Brochure

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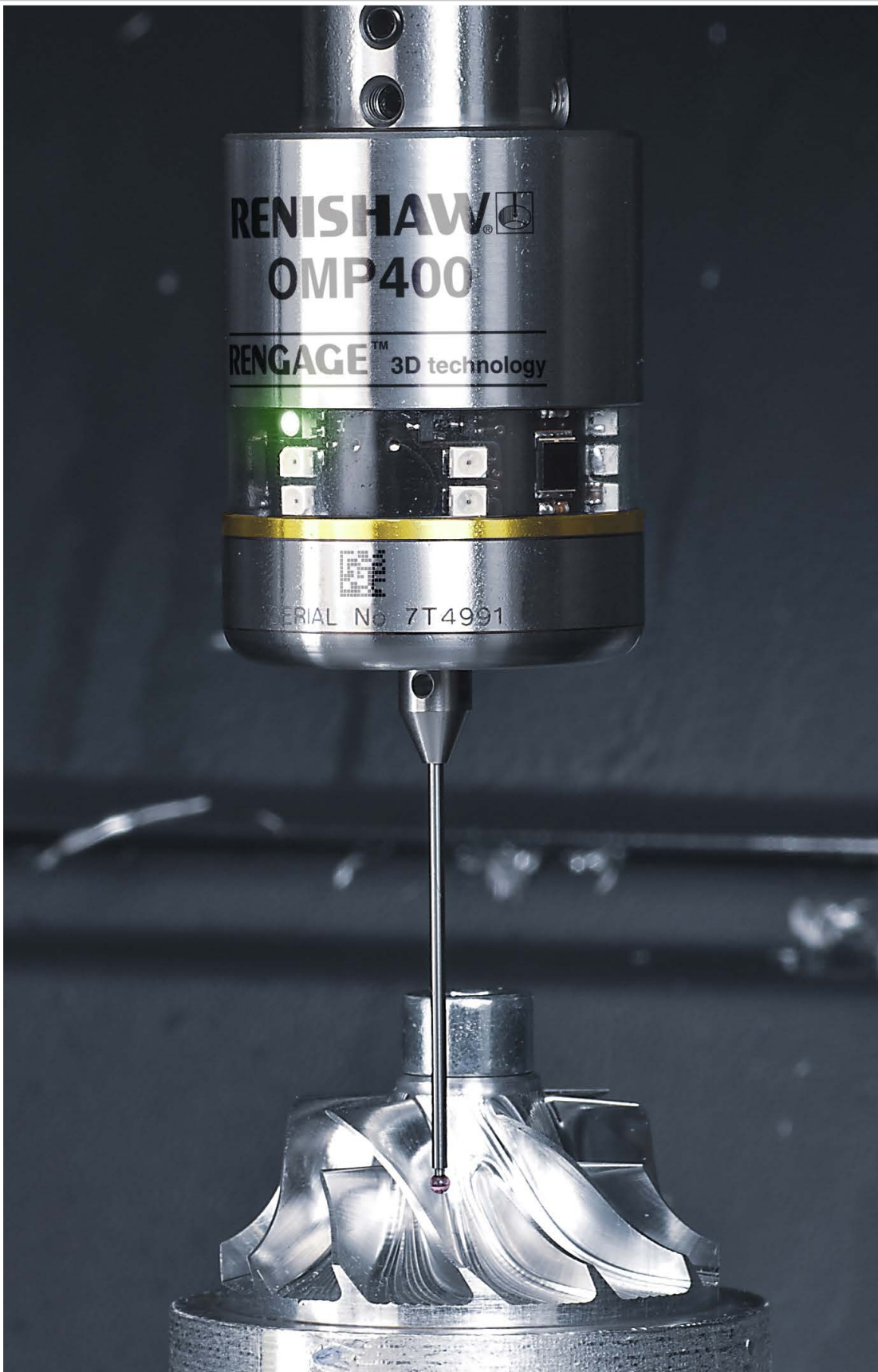
High-accuracy machine tool probes with RENGAGE™ technology



High-accuracy machine tool probes with RENGAGE™ technology

With unbeatable 3D measurement capability and submicron repeatability, Renishaw's family of machine tool probes with RENGAGE™ technology combines precise silicon strain gauge sensors with ultra-compact electronics to deliver superior performance. Use on-machine probing to set a workpiece, control a machining process or to inspect a workpiece after machining has been completed.

OMP400 and OMP600

Suitable for small to large machining centres, the OMP400 and OMP600 probes with RENGAGE technology use optical transmission – providing exceptional resistance to light interference.

MP250

Designed for harsh environments, the miniature MP250 probe with RENGAGE technology is aimed at grinding machine applications. The probe is hard-wired for maximum resistance to interference.

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RMP400 and RMP600

Ideal for small to large machining centres, the RMP400 and RMP600 probes with RENGAGE technology use radio transmission with frequency-hopping spread spectrum technology, providing remarkable reliability even in high density radio frequency environments.

Probes for tool setting

The optical or radio interface (or receiver) that is used with a spindle probe can also capture data from a contact tool setter.

The OTS and the RTS compact 3D touch-trigger tool setters can be used in conjunction with spindle probes using RENGAGE™ technology. Detect broken tools or quickly set the length and diameter of a wide range of cutting tools.

With their proven kinematic design, the OTS and RTS achieve 1.00 µm 2σ repeatability of tool measurement.

For more information about Renishaw tool setters, visit **www.renishaw.com/toolsetting**

The Productive Process Pyramid™

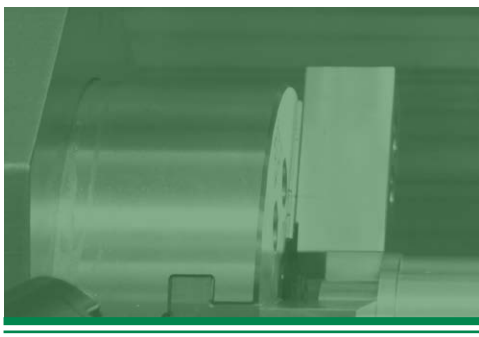
Tackle process variation at source, and reap the rewards

The higher the degree of human involvement in the manufacturing process, the higher the risk for error. Automated in-process measurement using Renishaw probes can help eliminate the risk. RENGAGE™ technology facilitates the following controls for enhanced management of production processes, leading to an increase in profits.

Post-process monitoring

Obtain information about a part or process once it is complete using Renishaw machine tool probes. By measuring on the machine tool, manufacturing processes can be streamlined.

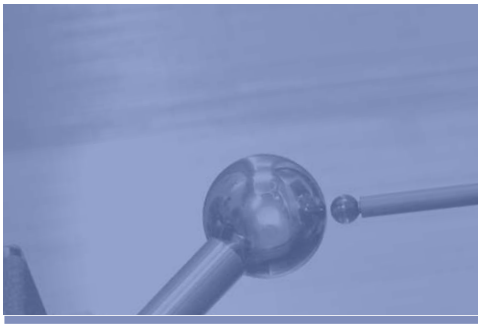
Determine whether a workpiece conforms to specification by gathering measurement results before the part is removed from the fixture on the machine. Use on-machine measurement data to identify ways of reducing process variation by analysing the variation in part dimensions, thereby increasing yield and quality.



Process setting

Use your Renishaw probe to set a machining process just before it starts, to ensure it runs smoothly. Automatic process setting enables, fast job set-up, significant quality improvements and substantial scrap reduction.

A probe can help you eliminate costly fixtures and reduce manual setting errors. Machine offsets can be automatically updated for accurate positioning and alignment. Through the introduction of probing, new processes can be introduced quickly, allowing users to respond to new customer requests.



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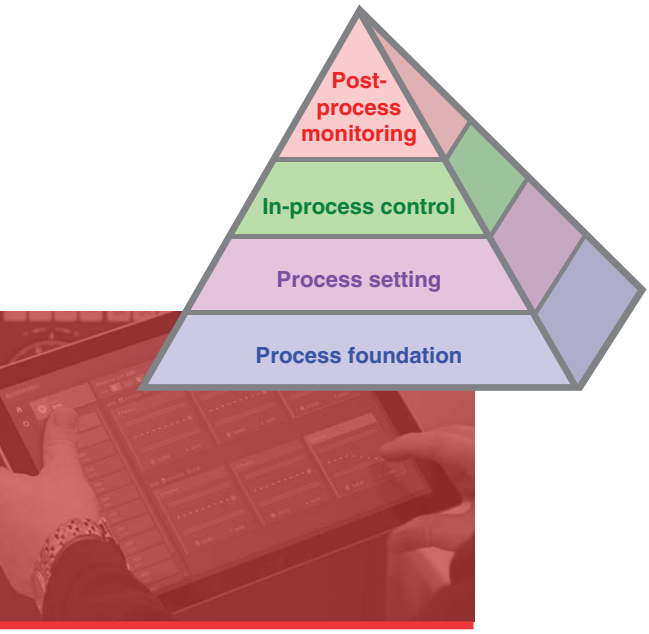


Improve your process, layer-by-layer

Each of the layers can build upon one another to systematically remove variation from the machining process. Start at the base of the pyramid to ensure the machine tool is capable, before setting the workpiece position and tool offsets prior to cutting. For higher levels of control, perform checks and make adjustments during the machining process. Finally, monitor how each machining process is performing, ensuring they all remain in control.

In-process control

Renishaw probes allow processes to adapt to and adjust for inherent variation during machining. Compensate for tool wear, thermal growth and part deflection by updating machine parameters to adjust the cutting process mid-cycle.

Through in-cycle process-adjustment, non-productive time and scrap can be reduced; increasing productivity and profits.

Process foundation

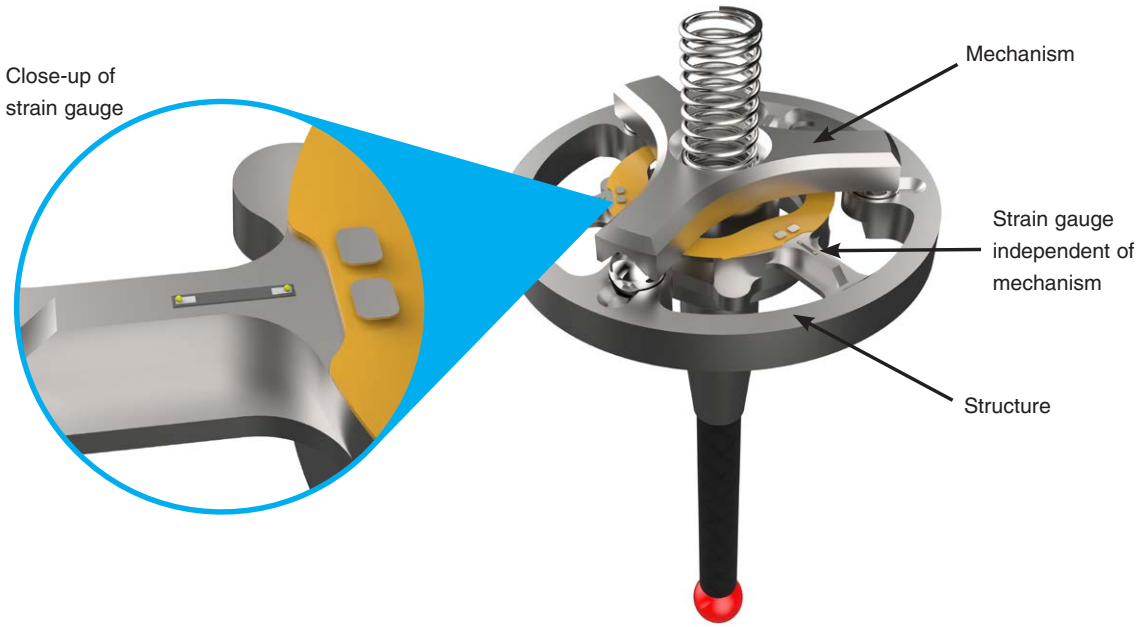
With AxiSet™ Check-Up software, probes with RENGAGE technology can be used to analyse the performance of machine tool rotary axes and identify problems caused by incorrect machine set-up, collisions or wear.

Use the probe to increase confidence in your machining process before cutting starts, reducing unproductive time and scrap.

Superior probing with RENGAGE™ technology

RENGAGE™ technology, combines proven silicon strain gauge technology with ultra-compact electronics – allowing on-machine probing systems to achieve outstanding 3D measurement capability and sub-micron repeatability.

As the strain gauges are independent from the kinematic mechanism, probes with RENGAGE technology have an ultra-low trigger force, providing exceptional measurement accuracy as well eliminating the possibility of surface and form damage on the parts inspected.



Supreme repeatability

An ultra-low trigger-force and solid state sensors found inside probes with RENGAGE technology combine to give remarkable repeatability.

Unidirectional repeatability	0.25 µm (10 µin) 2σ – 50 mm (1.97 in) stylus length 0.35 µm (14 µin) 2σ – 100 mm (3.94 in) stylus length

3D performance

Lobing errors are present in all probes. They are variations in the different trigger directions caused by flexing of the stylus and movement of the probe mechanism before the probe is triggered. While lobing can be calibrated out in 2D applications, in 3D applications – such as the inspection of free-form parts – a probe with RENGAGE technology is beneficial as it has remarkably low pre-travel variation.

The strain gauge sensors in the probe produce a trigger signal well before the kinematic mechanism moves, eliminating 90% of lobing errors and providing a vastly superior 3D performance when compared to other probing technology.

2D lobing in X, Y	± 0.25 µm (10 µin) – 50 mm (1.97 in) stylus length ± 0.25 µm (10 µin) – 100 mm (3.94 in) stylus length
3D lobing in X, Y, Z	± 1.00 µm (40 µin) – 50 mm (1.97 in) stylus length ± 1.75 µm (70 µin) – 100 mm (3.94 in) stylus length

Robust design

Constructed from high grade materials, all Renishaw probes are robust and reliable in the harshest environments withstanding shock, vibration, temperature extremes and even continual liquid immersion.

Ultra-low trigger force

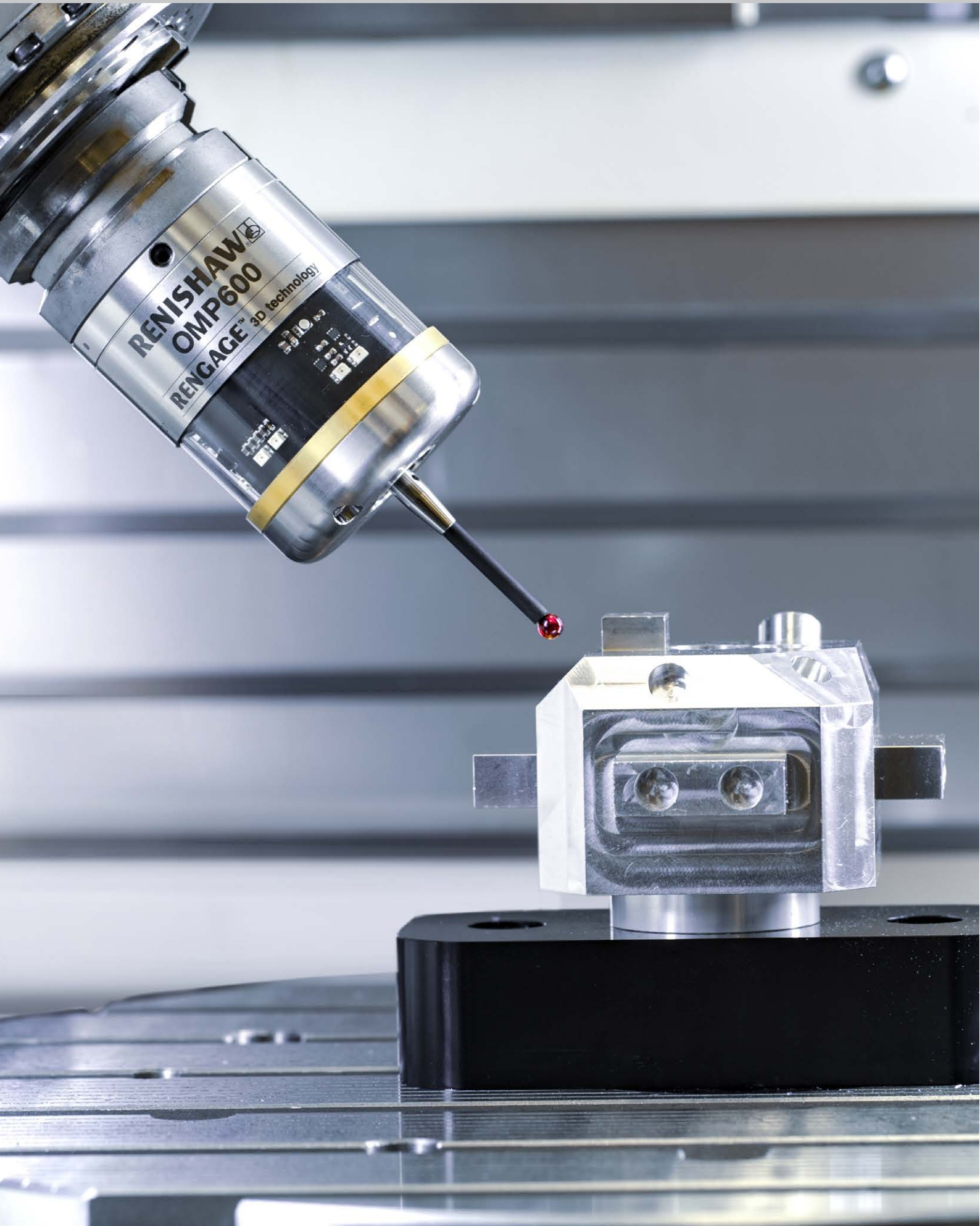
Probes with RENGAGE technology have an unmatched low trigger force, eliminating the chance of damaging delicate workpieces during inspection.

Stylus trigger force (typical minimum)	**OMP400**	**OMP600**	**RMP400**	**RMP600**	**MP250**
XY plane	0.06 N, 6 gf (0.22 ozf)	0.15 N, 15 gf (0.54 ozf)	0.09 N, 9 gf (0.32 ozf)	0.20 N, 20 gf (0.72 ozf)	0.08 N, 8.0 gf (0.29 ozf)
+Z direction	2.55 N, 260 gf (9.17 ozf)	1.75 N, 178 gf (6.03 ozf)	3.34 N, 341 gf (12.01 ozf)	1.90 N, 194 gf (6.83 ozf)	2.25 N, 229 gf (8.09 ozf)

Inspect difficult parts

RENGAGE technology allows Renishaw's range of high-precision probes to be used with long styli and custom heavy styli. Difficult-to-reach features can be measured with ease. Machine tool probes with RENGAGE technology are recommended for use with high modulus carbon fibre styli up to 200 mm long.

	OMP400	**OMP600**	**RMP400**	**RMP600**	**MP250**
Recommended styli	High modulus carbon fibre, lengths 50 mm (1.97 in) to 200 mm (7.88 in)				High modulus carbon fibre, lengths 50.0 mm (1.97 in) or 100.0 mm (3.94 in).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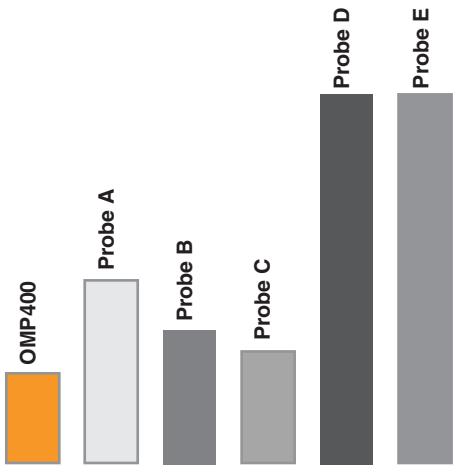
OMP600
RENGAGE™ 3D technology

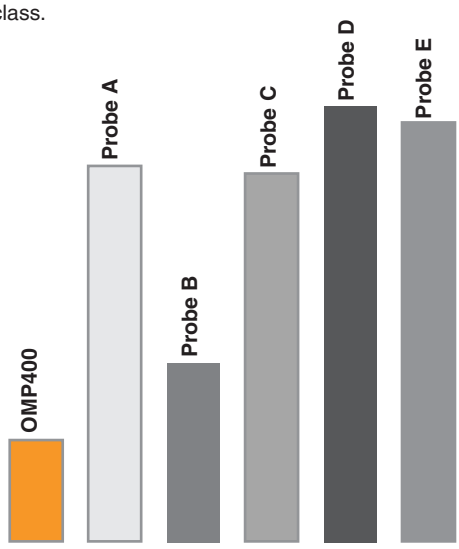
RENGAGE™ technology – unrivalled in performance

To prove that the performance of RENGAGE™ technology is truly unbeatable, Renishaw benchmarked the OMP400 against five machine tool probes from other brands (probes “A”, “B”, “C”, “D” and “E”).

After conducting many tests – varying the feedrate and the stylus length – the 2D and 3D form error of the OMP400 was found to be the lowest out of all the probes and the repeatability was best in class.



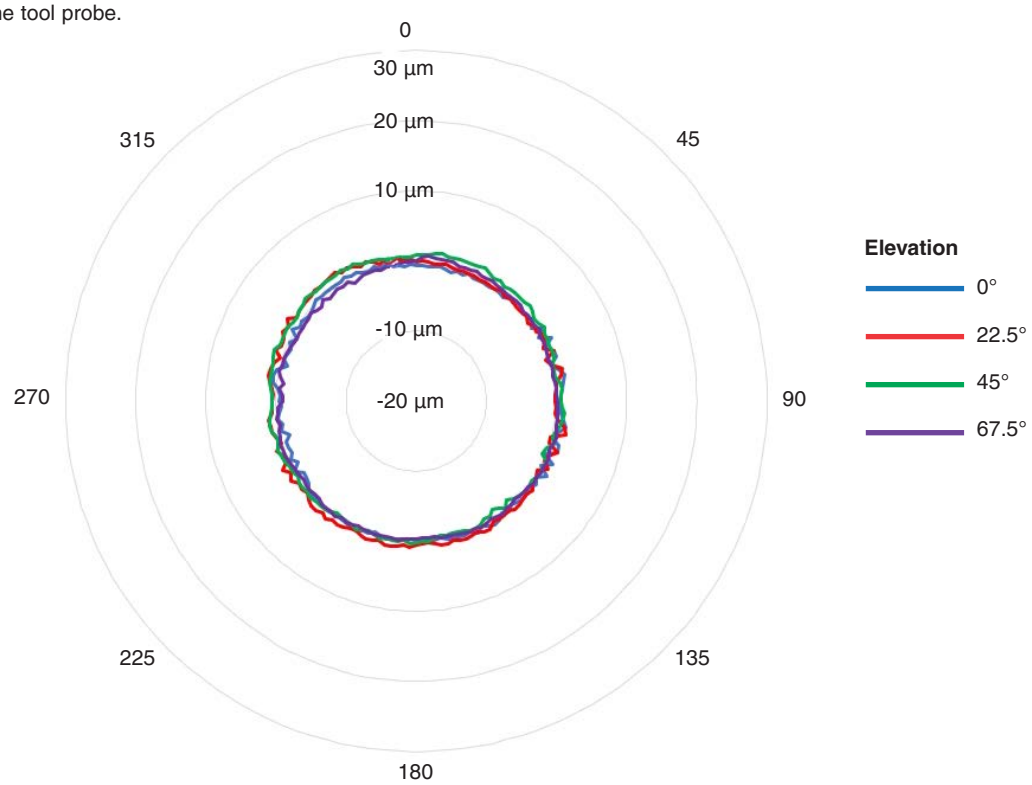
2D form error results at 2000 mm/min with a 50 mm stylus



3D form error results at 2000 mm/min with a 50 mm stylus

OMP400 3D form

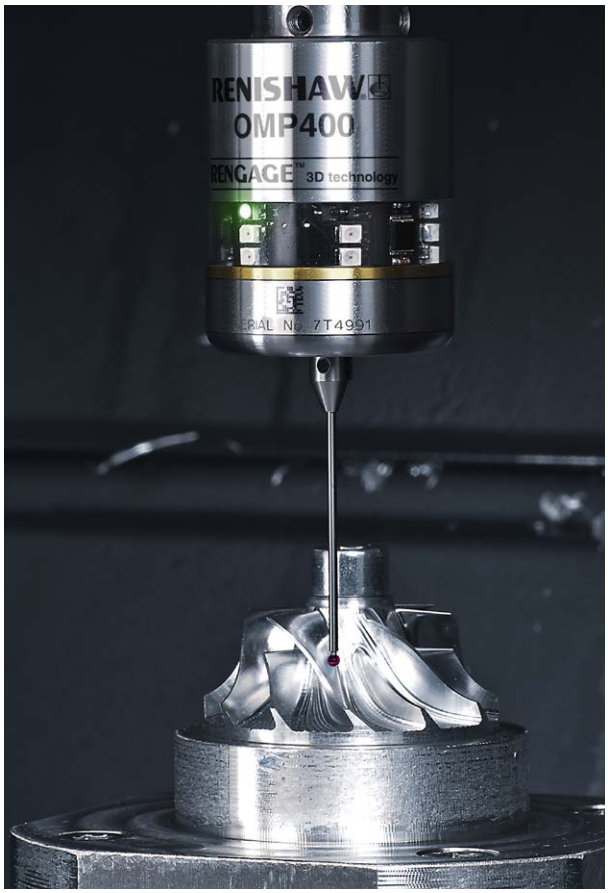
The chart below shows the form deviation from a Ø12.5 mm calibration sphere at different elevations, as measured by the OMP400 machine tool probe.



For more information regarding the superior 3D performance of probes with RENGAGE™ technology, visit **www.renishaw.com/rengage**

OMP400 and OMP600 – machine tool probes with optical transmission

Optical probes offer an extremely effective solution for users of small to large sized machine tools, where there is line-of-sight between the probe and the receiver.



Safe, reliable and efficient transmission

Renishaw optical transmission systems use infrared technology to transmit information between the probe and the interface (or receiver). Renishaw's modulated optical technology is optimised to work within areas containing other light sources; rejecting light interference from external sources and ensuring reliable communications.

Transmitting at a distance up to six metres, optical transmission is a secure, robust and well-proven transmission method.

	OMP400	**OMP600**
Transmission type	360° infrared optical transmission	
Operating range	Up to 5 m (16.4 ft.)	Up to 6 m (19.7 ft.)

For more information about our optical probes with RENGAGE™ technology, visit **www.renishaw.com/omp400** and **www.renishaw.com/omp600**

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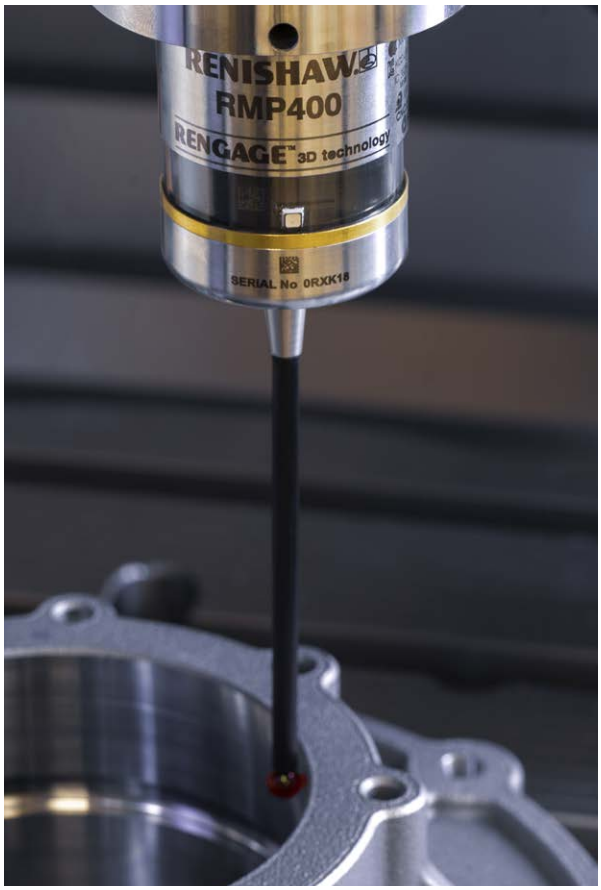
RMP400 and RMP600 – machine tool probes with radio transmission

Renishaw offers exceptionally reliable probing solutions with radio transmission, designed for larger machines or installations where the spindle probe is not within line-of-sight of the receiver.



Resistance to radio interference

Modern factories are very noisy in terms of the high-density of radio frequency (RF) traffic over the airwaves. With increased use of automation and wireless communication, radio interference can be a problem.

Renishaw's products continue to work automatically as other devices using Wi-Fi, Bluetooth and microwaves enter the same environment. Frequency-hopping spread spectrum (FHSS) technology enables devices to jump from channel to channel – avoiding interference and transmission dead spots. With FHSS technology, a very large number of Renishaw radio probes can work reliably in machine shops of any size.

	RMP400	RMP600
Transmission type	Frequency-hopping spread spectrum (FHSS) radio Radio frequency 2400 MHz to 2483.5 MHz	
Operating range	Up to 15 m (49.2 ft.)	

For more information about our radio probes with RENGAGE™ technology, visit **www.renishaw.com/rmp400** and **www.renishaw.com/rmp600**

MP250 – hard-wired probe for grinding machines

The MP250 is robustly engineered to perform in abrasive particle-laden environments and when subjected to the high levels of vibration found within grinding applications. Its hard-wired connection provides resistance to interference and allows the probe to operate battery-free.

Withstand machine vibration

Superior performance is sustained even when the probe is subjected to high levels of vibration, often experienced during grinding operations. If machine vibration is a problem, the probe can be switched to a more vibration-resistant configuration. Lower-latency configurations are also available, should a quicker probe response time be required.

	MP250
Transmission type	Hard-wired transmission

For more information about the MP250 with RENGAGE™ technology, visit **www.renishaw.com/mp250**

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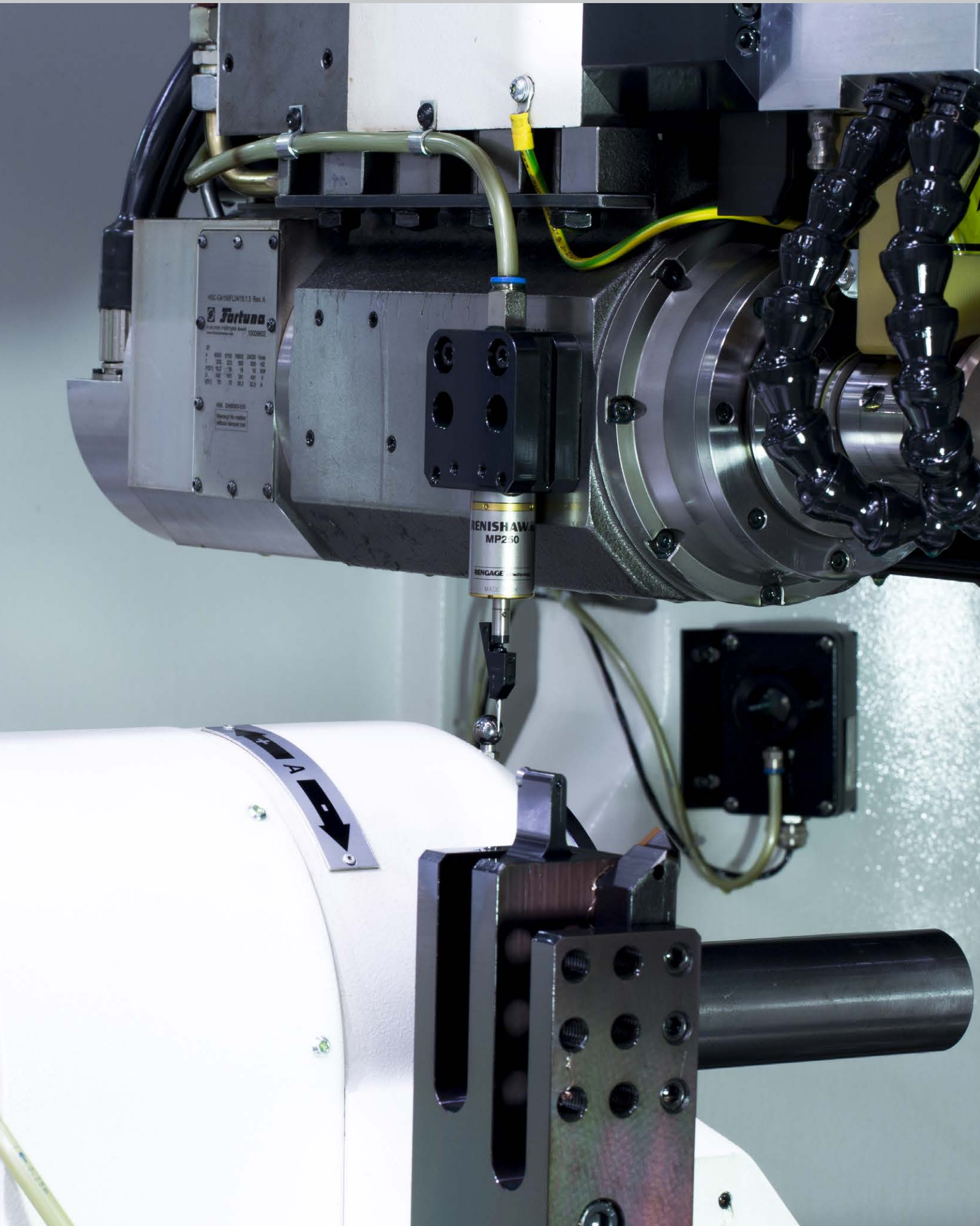


Software that makes probing simple

Renishaw is committed to ensuring its probes are easy to use. A comprehensive range of macro cycles and machine tool apps allows for quick and intuitive programming of measurement cycles.

Inspection Plus

This industry-standard G-code software package forms the basis of all Renishaw machine tool apps. Running on the machine tool, the macros measure a comprehensive range of features that can be found on machine-mounted workpieces.

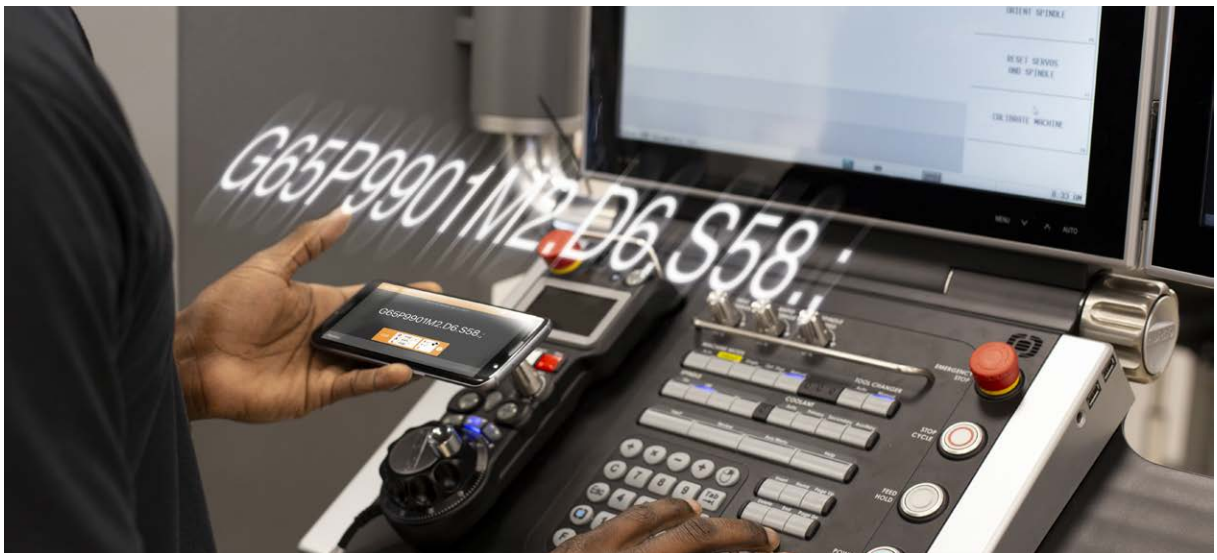
Program either by editing G-code at the machine, or by using one of the intuitive machine tool apps to aid creation of measurement cycles.

To learn more about our extensive range of macro cycles, visit **www.renishaw.com/inspectionplus**

GoProbe

The GoProbe smartphone app creates a probing routine with just a few quick taps. Simply select the required cycle and populate the data entry fields. The result is a single-line command that is manually entered into the CNC control.

To learn more about this simple smartphone app, visit **www.renishaw.com/goprobe**



AxiSet™ Check-Up

AxiSet™ Check-Up provides users of multi-axis machines with a fast and accurate health check of rotary axis pivot points. Alignment and positioning performance checks are carried out rapidly, using macro probing software and a dedicated calibration artefact, to benchmark and monitor machine performance over time.

To learn more about AxiSet Check-Up, visit **www.renishaw.com/axiset-check-up**

Set and Inspect

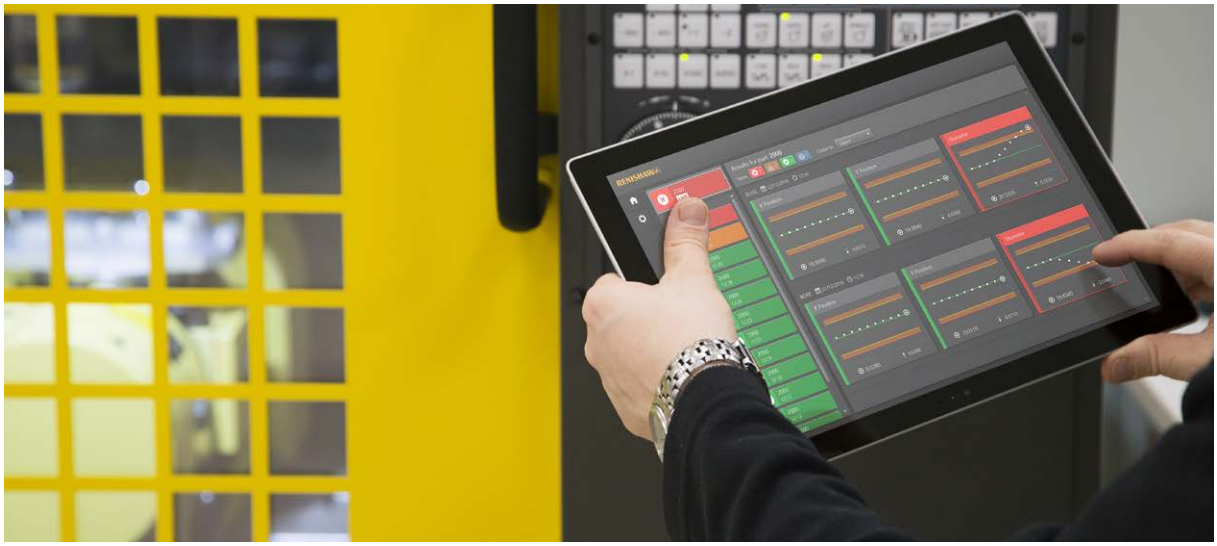
Set and Inspect is a simple, intuitive, on-machine probing app for machine tool users who require an easy-to-use probing solution. Use the app to easily create probing routines. These routines can be manually run, run as single cycles or executed as fully automated probing routines. Set and Inspect can upload probing routines to the CNC control automatically.

To learn more about intuitive programming using Set and Inspect, visit **www.renishaw.com/set-and-inspect**

Reporter

Reporter is an app designed to display component measurement data and production trends in a quick and easy way. View live and historical measurement results from Set and Inspect-generated programs as well as Inspection Plus measurement routines. The app is installed onto a Windows®-based CNC control or a Windows tablet connected to the control via Ethernet.

To learn more about viewing measurement results using Reporter, visit **www.renishaw.com/reporter**



Measured with RENGAGE™ technology

"We are very happy with the accuracy of RMP600 and, in particular, the consequent reduction in scrap parts further down the production line. These are large, expensive components and we can use the probe to identify and avoid errors."

Tods Composite Solutions Ltd (UK)

"Since we started using the RMP600, we have had no discrepancies, scrap or faults in production."

Honeywell (Mexico)

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"Renishaw probing systems have been beneficial as they encompass the best productivity solutions, which are impeccable and highly dependable. These solutions are also extremely versatile, ensuring that the company is on the right track. Renishaw has been a trustworthy partner in providing a complete solution and transforming our manufacturing process."

Vasantha (India)

"As we had planned, we were able to achieve ± 1 µm accuracy for all characteristics. This high-precision machining has a significant impact on whether or not scientists may need to rethink the accepted laws of physics. The accuracy and reliability of the Renishaw OMP400 probe was a key factor in our success."

National Metrology Institute of Germany (Germany)

> Accuracy is the main reason we use Renishaw technology. I don't think we could do half of what we do without their probes.
>
> **Tridan Engineering (UK)**

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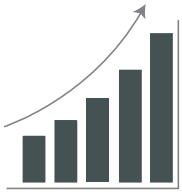
Probing pays with Renishaw

Optimise your cutting process



Ensure parts are machined “right first time”.

Reduce scrap and rework

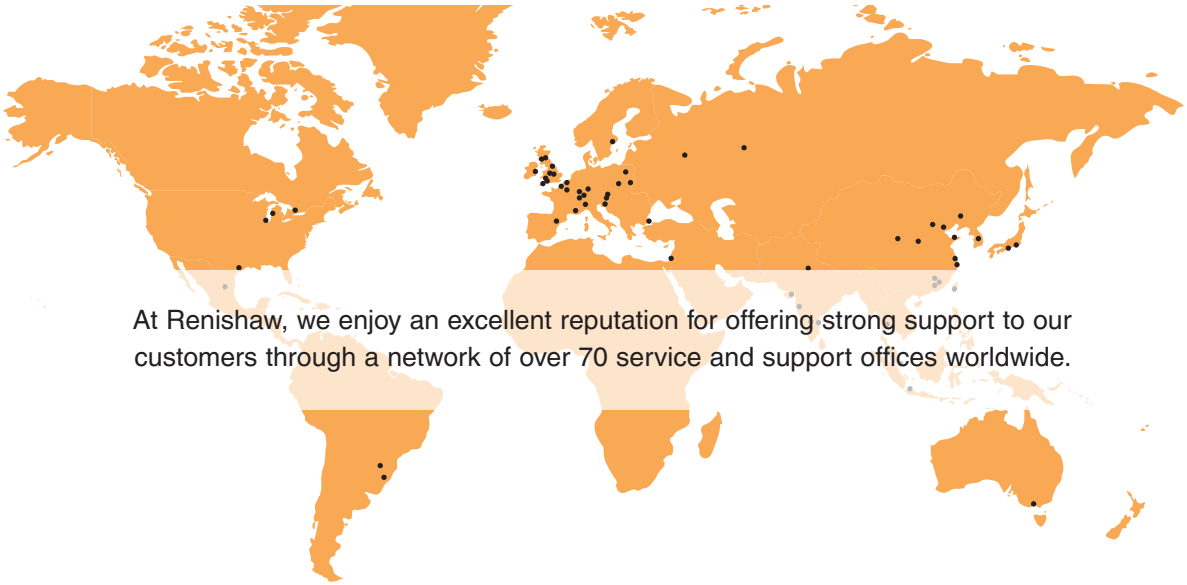
Set parts up to ten times faster than when using manual methods.

Save time and money

Produce more parts reliably and accurately.

> “Meeting current and future performance requirements for our products demands manufacture of ever smaller and more intricate parts that are consistently accurate to within 1 µm. Reliable set-up and measurements are therefore critical to this process and form the basis of our decision to use RENGAGE™ technology.”
>
> **Flann Microwave (UK)**

The Renishaw advantage



At Renishaw, we enjoy an excellent reputation for offering strong support to our customers through a network of over 70 service and support offices worldwide.

Technical assistance

We supply technical assistance to all our global customers.

Support and upgrades

We provide a variety of support agreements bespoke to your individual needs.

Training

We offer standard and bespoke training courses to meet your requirements.

Spares and accessories

Buy spares and accessories online or obtain quotes for Renishaw parts 24/7.

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About Renishaw

Renishaw is an established world leader in engineering technologies, with a strong history of innovation in product development and manufacturing. Since its formation in 1973, the company has supplied leading-edge products that increase process productivity, improve product quality and deliver cost-effective automation solutions.

A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

Products include:

- Additive manufacturing and vacuum casting technologies for design, prototyping, and production applications
- Dental CAD/CAM scanning systems and supply of dental structures
- Encoder systems for high-accuracy linear, angle and rotary position feedback
- Fixturing for CMMs (co-ordinate measuring machines) and gauging systems
- Gauging systems for comparative measurement of machined parts
- High-speed laser measurement and surveying systems for use in extreme environments
- Laser and ballbar systems for performance measurement and calibration of machines
- Medical devices for neurosurgical applications
- Probe systems and software for job set-up, tool setting and inspection on CNC machine tools
- Raman spectroscopy systems for non-destructive material analysis
- Sensor systems and software for measurement on CMMs
- Styli for CMM and machine tool probe applications

For worldwide contact details, visit www.renishaw.com/contact

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