RENISHAW
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# 50 years of manufacturing innovation

Anniversary special
1973-2023


SPRINT™
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543

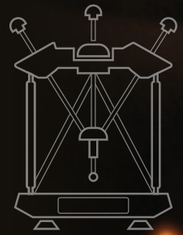
# 50 years of manufacturing innovation

**On 4 April 2023, Renishaw celebrated its 50th anniversary. Join us as we chart the history of global manufacturing technologies over the last five decades and the impact that our own engineering innovations have had on the business of making things.**

Global manufacturing has benefited from several periods of major technological change, or ‘industrial revolutions’, which have transformed the things we make and how we make them. Steam-powered machines enabled the mechanisation of manual labour. Developments in measurement and standardisation enabled the rise of mass production. The introduction of electronics and computer numerical control helped to automate production processes.

Manufacturing technologies continued to progress until, with a single feat of innovative engineering, our co-founder conceived of an invention with the power to transform global manufacturing capability. Our own ‘Renishaw revolution’.

In this special anniversary magazine, we’ll showcase the impact that this innovation and our other engineering technologies have had on the development and quality of manufacturing worldwide. We’ll also explore key technologies we’ve introduced and industries we’ve been proud to influence.



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# The Renishaw revolution

## How it all began

**Our origin story began in 1972. David McMurtry invented a device to solve a dimensional measurement problem that Rolls-Royce was experiencing during the manufacture of its Olympus jet engines – used to power the supersonic Concorde aircraft.**

David is now Executive Chairman of Renishaw, but at that time he was an Assistant Chief Designer for Rolls-Royce engines manufactured in Filton, UK. The need for a solution was urgent and so, over a weekend, David designed and built a prototype measurement device from his own home. Rolls-Royce took out a patent on the original design, which was filed on 21 September 1972, with David acknowledged as the inventor.

John Deer, who is now Non-executive Deputy Chairman of Renishaw, was also working at Rolls-Royce, on power plant aerodynamics. John had a background of machine shop engineering but wanted his own business. Both saw the wider commercial opportunities for the invention and Rolls-Royce agreed to license the patent to them, but only if they had a limited liability company. They therefore purchased an 'off the shelf' company and, on 4 April 1973, the first Renishaw company, Renishaw Electrical Ltd., was registered.

Following the receipt of our first commercial order, production took place at John's home where the garage was a machine shop, dust seals were made from the underlay of David's carpets, assembly took place in a spare bedroom and administration was done at the dining table. In 1976, the company purchased its first commercial premises; a former ice-cream factory. At that time, we had just nine employees but were already supplying most of the world's manufacturers of precision measuring machines.

**1972**
**A pioneering probe:** While working on Concorde engines at Rolls Royce, David McMurtry invents the world's first touch-trigger probe for co-ordinate measuring machines (CMMs).


1972

**1973**
**Our company is formed:** On 4 April 1973, David McMurtry and John Deer register Renishaw Electrical Ltd.


**Our first product launches:** Renishaw's TP1 touch-trigger probe is made commercially available and revolutionises automated component inspection on CMMs.


**1976**
**Our first commercial premises:** As demand for our product grows, production moves from John's home to a former ice-cream factory in the centre of Wotton-under-Edge, UK.

**Sales:** £109,000 (up 303% on the previous year).


**Renishaw was founded in 1973 to commercialise the invention of the touch-trigger probe.**


1976

# The Renishaw revolution

## A traditional manufacturer

**While manual machine tool use was declining, the computer numerical control (CNC) machining centre was gaining in popularity. Although our original touch-trigger probe was invented for use on co-ordinate measuring machines, David and John saw the potential for its use on CNC machine tools. So David started work on his next product.**

By the late-1970s, we were operating a 'traditional' CNC machine shop and facing the same challenges as everyone else: we relied on the traditional skills of experienced tool makers. CNC machines in the 1970s were neither as fast nor as accurate as they are today. There was no such thing as a multitasking machine that could perform milling *and* turning, and the notion of a 5-axis machine for the masses was a long way off. However, using our in-house technologies and integrating probing into our processes allowed us to implement process control across our machining platforms.

By now, the 'just in time' production principles pioneered by Toyota were commonplace. We focused our attention on finding ways to improve the flow of production by identifying and addressing any component manufacturing issues that could lead to waste.

Like everyone, we wanted higher productivity, consistent capability, more automation, and global competitiveness. So, we applied innovation to address these challenges and improve our operations and those of our customers. Our shop floor turned out to be a great place to try out our products and to understand their value to customers.

**A manufacturer first:** Renishaw's experience as a manufacturer separates us from the competition. The success of our business and product portfolio is intertwined with the evolution of our manufacturing operations.

Our experiences in the machine shop allow us to lead change, introduce breakthrough technologies and showcase new ways to approach manufacturing.

1977

**1977**
**The MP1 probe launches:** Our first dedicated probe for CNC milling machines enables automated setting and inspection. (Later MP3 probe variant pictured.)

**Introducing machine tool process control:** Established machine tool manufacturer Kearney & Trecker demonstrates our new machine tool probe on a milling machine at EMO Hannover.

**1979**
**Our first Queen's Award:** We win numerous Queen's Awards over the years (many for the technological achievements of our products). Our first comes in 1979 when we win the Queen's Award for Export Achievement.

**Record sales:** Our sales revenue this year is £1.1 million.

**1980**
**We begin to expand:** An extension of our Wotton-under-Edge premises is officially opened by Her Royal Highness The Princess Royal.

**1981**
**Employees:** We now have over 100 employees.

**Renishaw Inc:** Recognising our potential and the importance of local service, we open our first overseas company in Chicago, USA.

1981



**1981**
**Renishaw Electronics (Ireland) Ltd:** To keep pace with product demand, we need to increase our manufacturing capacity, so we also open a manufacturing facility in Dublin, Ireland.

**LP1 and LP2 probes:** We launch the first touch-trigger probes for CNC lathes and turning centres.

# The Renishaw revolution

## The influence of industrial metrology

**Improvements in machining capabilities and industrial metrology have had a profound influence on manufacturing. Our industrial metrology products have allowed us to accurately measure and analyse the physical qualities of the components we make. When you can measure and machine parts accurately, you can add process control and feedback loops to achieve precision. Where tolerances were once in the hundreds of microns, they are now down to single figures.**

Better metrology drove product quality. Take a typical car manufactured 40 years ago: it had a bulky, heavy metal body and doors that didn't seal properly. Beneath the vehicle was almost certainly a pool of oil that leaked from the engine. And it required frequent servicing and repairs due to breakdowns.

## Driving automotive product quality

Thanks to precision manufacturing, today's product quality expectations are high. Vehicles made using tightly toleranced automotive parts are safer and more reliable, and offer improved performance. Modern cars have lightweight bodies and doors that close with precision. They provide better fuel efficiency, need less maintenance and have longer service intervals and fewer breakdowns. Much of this is possible due to the advanced production processes pioneered by Renishaw.

**1970s**

1982

**Sales** £3.4 million

**Employees:** 159

Our precision manufacturing technologies have helped drive automotive product quality


**1982**
**Renishaw KK:** Our first office in Asia, Renishaw Kabushiki Kaisha is established in Tokyo in April 1982.

**1984**
**Renishaw plc:** Renishaw obtains a full listing on the London Stock Exchange, having entered the Unlisted Securities Market the previous year.




**1985**
**New Mills:** On 29 July, the New Mills building (pictured), which became our UK headquarters, is officially opened by the Lord Lieutenant of Gloucestershire.

**1986**
**Renishaw GmbH:** Our German office is established in Filderstadt, near Stuttgart.

**1986**
**Expansion for additional manufacturing:** A 14-acre site is acquired in Cwmbran, South Wales, for additional machining. Operations are later relocated to New Mills in 1992 and the Cwmbran site is sold in 1996.

**www.renishaw.com/precision**

1986

# The Renishaw revolution

## Probing technology

**By the late-1980s, we used probing to control the production of the vast majority of CNC-machined parts for our CMM and machine tool products, as well as our then-newly launched position encoders.**

Our approach to machine set-up, process control, and other manufacturing processes was typical of machine shops at the time. To increase our productivity, we used industrial metrology technologies to automate activities that previously required skilled manual input. However, there was huge demand for our probing instruments, and we were struggling to meet the requirements of our order book.

We didn't want to continue operating a large, unproductive factory with costly skilled toolmakers, nor did we want to subcontract out our machining. We invested in a third-party flexible manufacturing system (FMS) to add more automation to our operations. This increased our capacity so that we could make small quantities of many different parts. At that time, purchasing an FMS was a significant expense for any business, and the technology available at the time wasn't even that advanced. Surely, we could achieve the same level of productivity with a solution that cost significantly less?

**1987**
**ML10 laser interferometer:** We launch the first laser interferometer system, which transforms the speed and accuracy of machine calibration.

**1988**
**Renishaw S.A.:** In 1988 Renishaw acquires French company Périféric SARL. In 1990, the company is renamed Renishaw S.A.

**www.renishaw.com/whyprobe**

## 1987

**Rising standards:** In 1987, ISO (International Organization for Standardization) published the ISO 9000 quality-management standard. This standard covers all aspects of the production process, from design to delivery, and emphasises the importance of continuous improvement for the benefit of the customer.

**Employees:** 576

**Sales:** £23.1 million

**1987**
**PH10 motorised probe head:** We launch the second of our motorised probe heads, which allows the inspection of all faces of a part through the automated, repeatable re-orientation of probes. It transforms the capability of CMMs and is a major factor in our growth at this point.

**1989**
**Renishaw S.p.A:** We open our first Italian office in Turin.

## 1989

**1989**
**RG1 encoder/scale system:** We launch our first range of encoder readheads and interfaces. Today, our encoders have a wide range of applications, supporting motion systems involved in manufacturing (such as CMM and CNC machines), industrial automation and robotics.

# Our smart manufacturing journey begins

## Using experience to engineer the future

**Renishaw's commitment to investing in research and development*, and our passion for high-quality in-house manufacturing, ensure we're continuously innovating and developing the next generation of technologies. If there's a better way to do something, we'll use our experience as a manufacturer to engineer that solution ourselves.**

In the early-1990s, we were more reliant than ever on our own capacity to apply innovation. It was time to change how we did things. We started developing a bespoke automation system that would improve the efficiency and accuracy of our manufacturing processes at a much lower cost than the proprietary system we'd purchased.

We called it the Renishaw Automated Mill Turn Inspection Centre (RAMTIC) and in 1991, began using it in our New Mills machine shop in the UK. The system was a success and in 1992 we demonstrated the technology on the Renishaw stand at the MACH exhibition in Birmingham, UK, to help showcase our precision measurement and process control technologies. RAMTIC won industry awards and came to exemplify our manufacturing expertise.

## 1990

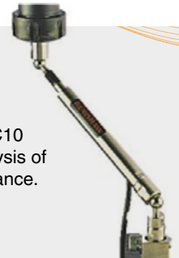
**Employees:** 782

**Sales:** £45.7 million

**1991**
**Renishaw Technology Centre:** His Royal Highness The Duke of Kent officially opens the Renishaw Technology Centre.

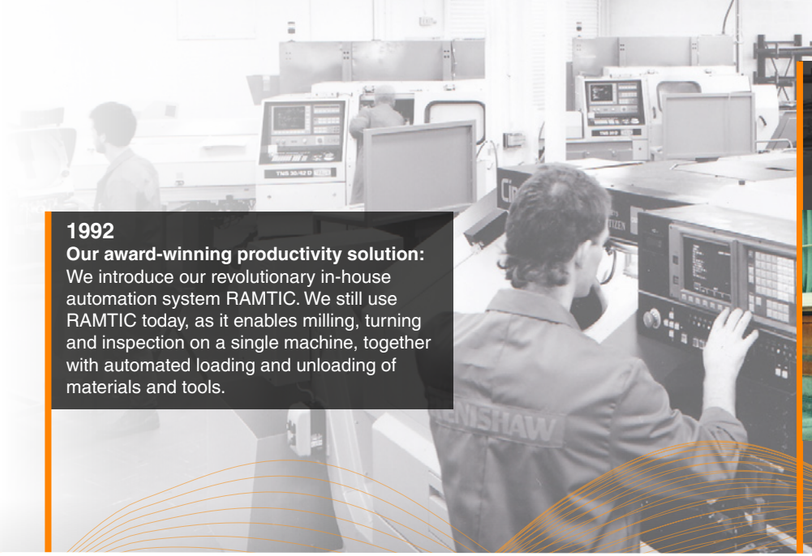
**1991**
**Renishaw Ibérica, S.A.U. and Renishaw AG:** We open a Spanish office in Barcelona and a Swiss office in Pfäffikon.

**1991**
**QC10 ballbar:** We launch our QC10 ballbar, which enables rapid analysis of machine tool positioning performance.



* We typically reinvest 12-18 % of our revenue into engineering, research and development.





**1992**
**Our award-winning productivity solution:** We introduce our revolutionary in-house automation system RAMTIC. We still use RAMTIC today, as it enables milling, turning and inspection on a single machine, together with automated loading and unloading of materials and tools.

**1994**
**McMurtry honoured:** David McMurtry is made a Commander of the Order of the British Empire (CBE) for services to Science and Technology.

**1993**
**Renishaw (Hong Kong) Ltd:** Our first office opens in Hong Kong. Today this is the headquarters for our Asia Pacific (APAC) region.

**1994**
**Singapore and China:** We establish two representative offices in APAC, one in Singapore and another in China.

## 1994

# Our smart manufacturing journey begins

## All about RAMTIC

**Although now in its 30s, our RAMTIC automation platform has stood the test of time, and today there are 67 RAMTIC systems in operation across our factories. Every product we've designed since the early-1990s has been conceived around the RAMTIC system.**

We used a combination of our own probing technologies and production expertise, together with Design for Manufacture principles to engineer a flexible platform capable of automating the measurement and inspection of complex machined parts. While the RAMTIC solution is unique to our factories, our customers love talking to us about applying the technologies involved.

The RAMTIC system, which was adapted from a standard vertical machining centre (VMC), features patented automation and closed-loop process control techniques. It includes a unique mobile pallet system, loaded with up to 50 individual fixturing plates containing all the raw material billets, tools and probes required to machine small prismatic parts on VMCs.

Renishaw probing systems allow RAMTIC to fully automate the following process control activities:

- Alignment checks
- Machine setting
- Tool setting
- Part setting
- Machined feature measurement
- Offset updates and tracking

**Sales:** £62.7 million


**Employees:** 800

1995

**1995**
**HS10 laser scale:** We launch the HS10 laser scale system for large machine tools, offering accurate long-range motion control.


**1996**
**Renishaw (Latino) Americana Ltda:** Our Brazil office is established in Sáo Paulo.



**1997**
**Productivity+™ software:** We launch our Productivity+ software package for machine tools. This PC-based process control offline programming software supports part setting, inspection and in-process measurement.

**1999**
**Korea and Australia:** Two more representative offices open in the Asia Pacific area.

1999

**RAMTIC solved our productivity and precision manufacturing challenges.**
We're always looking for new ways to improve, but in 2023 RAMTIC really has stood the test of time and remains the best solution for making our parts today.

**1998**
**TP20 probe:** We launch our TP20 touch-trigger probe for CMMs, which allows you to change stylus configurations manually or automatically, without re-qualification. The probe features two parts: a probe body and a detachable stylus module which contains the kinematic touch sensor and carries the stylus assembly.

# Our smart manufacturing journey begins

## Controlling variation for automation

**Successful factory automation requires predictability and consistency. Process variation is the difference between the actual output of a manufacturing process and the expected output. Sources of process variation in CNC machining include the machine tool; equipment, such as tooling, work holding and fixturing; and material and environmental conditions.**

In the 1990s, we took a structured approach to eliminating or controlling sources of variation in our CNC machining operations. To keep processes under control, we identified that layers of control can be applied before machining, while setting the machine, during machining, and after metal cutting are completed.

Today, we offer a complete range of technologies, applications and software designed to address sources of variation in CNC machining processes. The technologies applied at each stage provide data which is critical to understanding what's happening at each step of the process.

Our proactive approach to process control has been vital to the success of our own factory automation as well as to the experience that we share with our customers. This approach, together with our RAMTIC solution, has been instrumental to our digital transformation, which began over 30 years ago.

## 2000

**Employees:** 1,353

**Sales:** Worldwide sales exceed £100 million for first time

**2000**
**Benelux, India and Taiwan:**
We open representative offices in the Netherlands, Taiwan and in India.

**2000**
**NC1 non-contact tool setter:**
We launch our first laser tool setter to support tool measurement and tool breakage detection.




**2001**
**OMP40 optical machine tool probe:** We radically redesign our machine tool probe range with the launch of this robust, compact optical probe for part inspection and machine tool set up. It's significantly smaller than other probes on the market. With its outstanding performance, it remains a popular choice for our customers today.




**Our smart manufacturing technologies and philosophies were in place over 30 years ago.**

## 2001

**2001**
**Sir David McMurtry:**
Our founder receives a knighthood for services to Design and Innovation, and becomes Sir David McMurtry.

**www.renishaw.com/processcontrol**

# Transforming tomorrow together

## Continuous product innovation

**Post-millennium, we introduced several breakthrough products whose technologies have continued to contribute to high-performance manufacturing today.**

Over 30 years after the launch of our original probe, we delivered another step-change for CMM inspection capability – this time with our REVO® 5-axis measurement system. Unlike conventional CMM measurement methods, our 5-axis technology uses the synchronised motion of the CMM and probe head axes to minimise dynamic errors at ultra-high measuring speeds.

Today, the REVO system offers multiple interchangeable sensors on a single CMM with the speed, accuracy and flexibility of a 5-axis system. It enabled a 10× increase in tactile measurement speeds, transforming the throughput and accuracy of CMM inspection.

### 2003

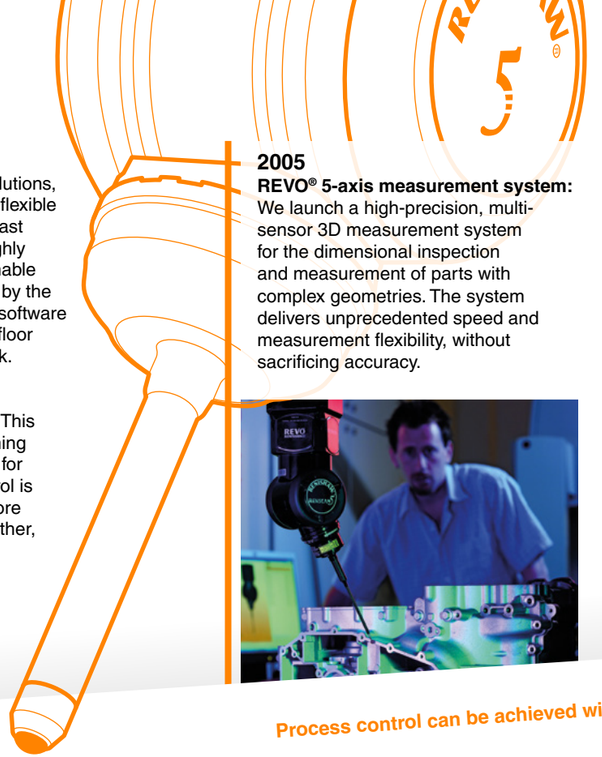
**Renishaw (Austria) GmbH, Renishaw (Canada) Limited, Renishaw Hungary Kft, Renishaw (Israel) Ltd and Renishaw AB:** 2003 sees our largest international expansion in one year with offices opening in Austria, Canada, Hungary, Israel and Sweden.

2003

Our REVO multi-sensor technology reduces the range of different inspection equipment required to comprehensively inspect components with complex geometries.

Now supporting our growing range of factory automation solutions, in 2011 we introduced our Equator™ gauge; the world's first flexible gauging system and a category creator. It combines super-fast scanning with a robust comparison process and delivers highly repeatable, thermally insensitive, versatile, and reprogrammable gauging to the shop floor. Part measurement data collected by the Equator gauge can be used with intelligent process control software to update offsets directly on machine tool controls for shop-floor validation of machining processes with closed-loop feedback.

We then expanded our range of position and motion control technologies, with our RESOLUTE™ true-absolute encoder. This product delivers nanometre resolution at 100 m/s, transforming absolute encoder performance. It's since proved successful for many applications where precise and accurate motion control is critical for the performance and safety of equipment. Our more recent FORTiS™ enclosed encoder has taken this a step further, extending that high-performance motion control into harsh environments, such as machine tools.



### 2005

**REVO® 5-axis measurement system:** We launch a high-precision, multi-sensor 3D measurement system for the dimensional inspection and measurement of parts with complex geometries. The system delivers unprecedented speed and measurement flexibility, without sacrificing accuracy.



### 2009

**RESOLUTE™ encoder series:** We launch our RESOLUTE true-absolute encoder, a high-speed fine-resolution position measurement system. Position is acquired immediately upon start-up, with no motion required, offering smooth velocity control and dependable positional stability.

### 2011

**Equator™ gauging system:** We launch the world's first flexible gauge. The highly automated Equator gauging system combines super-fast scanning with a robust comparison process.

Process control can be achieved with closed-loop feedback using Equator gauging data to update offsets directly on machine tool controllers.

2011

# Transforming tomorrow together

## Aerospace problem solvers

**Our products have revolutionised key aspects of component manufacturing for a range of industries and contributed to their ability to make the highest performing precision products in use every day. But one sector that remains an inspiration for our product innovations today is the aerospace industry.**

Solving an aerospace manufacturing problem is where our story began, and we've continued to address the challenges facing our aerospace partners (the pursuit of fuel efficiency, lightweighting, and reliability) and take pride in engineering solutions that support this branch of manufacturing.

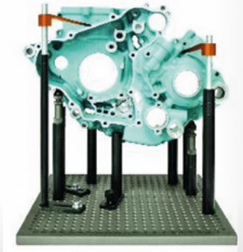
The ability to orientate a probe head at hundreds of repeatable positions to inspect highly complex aerospace parts inspired our PH10 motorised indexing head. Our REVO 5-axis measuring system reduced the range of different quality assurance equipment necessary for the inspection of complex aerospace parts. And our SPRINT™ technology for high-speed, high-accuracy scanning on machine tools is critical for the 5-axis machining tasks used in the manufacture of aircraft parts. These Renishaw technologies were all inspired by aerospace manufacturing challenges.

## Sustainability

In a world where it's increasingly vital for businesses to reduce their environmental impacts, our products are also helping our customers to operate more sustainable and productive businesses. Our products help to maximise useful machining time, eliminate scrap components and reduce total energy consumption. Our solutions for increasing smart factory automation drive operational efficiency by increasing machine uptime and overall output, without adding extra machines.

**www.renishaw.com/sustainability**

**2013**
**Metrology fixturing:**
We introduce our modular metrology fixturing product line for CMMs, vision systems and Equator gauging systems. We offer a choice of base plates and components for measurement applications across industries, such as aerospace, automotive and medical.



**2013**
**SPRINT™ technology:**
Our game-changing SPRINT technology for high-speed contact scanning delivers new process control opportunities for high-value CNC machine tools. SPRINT technology delivers a step-change in the benefits of process control, enabling fast and accurate form and profile data capture from both prismatic and complex 3D components.


**2015**
**Renishaw Innovation Centre:**
35 years after officially opening Renishaw's first site expansion, HRH The Princess Royal returns to formally open the Renishaw Innovation Centre, in Gloucestershire, UK. Reflecting on her original visit The Princess Royal commented:

*"It's extraordinary how you have evolved that technology which was so ahead of its time into being such an integral part of pretty well what anybody wants to do in terms of precision manufacturing; an astonishing achievement. The only thing that is missing from Renishaw in a way is that public perception of just how integral you are and just how important you are in so many things that people do and enjoy doing."*

**2017**
**Machine tool apps:**
To make programming and reporting on machine tool performance easier, we offer a range of on-machine and smartphone apps to make it easier to install, configure, use and maintain our systems.


2013

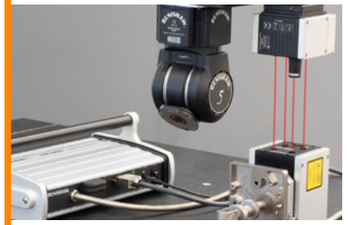
2017

**www.renishaw.com/aerospace**

# Transforming tomorrow together

**2018**
**RenAM 500Q metal 3D printer:** We launch the RenAM 500Q metal 3D printer, the smallest quad-laser powder bed fusion machine on the market. It enables high productivity and lower costs per part, with a new level of build quality due to its novel gas flow.

**2018**
**XM-600 multi-axis calibrator:** We launch our XM-600 laser measurement system for assessing machine tool and motion system performance. It's most suited to ultra-high-precision measurement applications on precision motion systems and can measure errors in six degrees of freedom with direct connection to CMM controllers.

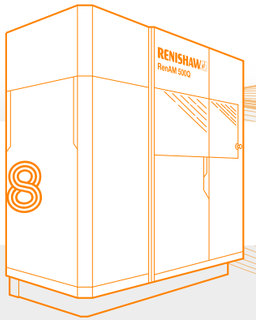


**2020**
**VentilatorChallengeUK:** Our in-house manufacturing facilities help to deliver over 13,000 ventilators to the UK's National Health Service during the Coronavirus (COVID-19) pandemic.

**2021**
**FORTiS™ enclosed linear absolute encoders:** We launch our FORTiS range of next-generation enclosed linear absolute encoders. Its breakthrough non-contact readhead design provides class-leading vibration resistance.

**2022**
**Expanding our factory of the future:** £65 million expansion begins at our Miskin manufacturing site in South Wales.

**2023**
**Renishaw Central:** In 2023 we launch a manufacturing connectivity and data platform to allow manufacturers to implement smart factory technologies into their operations.




2018


THE FUTURE

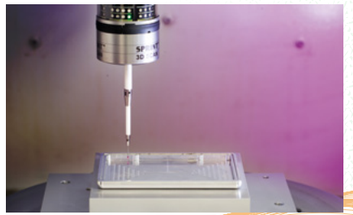
# Transforming tomorrow together

## Our everyday impact

**Our global contribution may not always be apparent, due to commercial confidentialities, but its impact can be felt all around us – perhaps most visibly in the world of consumer electronics.**

Products must be visually perfect, slimline, lightweight and easy to assemble. This high-quality aesthetic can now be assured on a mass scale thanks to modern production processes and quality control using our technologies. The fast-paced nature of the consumer products market demands flexible manufacturing systems that can adapt to shorter lifecycles yet still meet the requirements for high-quality, high-volume components.

This illustration of a typical household shows how Renishaw products help manufacturers to satisfy these demands.



### Plastic moulded casings

Additive manufacturing and precision machining technology are used to produce injection mould tooling with optimised conformal cooling for leading consumer brands, enhancing product quality and production efficiency.

### Lens testing for digital cameras

High-quality cameras incorporated into compact devices require good lenses. Position encoders are used to enable high-speed automated testing of optics at the production rates required by smartphone manufacturers.

Solar panel production

Electric motor manufacturing

Machined components

### Digital display manufacture

Large-scale manufacturing of flat panel displays requires accurate encoders for position and motion control of high-speed systems. Absolute encoders improve reliability and productivity.

### High-quality look and feel

Precision manufacturing using multiple process control techniques is used to produce the high standard of fit and finish required on casings and components for smartphones and tablets.

### Metal housings for computers

High-volume production machining needs probing technology to automate part setting and control cutting tools to minimise scrap and maximise production capacity from each machine tool.

## Always applying innovation

We work closely with our customers to solve complex engineering challenges and improve products and processes. Our unique blend of pioneering research and product innovation helps push the boundaries of what's possible, transforming product performance and touching billions of lives around the world. We'll continue to use our precision, productivity and practicality to help transform manufacturing capabilities so that it's possible to create the products that will define our world in the decades to come.



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