



**Electro-Mechanical, Opto-Mechanical
Assemblies and Specialist
Geared Components**





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 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 defence, aerospace, space, scientific, medical, semi-conductor and photonics, capable of providing not only mechanical solutions but electro-mechanical, opto-mechanical and high-vacuum solutions.

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.



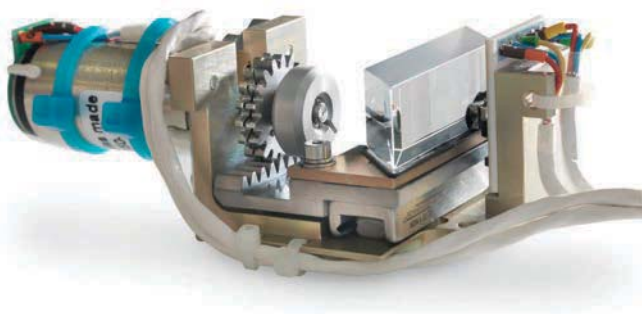
Products and Applications

High performance systems

Reliance specialises in the design and manufacture of high performance electro-mechanical systems and components for aerospace, space and defence, and for other industries with performance-critical requirements. We are an established supplier to major equipment manufacturers, offering a breadth of engineering experience combined with a proven track record in quality, delivery and technical performance.

Delivering technical excellence

Our reputation has been built upon our overriding company principle of delivering technical excellence. This demands that we are able to validate the accuracy and performance of everything we design and build for our customers. Investment in design and development means we have access to unique product validation techniques and offer industry-leading metrology and testing expertise, ensuring our customers have complete confidence in the performance of their products.



Electro-mechanical assemblies

Design and manufacture of mechanical and electro-mechanical sub-systems for high performance applications including:

- Control surface actuation
- Instrumentation and feedback systems
- Safety, arming and locking mechanisms
- High power, short life actuators



Opto-mechanical assemblies

Rotary and linear positioning systems and drive mechanisms for sighting, imaging and target acquisition including:

- Focusing mechanisms
- Laser beam manipulation
- Optic positioning
- Optic mounting

Accurate geared components

Bespoke manufacture of complex geared components, fully certified to specification, for high value, performance critical applications:

- Accurate short-life highly loaded gear trains
- Internal and external ring gears
- Hobbed and shaped spur and anti-backlash gears
- Worms, wormwheels, and bevel gears



Specialist Gear Expertise

Design and manufacture of gears

Reliance has over 50 years' experience in the design and manufacture of bespoke gears, ranging from high accuracy, long life applications such as radar and optical payloads, to very short life, highly loaded aerospace applications.

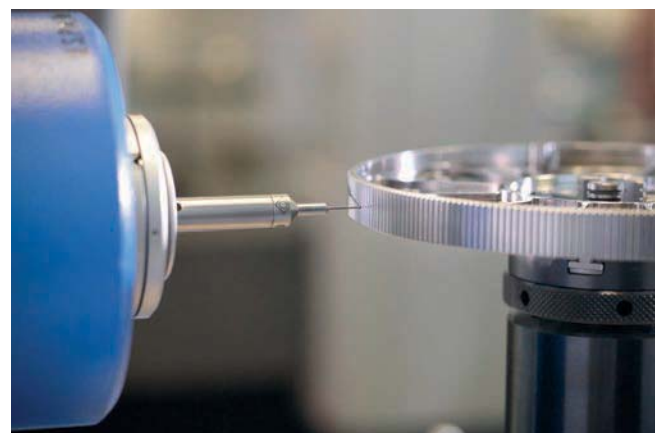
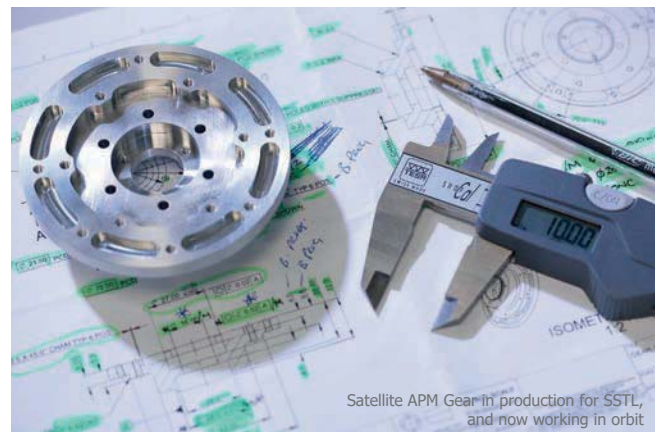
We are happy to offer advice on the design strategy for custom gears and can help with datum positioning and dimensioning to achieve the best possible accuracy at the most economical cost. For example, unnecessary tolerance build ups and interim manufacturing operations can be avoided by simply utilising the mounting feature of the gear as the datum for the gear cutting operation.

Our engineers have a detailed knowledge of the principles of gear tooth generation and the resulting contact conditions. This enables us to work with engineers in other industries to offer advice on the modification of gear teeth to provide bespoke contact conditions that enhance the performance of the gear pair, or to achieve an imposed centre distance within the constraints of the design environment.

Typical market sectors we supply gears into include aerospace, space, defence and down-hole instrumentation, where performance-critical applications demand a deep understanding of gear geometry. Both external, internal and combination gears can be manufactured using our high accuracy hobbing and shaping machines with a module range of between 0.2 to 1.5 mod and a diameter range from 2 to 330 mm.

Custom gears can be manufactured from a range of materials such as, but not limited to, stainless steel, aluminium alloy, precipitation hardening steel, phosphor bronze, titanium and other speciality metals, as well as high performance polymers such as PEEK. Reliance also work very closely with accredited and formally approved surface coating and heat treatment specialists to provide most industry standard processes.

During manufacturing all gears are individually inspected for gear quality and size using a dual flank inspection process with maximum accuracies of 3 microns tooth-to-tooth and 5 microns total composite error. For demanding applications gears are inspected for lead, pitch and profile on our Klingelnberg P40 gear measuring machine.



Design Support

Collaborative engineering

Reliance has worked as a collaborative technical partner on a number of diverse programmes to support designers responsible for both new and mature products. We provide a complementary design capability, offering access to specialist facilities and technical expertise, or additional capacity during resource intensive projects. The scope and depth of design support is tailored to suit each customer's in-house expertise and resource levels, managed flexibly in line with their design, manufacturing and organisational practices.

Skills and capabilities

We cover a broad range of disciplines, including mechanical, electronic and control engineering, with a core design expertise in complex geared components and high performance geared assemblies. Our dedicated prototyping facility helps secure effective design implementation, whilst our unique test and validation capabilities provide customers with confidence in the quality and performance of their equipment, helping reduce time-to-market and lifetime costs. We offer practical experience in bringing product designs into production, with design engineers working alongside production engineers and operations teams at Reliance's UK manufacturing facility.



Design engineering

Professional multi-disciplined engineering team with hands-on product implementation experience, capable of undertaking:

- Design from specification
- Concept development and prototyping
- Collaborative design review
- Through-life engineering support

Design verification

As a standalone investigative project or as part of a design engineering project, ensuring critical time-to-market deadlines are secured by:

- Design analysis by calculation / modelling
- Performance validation of critical design elements
- Assessment of alternative design solutions
- Functional testing of the final assembly

Test facilities

Providing essential data to our customers to validate the functional performance of their design, including:

- Transmission error measurement
- Temperature, humidity and vibration testing
- Custom designed test equipment and software
- Metrology data at component and assembly level





Manufacturing and Assembly

Reducing operating costs

Reliance supplies certified components and fully tested assemblies for use directly into final production, helping our customers reduce lead-times and supply chain management costs. We provide a single point of contact for the supply of critical sub-systems, combining our own manufactured and bought-in parts,

together with our customers' preferred suppliers. By working collaboratively we have demonstrated that we are able to respond effectively to our customers' plans for growth and support their supply chain strategies effectively.

Investing for business improvement

We have developed an extensive breadth and depth of operational capabilities over many years in order to serve a range of different markets. We look for opportunities for cross fertilisation of skills and capabilities between markets, such as adapting



our cleanroom capabilities, established to meet the needs of the scientific instruments market, in order to provide opto-mechanical assemblies for aerospace and defence, and geared assemblies for the space industry.

We are engaged in business process improvement activities, such as the SC21 Supply Chain Programme, and are investing £6 million to ensure we keep our precision machining and metrology at the forefront of the manufacturing industry.

Component manufacture

High accuracy manufacturing facility with embedded through-process quality control to ensure full compliance to specification:

- High precision manufacture of critical components
- World-class, NPL accredited, metrology capability
- Tailored cleaning processes to customer specification
- Packaging and supply options to suit

Electro-mechanical assembly

Assembly of high performance sub-systems where the avoidance of contamination is critical to achieving demanding accuracies:

- Controlled atmosphere assembly facility
- Electro-static protected area to BS EN 61340
- Instrumentation and test of final assemblies
- Restricted access facility for confidential projects

New product introduction

Experienced engineering team responsible for the smooth transition from design to manufacture:

- Close customer liaison and project management
- Highly disciplined build standard control
- Production engineering “design-for-manufacture”
- Development of manufacturing methods and tooling



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



Quality and Reliability

Trust and experience

With over 50 years' experience in serving the aerospace and defence sector Reliance is able to demonstrate consistent achievement of the stringent performance criteria required by these industries. We have built longstanding relationships with major OEMs, systems integrators and prime contractors, and participated in national and international programmes including Eurofighter, JSF, Gripen, Tornado and Falcon.

Disciplined and adaptable

We ensure a consistent approach based on established operational disciplines and methods, and thorough build standard control. This allows us to manage effectively a combination of in-house designed and manufactured elements and externally sourced components, including those from both our own and our customers' supply chains. Our size and independence means that we can adapt to the needs of our customers' organisations and adopt their operational procedures alongside our own systems.

A strong project management approach, drawing upon operational experience and close customer collaboration, ensures that major new projects are introduced into production with confidence, helping to reduce time to market for new products.



Quality assured

As a BS EN ISO 9001 and AS9100 approved company, Reliance is committed to providing high standards in product and service delivery. We are actively engaged in the SC21 Supply Chain Programme, having achieved a silver award, and continue to work with our sponsor, Selex ES, and our customers, Thales Optronics Ltd and MBDA UK Ltd, as we continue to develop our operational and business processes.





Quality control

Effective application of metrology and test is a core part of our company philosophy. Inspection and measurement disciplines are embedded throughout the component manufacturing process in order to prove parts are manufactured correctly to specification. Investment in test engineering has resulted in unique facilities for functional testing of assemblies, with the capability to custom-design test equipment and processes for different applications and performance criteria.

Creativity and problem solving

Reliance is committed to developing knowledge and understanding and has a strong appetite for problem solving. By understanding the issues facing our customers - technically, operationally and commercially - we are able to provide creative technical solutions. Our creativity is grounded firmly by our core company principle which demands that we can prove that our design and manufacturing solutions meet the customers' specifications and performance criteria.



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