industries ensures we have effective, established processes in place and the necessary technical expertise to provide consistently high standards of performance and delivery.

We supply custom-built sub-systems to specification, as well as offering our own design platforms, which can be customised to individual requirements. In-house developed software systems give us the flexibility to respond to the needs of our customers' own operational processes and bills of materials, whilst adhering to our manufacturing disciplines and maintaining essential build standard control.

The types of sub-system supplied are critical to the performance of the parent machine. We therefore take a very thorough approach to understanding the application for each customer's product in order to develop the most appropriate manufacturing methods. We also have specialist design engineering facilities, which complement and support our manufacturing capabilities.



## Scientific and analytical

Vacuum sub-systems such as quadrupole mass filters, optic rails, ion optics, ion sources and detector assemblies, sample cones and extraction cones for:

- GC, LC & ICP mass spectrometers
- MALDI & QToF mass spectrometers
- Materials analysis instruments
- Microscopy systems

## Medical and laboratory

Clean, high precision components and sub-assemblies, including specialist materials and coatings, for:

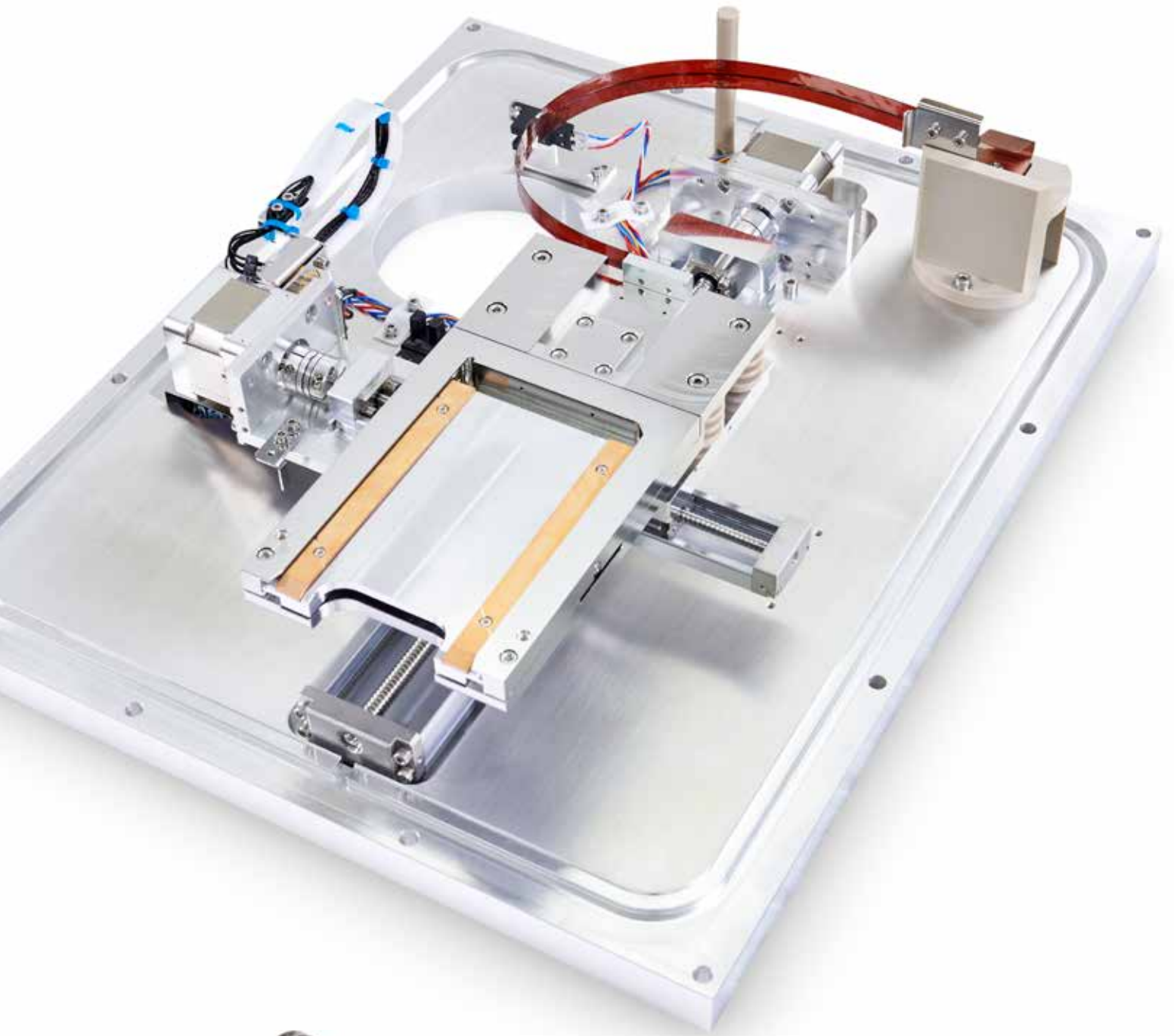
- Biomedical engineering
- Medical imaging
- Dosing and treatment systems
- Laboratory automation

## Photonics

Rotary and linear positioning systems, drive mechanisms and integration of electro-mechanical and optical assemblies for:

- Beam alignment
- Focusing mechanisms
- Optic positioning
- Optic mounting







# Manufacturing, Assembly and Test

## Delivering technical excellence

Critical components are manufactured in-house using unique capabilities for machining ceramics and other complex materials. Supply chain management secures specialist components such as electronics, optics and vacuum pumps, together with components from overseas manufacturing partners. All components have complete material traceability.

We understand that equipment supplied to the scientific instrument, semi-conductor and photonics industries requires extremely high levels of cleanliness in order to avoid contamination, which can result in ineffective performance of the parent equipment or latent failures in service. Our sub-systems are assembled in a suite of laminar flow cleanrooms capable of handling the most sensitive high vacuum and optical work, with appropriate combinations of cleaning processes selected from a range of adaptable state-of-the-art facilities.

Testing is core to our operational activity with all assemblies tested diligently and recorded in line with customers' specifications. In addition, having our own development team means that in-depth design analysis and verification can be undertaken, helping



resolve performance issues and validating performance against key functional criteria. We tailor the functional test methods to each customer's requirements so they replicate how the equipment will work in service.

## Cleanroom facilities

Over 450 m2 of assembly cleanrooms:

- Laminar flow cleanroom
- ISO 14644-1 Class 6 (Fed Std 209E Class 1,000)
- Laminar clean air flow cabinets
- ISO 14644-1 Class 4 (Fed Std 209E Class 10)
- Specialist opto-mechanical assembly cleanroom

## Cleaning facilities

Flexible state of the art facilities:

- Plasma cleaning
- Vacuum baking
- Solvent cleaning
- Acid cleaning
- Aqueous cleaning

## Test facilities

Validating functional performance by:

- Vacuum leak testing
- Pressure testing
- Ion beam testing
- Electrical conditioning testing
- Opto-mechanical testing

# Opto-Mechanical Assembly

## Optical integration

In addition to specialist capabilities in precision component manufacturing and electro-mechanical assembly, Reliance also supplies custom-built opto-mechanical assemblies, from static, mounted optics to fully integrated within a moving mechanical assembly. We work closely with customers and industry-leading optics suppliers in order to understand the application for each assembly. By fully appreciating the interaction of the optical and mechanical elements we are able to ensure the accurate positioning and robust performance of the optics in the mechanical environment.

## Dedicated clean assembly facility

All optical integration projects are undertaken in a dedicated cleanroom facility, adhering to the necessary disciplines and processes appropriate to working with precision optics. The cleanroom is certified to ISO 7 (Class 10,000), supplemented by laminar flow cabinets to ISO 4 (Class 10), together with certification to BS EN 61340 ensuring effective protection for sensitive electronic devices against electro-static discharge. The cleanroom is completely paper-free; all operations are managed via a suite of in-house designed software applications, using the latest wireless computing technology.



## Optics handling and inspection

Customer-approved disciplines, procedures and equipment to ensure the optical components are not subject to latent failure during operation:

- Visual inspection of optics to ISO 10110
- Customer inspection requirements - 100% or sample
- Non-contact handling, using vacuum devices
- Non-contact measurement, using optical CMM

## Assembly facilities and disciplines

Accurate mounting of optics using bespoke in-house designed and manufactured tooling and test equipment:

- Proven assembly disciplines to protect optic coatings
- Accurate bonding of optics, positioned to  $\pm 0.05\text{mm}$
- Experience in UV curing and epoxy bonding
- Outgassing in a controlled environment

## Tested sub-assemblies

Testing undertaken to customer specification, checking the movement of the optic as part of the overall mechanical assembly:

- Verification of optic positioning
- Verification of optic movement
- Supplied in high integrity packaging
- Shipped directly to the customer's clean assembly line







# Quadrupole Mass Filters

## Specialists in quadrupole manufacturing

One of our core areas of expertise is the ability to manufacture, assemble and undertake mechanical and functional testing of quadrupole mass filters for use in LC, QToF, GC, ICP, SIFT mass spectrometers and residual gas analysers. Reliance has over 20 years' experience

in the manufacture of quadrupoles. Through continued investment and development our capability has evolved into a state-of-the-art quadrupole manufacturing facility incorporating: close tolerance rod and ceramic grinding, assembly in cleanroom conditions, a diverse range of fully automated component and assembly cleaning methods, as well as mechanical and functional testing.

## Quadrupole development

In addition, our experienced design engineers have developed a standard quadrupole product and ion flight model, which enable us to provide a range of standard and customised products. We can supply our standard



quadrupole or use this as the basis to customise a design to suit individual customer applications. The ion flight modelling capability provides customers with a high degree of flexibility in the quadrupole design to meet their specific technical and commercial needs.



## Cost effective prototyping

The Reliance standard quadrupole has proven to be a very cost effective solution for use in the proofing and prototyping stages of our customers' designs and for use in lower volume instrument production.

## Product specification

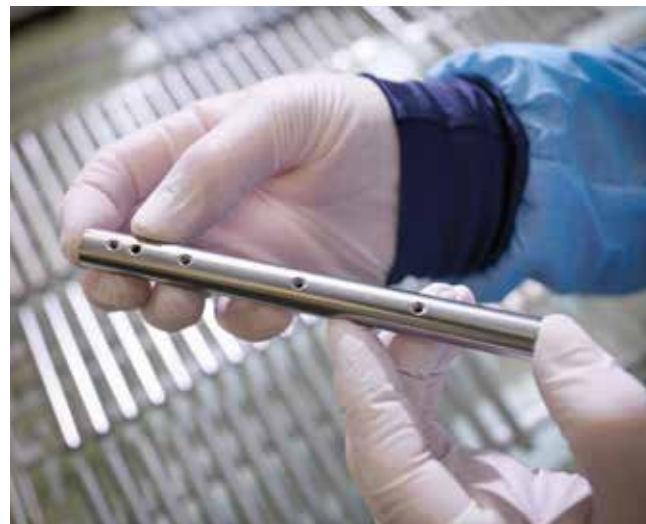
Our manufacturing processes are primarily based around electrode rods of 12 mm diameter, up to 200 mm in length, dimensions and features of which can be produced to precisions of 20 parts per million. We also have the capability to manufacture electrode rods in diameters from 6 mm to 12 mm. To complement this, the mechanical dimensions of the parts and assemblies can be determined down to hundredths of a micron, using Reliance's unique test equipment.

## Choice of materials

We have the capability to manufacture electrode rods from a variety of different materials including molybdenum and stainless steel. Our standard range of collars are manufactured in high purity ceramic, but alternative materials, such as high performance engineered plastics, can be applied.

## Additional options

The standard quadrupole can be adapted to include additional options such as pre and post filters, mounting saddles, electrical connections and interfaces.



# Quadrupole Ion Flight Modelling

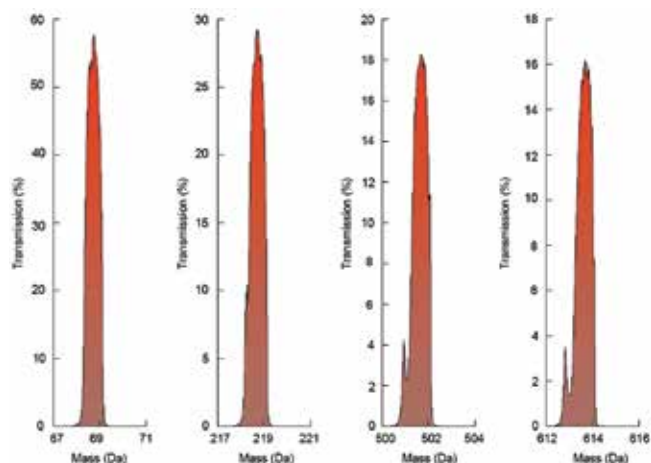
## Customising the quadrupole design

Quadrupole mass filters require a very high degree of mechanical accuracy. In an effort to help reduce our customers' time-to-market on new instrument designs, or indeed help to identify potential performance issues with existing instrument designs, Reliance has developed a computer model which simulates ion trajectories for quadrupole analysis.

The modelling software is a key enabling tool, not only to aid customisation of the quadrupole design, but also to assess the manufacturing and assembly issues involved in making the quadrupole. It allows us to determine the ideal manufacturing strategies and test methods to meet the performance requirements, both of which are fundamental to reducing time-to-market for new products.

## Optimising performance

Reliance's modelling capability allows our customers a high degree of flexibility in the design of their quadrupoles and assists with optimising the design in terms of cost and performance.



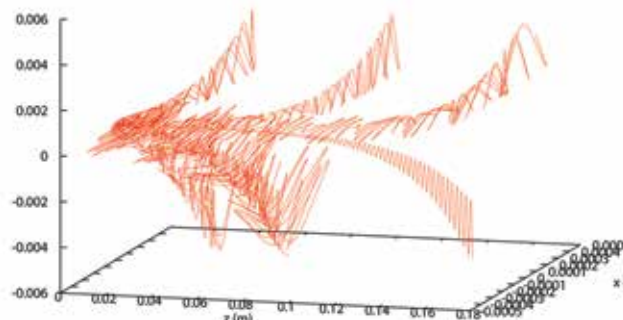
## Introducing the ion flight model

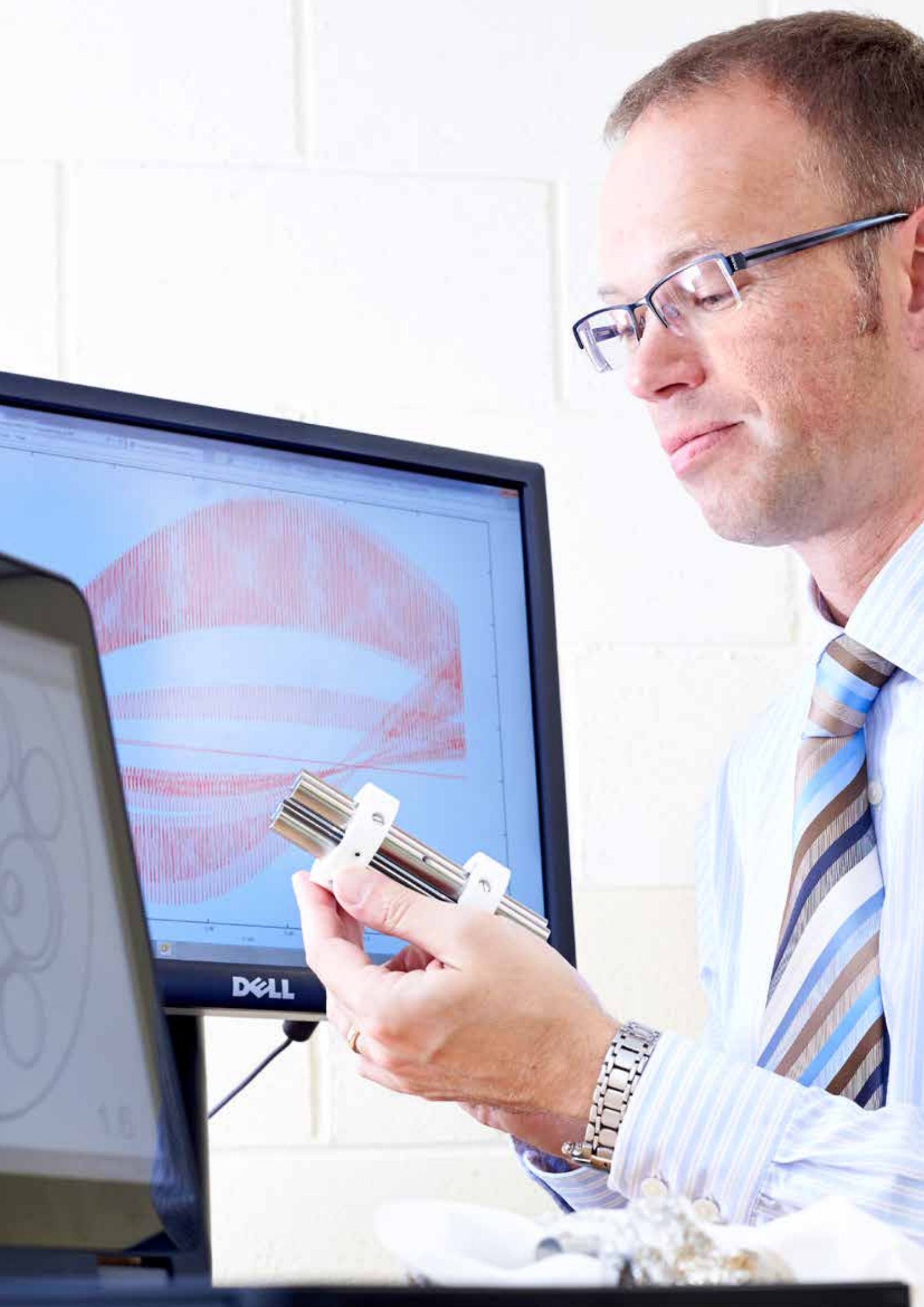
The computer model is used to evaluate the design of a quadrupole against its required performance criteria. Tolerance details for size, straightness, orthogonality, symmetry, positional accuracy, curvature, taper, and parallelism can be studied, and tolerances specified in relation to the customer's application.

The model can produce details of ion entrance conditions, trajectories, and exit conditions as well as representative mass peak shape calculations. Transmission versus resolution can be rapidly assessed for any design, enabling the optimum ion injection conditions to be specified.

Using the customer's parameters for their quadrupole application, ions are injected in a round beam into the model, parallel to the Z-axis. Their trajectories through the quadrupole are then calculated by numerically solving a set of ordinary differential equations derived from the Mathieu equation. Only ion trajectories that pass through the circular aperture of the exit filter are regarded as having been detected.

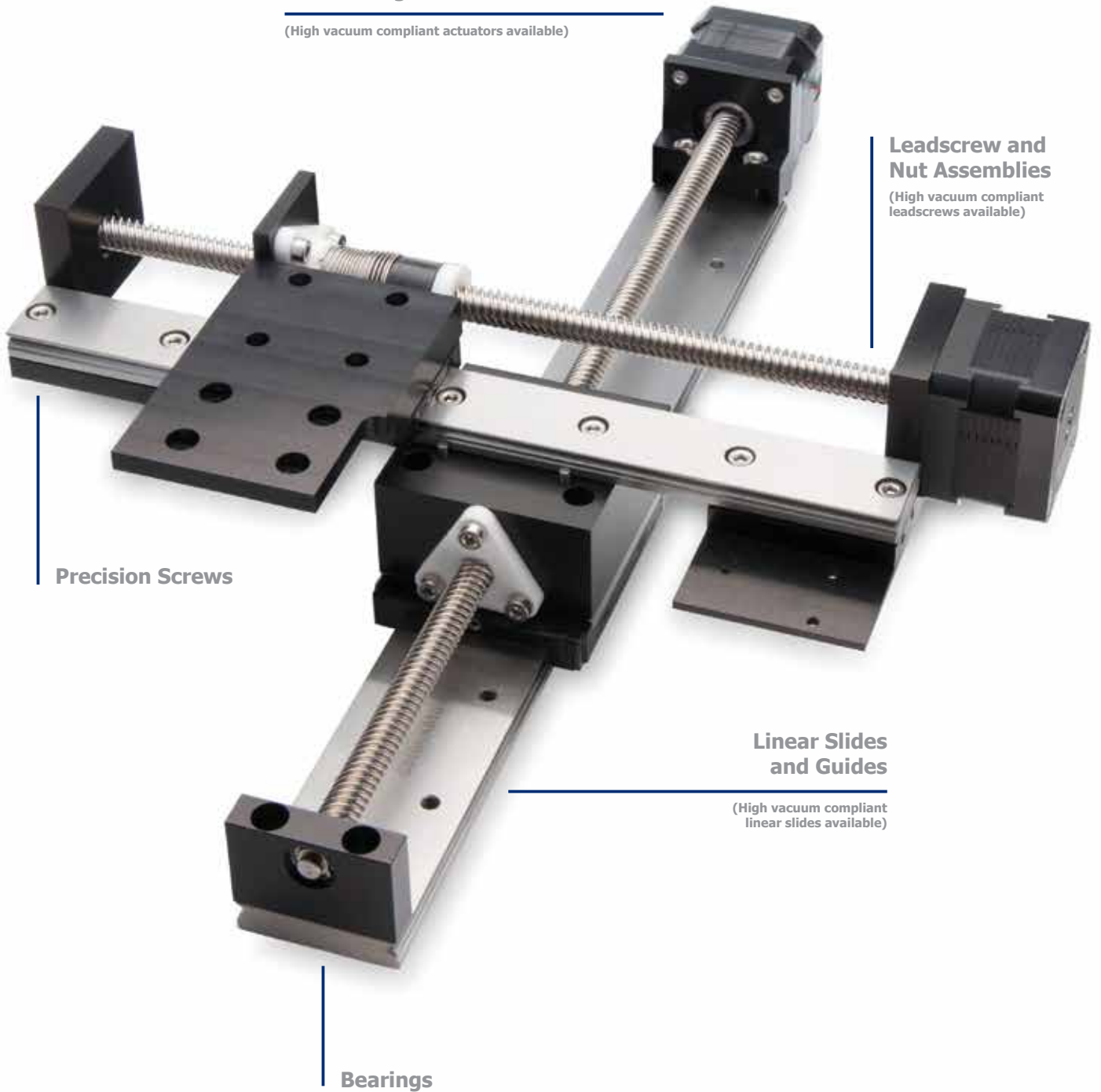
Several million ion flights are calculated in a simulation to determine the aggregate mass peak shape. The effects of imperfect quadrupole geometry can be simulated in order to identify potential resolution limitations and peak shape degradation.





## Hybrid Linear Actuators and Intelligent Motors

(High vacuum compliant actuators available)



# Catalogue Solutions

## Precise motion control

To complement our custom design and manufacturing capabilities we also supply an extensive range of catalogue solutions. Products range from components and assemblies for rotary and linear motion to intelligent control and actuation. Our catalogue products can be readily modified to support applications which require a tailored solution.

## Design without compromise

As an engineering company it is important to us to build a thorough understanding of your wider system design and application in order to recommend the most appropriate product. We consider not only the technical specification, but also the product's suitability to the operational environment and any implications of technical and commercial trade-offs.

Discussion of the technical, operational and commercial requirements are a key part of our product support philosophy. Our aim is to help you make an informed choice about our products before you make a purchasing decision; we want to be confident that what we deliver is going to work for you.



## Creating flexible sub-systems

For design engineers seeking integrated solutions, we are able to combine catalogue products and assemblies to provide cost-effective sub-systems. Should a fully bespoke solution be required, further in-depth design engineering support can also be provided which, together with specialist manufacturing, assembly and test facilities, enables production of a wide range of custom-designed electro-mechanical, opto-mechanical, clean and high-vacuum solutions.

## Solutions for diverse applications

We are an accredited supplier to global OEMs and product developers, covering a wide variety of markets and applications.

In Switzerland our tubular round racks provide a space-saving solution for laboratory automation, locating fluid tubes and fibre optic cables inside the rack to give a more compact instrument. In the UK over 5,000 syringe drive mechanisms, using our motors and leadscrews, are in operation in drug dispensing systems.

In Asia our precision antibacklash gears are used in military applications where our innovative, two-piece gear design is ideal for high reliability applications.

Our gears and leadscrews provide motorised actuation for the fingers and thumb of the *bebionic* prosthetic hand.

*“We appreciate it’s a total team effort to deliver a project, it’s a pleasure to work with a company so well co-ordinated who keep us informed all the way through.”*



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