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The Renishaw QC20-W wireless ballbar for machine tool performance diagnosis

Helps ensure accurate parts, first time, from CNC machines

Reduces down-time & costs
Reduces machine down-time, scrap and inspection costs

QA compliance
Show compliance with both machine performance and quality management standards

Predictive maintenance
Allows fact based predictive maintenance

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Production pressures!

If you are involved in component machining you don't need telling that machining errors can result in numerous quality problems and reworked or scrapped components.

The quality of every component produced on a CNC machine is highly dependent on the machine's performance. Problems with a machine inevitably result in defective parts. It may be cosmetic, out of specification, or unfit for purpose but the inspection, investigation and rectification will have an impact on your business:

- Wasted time and reduced productivity
- Higher piece part costs
- Delayed deliveries
- Dissatisfied customers

All too frequently, traditional quality and inspection procedures only identify problems after components have been produced. That's too late.

This is especially true if you're working on high cost, complex parts. In combination with the close tolerances of the parts and high volume machining there is little or no margin for errors.

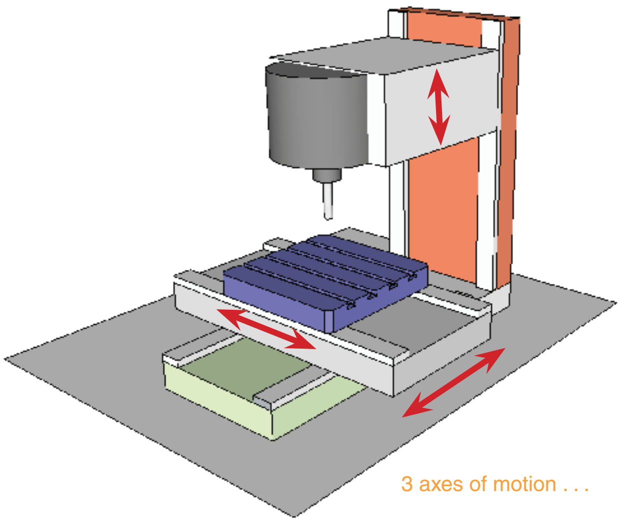
Human error and tooling problems can be some of the many reasons for this, but machine positioning performance can often be the major factor.

Modern CNC machine tools have excellent specifications, but their performance (even when new) can be compromised by inadequate foundations, poor location and incorrect installation. Once in use, they are also subject to wear and possible damage from crashes or misuse.

That's why it is ESSENTIAL that your machine's performance is checked regularly and, just as importantly, checked **before** you start manufacturing components.

Defective machines = defective parts

A typical 3-axis machine tool is subject to 21 degrees of freedom (deviations from the ideal including linear positioning, pitch, yaw, straightness, roll and squareness between axes). All of these can have a detrimental effect on the machine's overall positioning accuracy and the accuracy of machined parts.



3 axes of motion . . .

. . . and multiple potential positioning errors on each axis (and between axes)

Potential errors on an axis	
Backlash	Cyclic error
Reversal spikes	Straightness
Lateral play	Scale error

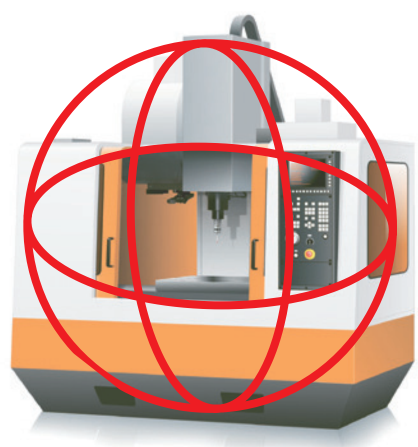
Potential errors between axes	
Servo mismatch	Squareness

Furthermore, the potential for problems increases significantly when you consider the additional dynamic effects as the machine moves and the coordination needed to produce smooth, interpolated motion.

Degradation of machine positioning accuracy is not always apparent until a machine starts to produce reject parts. What is needed is a process to put you back in control of your machine tool so you can decide whether a problem needs immediate attention or can be tackled later, but in all cases, **before** you start machining!

With so many factors involved, any solution has to be simple to use, quick and deliver easily understood results, with the minimum disruption and cost to your business. Luckily there is a solution.

In theory if a CNC machine's positioning performance was perfect then the circle traced out by the machine would exactly match the programmed circular path.



Perfect circles in X, Y and Z axis define a perfect machine

In practice any of the errors mentioned above will cause the radius of the circle to deviate from the programmed circle. If you could accurately measure the actual circular path and compare it with the programmed path you would have a measure of the machine's performance.

This is the basis of the Renishaw QC20-W ballbar, the industry standard for quick machine tool performance diagnosis.