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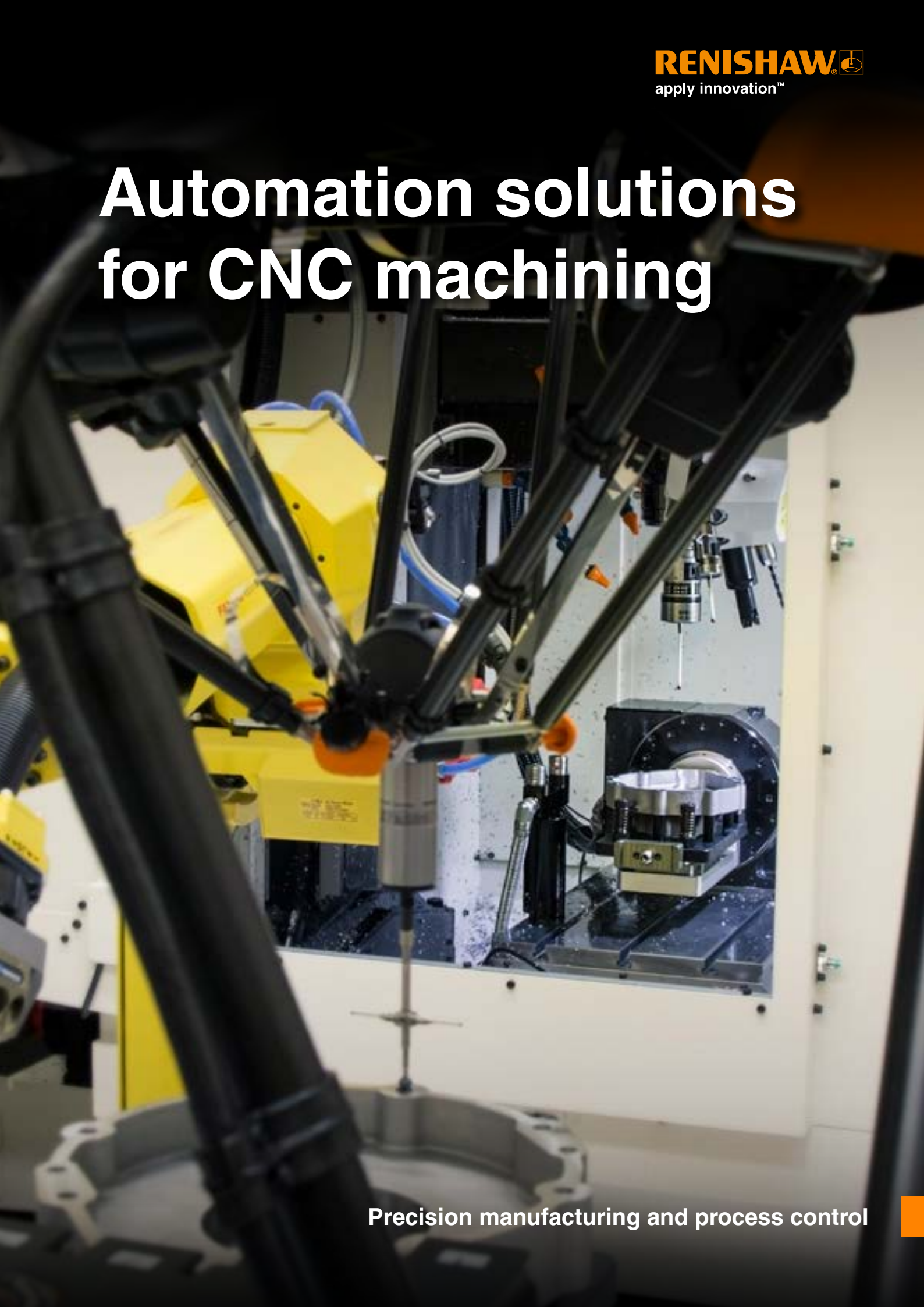
Automation solutions for CNC machining



Precision manufacturing and process control

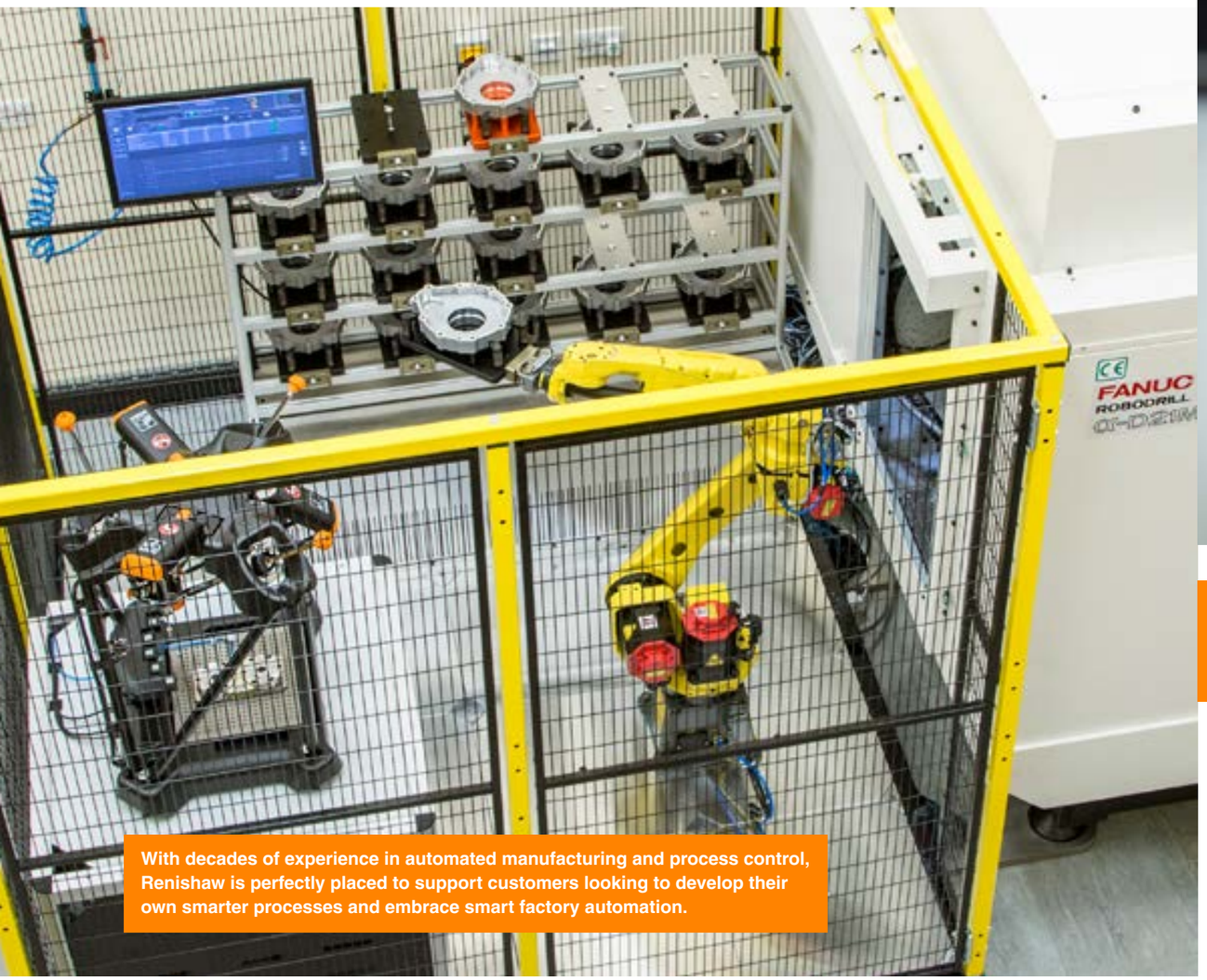
How to meet rising demand for automation

The resilience of the manufacturing industry has been tested to the limit in recent times. Manufacturers are under pressure to produce more from existing plant and equipment than ever before, and all in the face of significant global challenges.

Geopolitical changes and the unprecedented disruption caused by the global pandemic have impacted the stability and effectiveness of supply chains, causing the major centres of manufacturing to use reshoring initiatives to ensure supply. As a result, many have fast-tracked their plans to implement automation.

With few new workers entering the sector with the necessary manual, operational and technical skills to support traditional CNC machining processes, businesses must find ways to increase production without increasing labour requirements. As a result, demand for industrial automation technologies has risen sharply.

Automating CNC machining processes allows increased levels of utilisation and reduces the amount of labour required in factories. By decreasing reliance on human intervention in favour of the consistency and predictability associated with automation, manufacturers can drastically reduce cycle times and enhance quality and the ability to plan.



With decades of experience in automated manufacturing and process control, Renishaw is perfectly placed to support customers looking to develop their own smarter processes and embrace smart factory automation.

Renishaw customers are capable of producing high-performance parts, manufactured to tighter tolerances and with minimal human intervention.

Renishaw: the process automation experts

For decades, Renishaw has been using its own industrial metrology products, with high levels of automation and connectivity, to master consistent, automated and productive metal cutting in its own production facilities.

The company's digital transformation began in the early-Nineties, when demand for Renishaw probing instruments rose sharply. Its trademark innovative approach to solving manufacturing challenges led to the development of its Renishaw Automated Milling, Turning and Inspection Centre (RAMTIC).

RAMTIC enabled Renishaw to revolutionise its manufacturing operations, using process control to increase production with high levels of machining accuracy and process automation.

Renishaw now helps its partners to apply these technologies and integrate industrial automation into their own end-to-end production processes.

For example, adding standard on-machine probing routines to automate traditionally manual activities, such as part set-up and process monitoring, simplifies operations and reduces the manual interventions they require to keep running. Probing is proven to help maximise the efficiency, quality, capability and accuracy of machine tools.

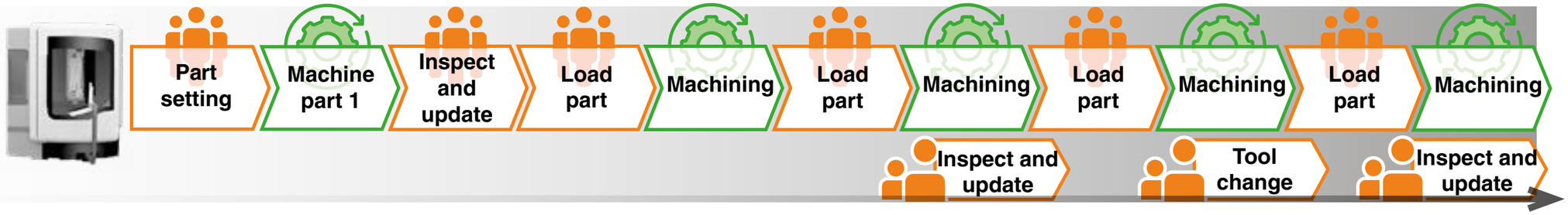
Automated CNC machining processes

The integration of physical manufacturing processes with digital information technologies provides an opportunity for manufacturers to develop smarter processes for improved capability and productivity. Technologies used in the early stages of design and process planning, such as CAD/CAM and CNC programming software, require reduced levels of user expertise. Meanwhile, more technology is being directed towards shop floor CNC machining process information and using that data to continuously optimise processes and design efficiency.

If you include metrology in your CNC machining processes, you'll be able to automate manual processes.

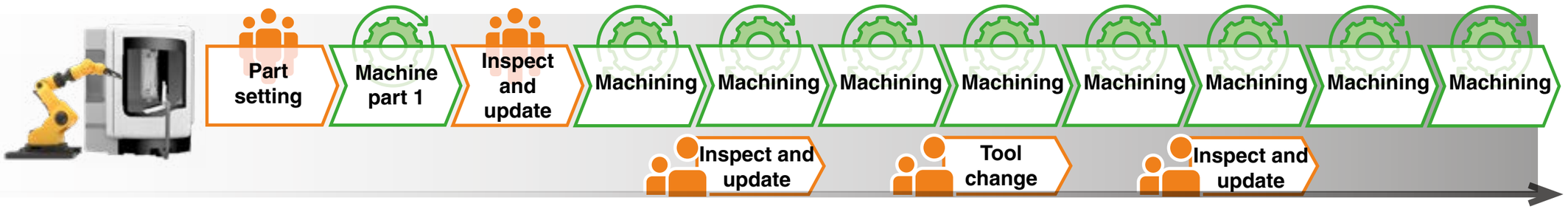
No automation

The manufacture of a batch of parts on a CNC machine without automation includes a combination of relatively low-skilled manual activities, such as loading materials for machining parts as well as skilled activities, such as part set-up and process control to inspect, adjust and update.



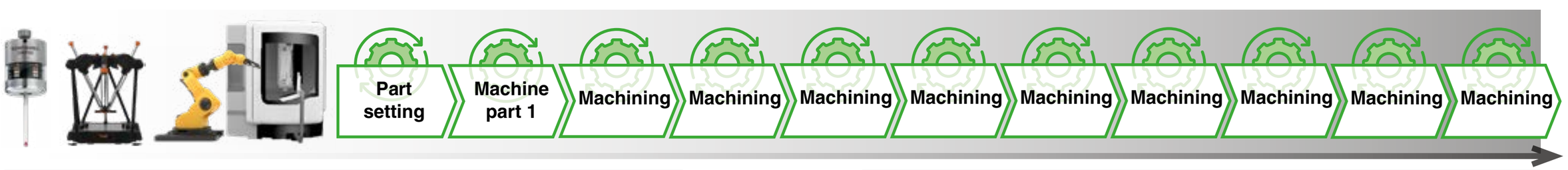
Basic automation

The introduction of factory automation reduces the number of manual interactions between people and machines, such as loading and part-handling activities.



Full automation

Integrated metrology automates the remaining manual processes, such as measuring and adjusting tool offsets to keep processes under control.



Integrating Renishaw technologies

Bringing industrial metrology to the shop floor enables you to automate activities that previously required skilled manual input. Performing process setting activities on your machine tools before metal cutting starts allows you to predict whether processes will be successful. Follow this with process control activities and your machine can respond automatically to material conditions, inherent process variations and unplanned events.

No other industrial metrology company offers the breadth of technologies to support full end-to-end control of automated CNC machining processes.

1 Machine performance

Successful automation of CNC machining processes requires the confidence that your machine tool is performing as expected. Renishaw's calibration systems and software for accurate machine tool set-up, create a foundation for high quality, repeatable, automated manufacturing processes.

2 Machine setting

Machine setting establishes alignment and position and allows machine-specific work offset calculation, which reduces machine-to-machine variation.

3 Tool setting

Contact and non-contact tool setting systems enable the unattended operation of machine tools. Tool setting determines the length, radius and/or diameter of cutting tools and even the condition of the cutting edge for automatic tool offset calculation and correction.

4 Part setting

Traditionally, this would involve human intervention. Introduce automated workpiece setting to your machine shop to establish the datum feature positions, orientation, size and identification of part.

5 Tool breakage detection

Automatic broken tool detection enables the unattended operation of machine tools, which means that one operator can easily manage multiple machines. Tool condition monitoring can detect the presence of a tool, tool position and broken or chipped tool edges.

6 On-machine measurement

In-cycle gauging enables you to adapt metal cutting based on variations in the machining process, part distortion, tool deflection and thermal effects. It allows you to update co-ordinate systems, parameters and offsets based on actual real-time conditions.

7 Off-machine measurement

Introducing flexible gauging close to the point of manufacture allows you to validate discrete machining operations, enabling automated process control and increased confidence in final part quality.

8 Tracking and control

As well as tool setting, part finding and tool breakage detection, Renishaw technologies can also compensate for changes and process drift caused by tool wear and thermal effects.

9 Tool adjustment

Automatically reset the machining process after tool replacement.

10 Part verification

To complete the manufacturing process, Renishaw's growing range of 5-axis multi-sensor technologies for use on a single co-ordinate measuring machine enables you to switch automatically between dimensional and surface finish measurements. This facilitates a level of automation in the quality room.

Renishaw technology in the automated manufacturing process

Only Renishaw can provide all of the industrial metrology solutions that are required throughout the manufacturing process. These technologies include systems for assessing the performance and calibration of CNC machines, on-machine probing and tool measurement systems for automated CNC set up, process control and part measurement. Discover Renishaw's end-to-end technologies for enabling effective process automation.

AxiSet™ Check-Up software

- Quick, easy and automated set-up of multi-axis machines
- Automatic compensation for machine kinematics and thermal drift

RENGAGE™ strain gauge probe

- High-accuracy machine tool probes with industry-leading 3D performance
- Workpiece set-up, in-process control and post-process inspection

NC4+ Blue non-contact toolsetting and breakage detection

- High-precision, high-speed tool measurement and broken tool detection for a wide range of cutting tools

REVO® 5-axis measurement system for co-ordinate measuring machines

- Multi-sensor automated part validation for the shop floor or quality lab

Set and Inspect and *Reporter* apps

- Data visualisation at the machine
- Ease of use for probing applications

Equator™ gauge with IPC software (Intelligent Process Control)

- Shop floor validation of machining processes with closed-loop feedback

Supporting your process automation journey

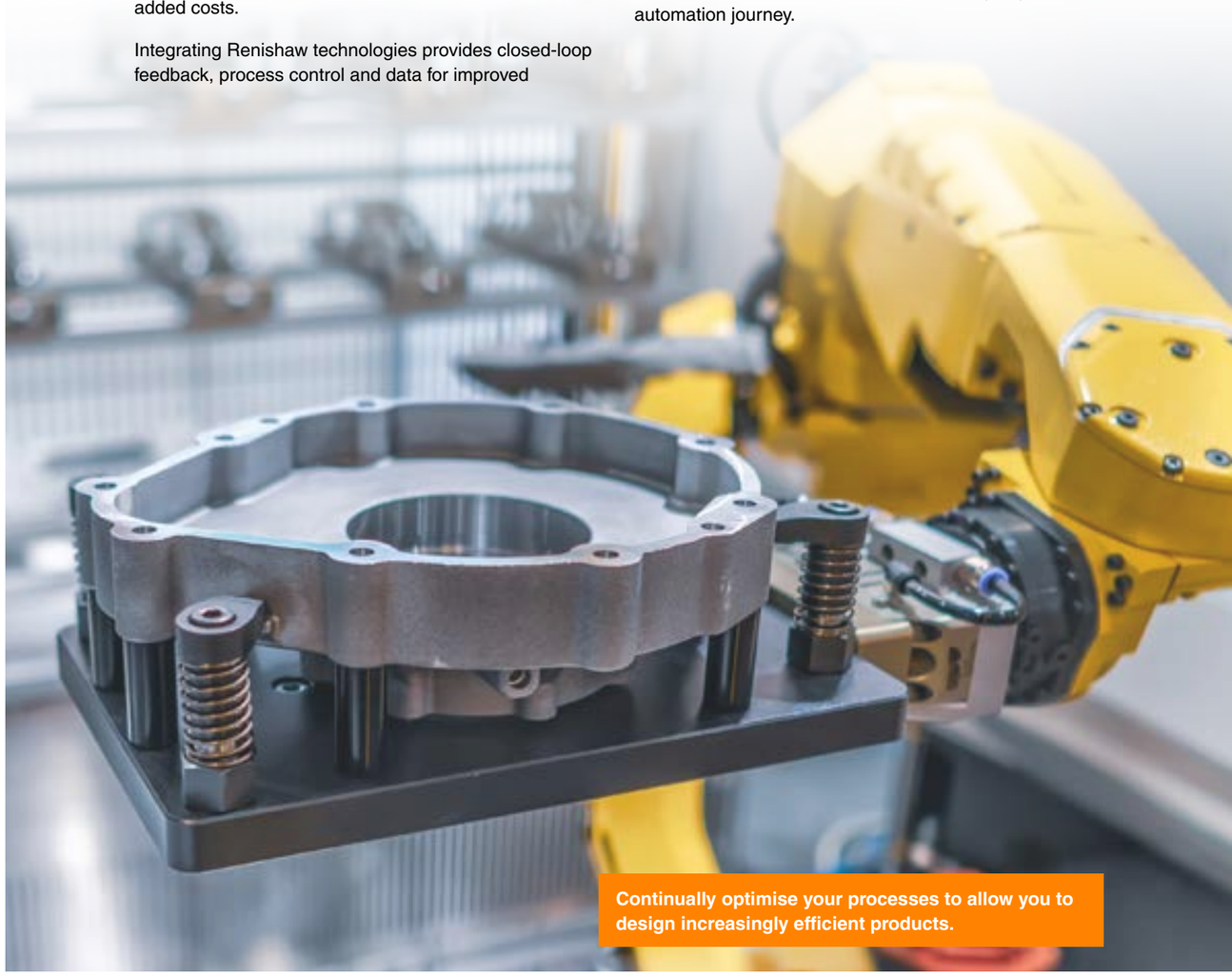
'Automation' means different things to different manufacturers, and there are many levels of automation that can enhance CNC machining operations.

Automation can mean anything from bar feeding raw material onto a lathe, to reducing operator intervention, to allowing machines to run for longer with fewer staff, and even taking the step towards fully automated intelligent manufacturing systems.

Renishaw's vision for the factory of the future considers the full manufacturing process and supports more than just mechanical automation. Automating all aspects of process control, adjustment and decision making is critical to unlocking the potential capacity of a factory without adding the requirements for specialist skills and added costs.

Integrating Renishaw technologies provides closed-loop feedback, process control and data for improved factory efficiency from start to finish. But more than this, Renishaw's data-driven technologies are enabling manufacturers to take full advantage of the transformative opportunities represented by Industry 4.0. Connecting information about manufacturing processes with Product Lifecycle Management (PLM) systems, for example. By collecting process data and linking it back to product design, your business can continuously optimise the design of your products and processes. This enables you to create more efficient products, with less scrap and reduced energy requirements, in pursuit of more sustainable production

Renishaw technologies can deliver benefits at every stage of the automation journey. So, whatever you're here for, Renishaw has a critical part to play in your automation journey.



Continually optimise your processes to allow you to design increasingly efficient products.

RENISHAW
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Applying innovation since 1973

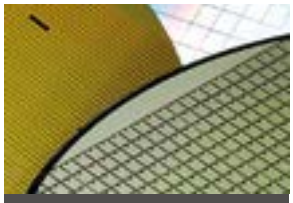
Renishaw is one of the world's leading engineering and scientific technology companies, with expertise in precision measurement and healthcare.

Our worldwide network of subsidiary companies and distributors provides dedicated global customer support, wherever you are.

Our principal markets include:


Aerospace


Automotive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