

# Quickly diagnose the performance of your machine tools



## Reduces down-time

Reduces both machine down-time and maintenance costs



## Compliance

Full compliance with ISO, ASME and JIS standards



## Predictive maintenance

Forms the basis of predictive maintenance programs



Quickly diagnose the performance  
of your machine tools

## Get a Renishaw QC10 ballbar, get control!

### The problems

- Inspection failures
- Scrapped components
- Wasted time
- Reduced productivity
- Quality crisis

Before you blame . . .

- The tooling
- The drawing
- The inspection
- The part program
- The machine operator

. . . maybe your machines are at fault!

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 inspection failures, scrapped components and unexpected down-time.

All too frequently, quality and inspection procedures identify problems after components have been produced. However, this is often too late to rectify any of the incurred scrap and down-time costs.

For this reason, it is ESSENTIAL that your machine performance is checked before

component manufacture.

### The solution

**Renishaw's QC10 ballbar offers you the perfect solution. A quick 10 minute test\* is all that is required to assess the performance of your machine.**

The Ballbar 5 software guides you through the dynamic circular test, analysing your machine's performance in accordance with ISO, JIS and ASME standards, as well as Renishaw's own reports. In addition, advanced mathematical techniques are used to identify the specific error sources on your machines.

Take the guesswork out of your machine's performance. The QC10 ballbar system provides you with a quick and effective solution to evaluate machine performance, and actually helps you to improve it through targeted maintenance.

- Verify machine performance
- Achieve manufacturing tolerances
- Grade and compare machines
- Test and monitor machine condition
- Predict maintenance requirements
- Check new machines at commissioning

### QC10 ballbar kit

**The quickest, easiest and most effective way to monitor machine tool condition. The ballbar kit provides a complete,**

\*Based on typical feedrates and test radius

### Accurate

When used with the Zerodur® calibrator, the QC10 ballbar measures the absolute radius of a tool path. The ballbar can be used to diagnose pitch errors, thermal distortion, scaling errors and radial deviation (ISO230-4 and B5.57). In addition, the software will automatically calculate the positional tolerance of the machine.



Zerodur is a registered name of Schott Glass Technologies Inc.

### Who can benefit?

- End users
- Distributors
- OEMs
- Service companies

### Where can you benefit?

- Production
- Maintenance
- Engineering
- Management
- Quality
- Sales and Marketing

### How can you benefit?

For more details of user benefits and of the QC10 in action ask for your free copy of the QC10 promotional CD-ROM today.

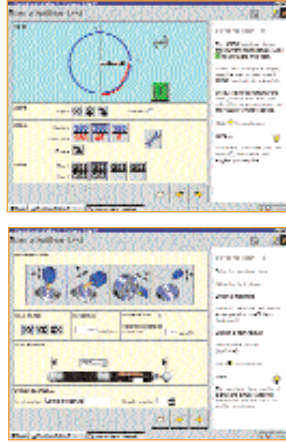
**Ask for a free copy!**



QC10 ballbar kit with Zerodur® calibrator

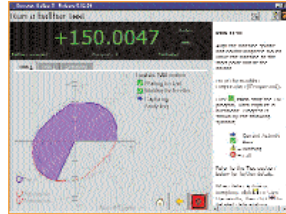
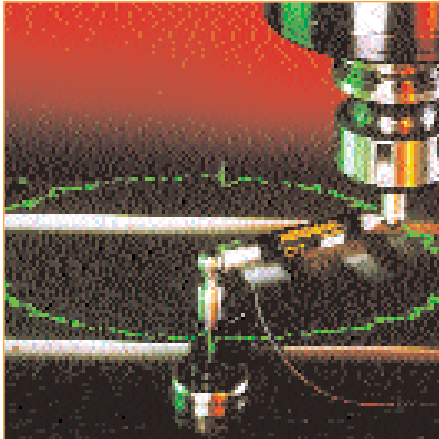


With a QC10 Ballbar system it only takes 10 minutes to diagnose the fault



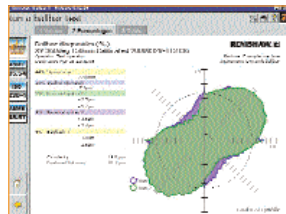
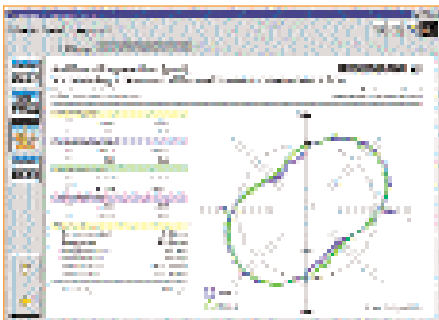
## 1. Setup

- Setup is quick and easy with Windows™ based software guiding the operator through each step
- The QC10 ballbar is mounted between two repeatable magnetic joints
- A simple G02 and G03 command program is all that's required for the test
- The new HPS software includes an automatic part program generator



## 2. Capture

- The machine performs two consecutive circular arcs, one test in the clockwise direction, the other in the counter-clockwise direction
- The QC10 ballbar accurately measures any deviations in the circle radius during the test

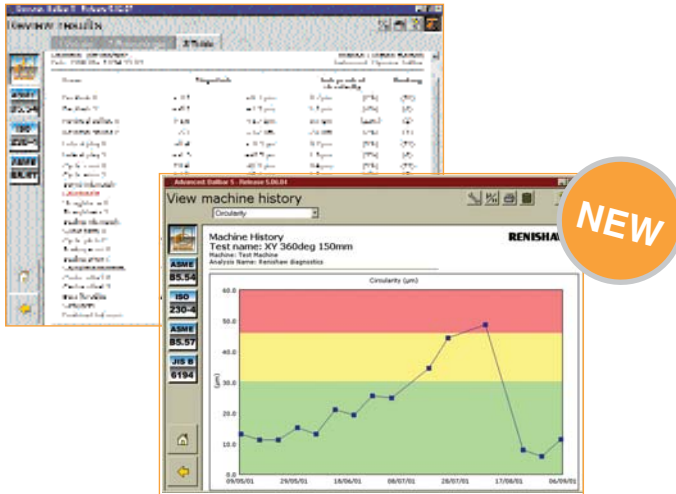


## 3. Analyse

- Ballbar data is sent directly to a PC via a standard RS232 link
- Renishaw's Ballbar 5 software then analyses the data in accordance with ISO230-4, ASME B5.54 – B5.57, or JIS B6194 machine performance standards
- The shape of the ballbar plot indicates the major sources of machine error

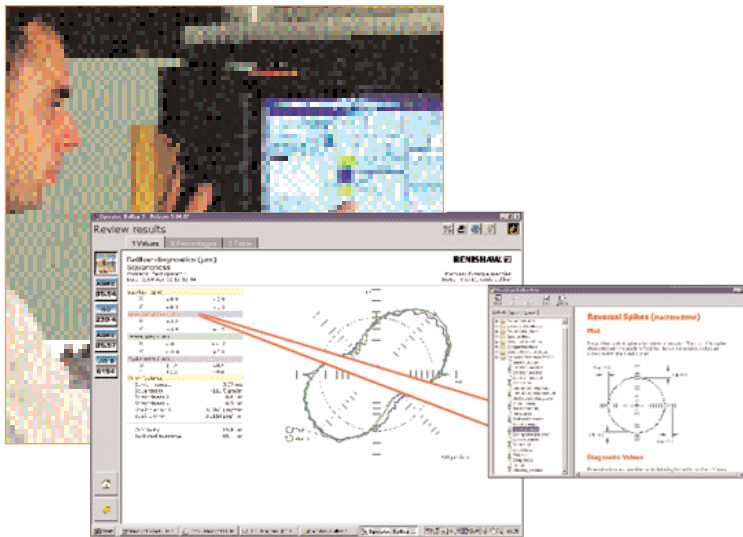


Servo Mismatch, Stick-slip, Reversal spikes, Cyclic error, Scale, Straightness, Lateral play, Backlash, Squareness.



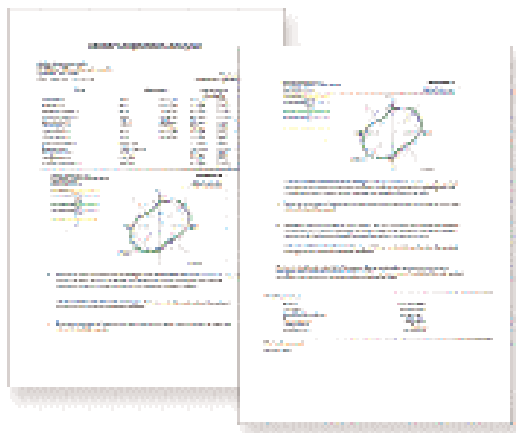
#### 4. Diagnose

- Powerful software gives automatic analysis and diagnosis of specific machine error characteristics
- Each error is ranked according to its significance to overall machine accuracy
- Overall machine accuracy is graded with a value for circularity and positional tolerance
- Machine history - Review machine



#### 5. Fix

- Pinpointing the specific machine faults enables efficient, targeted machine maintenance, minimising downtime
- 'Hotlinks' take you directly to the relevant section of the on-line user manual
- The manual explains the possible causes for each type of machine error and offers advice on how best to fix them
- The software includes a machine error simulator to help predict effect of maintenance in advance.



#### 6. Report

- On screen reports can be printed or archived for future reference and also cut and paste into other applications
- Switch between supported languages for reports\*
- Plan predictive maintenance programs by tracking machine performance

\*English, French, German, Italian, Spanish, Czech, Russian, Chinese, Japanese and Korean.

## Test a wide range of machines

### Flexible and easily adaptable

The QC10 ballbar is an extremely versatile tool designed to be used on a large variety of machines. The standard system can be used to test 3-axis CNC machines such as horizontal and vertical machining centres. With the addition of other accessories detailed below, the QC10 ballbar can also be used to test a much wider range of machines.

For 2-axis CNC applications, a special retractable centre mount, the **VTL adaptor**, is used. This enables typical 2-axis machines such as pick and place machines, laser cutting machines and vertical turning lathes etc. to benefit from QC10 ballbar diagnosis.

The **360° lathe adaptor** enables the QC10 ballbar to be used on a wide range of CNC lathes. As with machining centres, it also allows a full diagnosis of lathe capabilities to be performed.

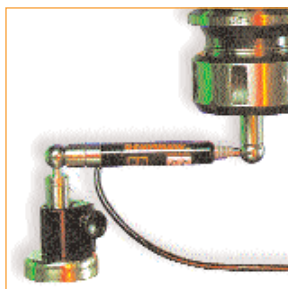
To address smaller machines, the **small circle accessory kit** allows testing of CNC machines with shorter axis travel. Additionally, it can help to give an enhanced analysis of servo control systems on most types of machines.

### System specification

|  |   |
|--|---|
| <b>Resolution</b>                      | 0.1 $\mu\text{m}$ (4 microinches)   |
| <b>Ballbar sensor accuracy</b>         | $\pm 0.5\mu\text{m}$ (at 20°C)<br>$\pm 20$ microinches (at 68°F)  |
| <b>Maximum sample rate</b>             | 250 values per second   |
| <b>Extension bars</b>                  | 50 mm, 150 mm, 300 mm   |
| <b>Operating range</b>                 | 0 – 40°C (32 – 104°F)   |
| <b>Calibrator accuracies (at 20°C)</b> | $\pm 1\ \mu\text{m}$ (50 mm)<br>$\pm 1\ \mu\text{m}$ (100 mm)<br>$\pm 1\ \mu\text{m}$ (150 mm)<br>$\pm 1.5\ \mu\text{m}$ (300 mm) |

### Minimum PC specification

Windows® 95, 98, 2000, XP, ME or NT4, Internet Explorer 5.5 (5.1 or higher), at least 200MHz, 32MB RAM, min screen resolution 800 x 600 pixels, CD-ROM drive, at least one RS232 port (USB to RS232 adaptor required for USB only PCs).



QC10 ballbar



VTL adaptor



360° lathe adaptor



Small circle accessory kit

**Renishaw plc**  
New Mills, Wotton-under-Edge,  
Gloucestershire GL12 8JR  
United Kingdom

**T** +44 (0) 1453 524524  
**F** +44 (0) 1453 524901  
**E** uk@renishaw.com  
[www.renishaw.com](http://www.renishaw.com)

**RENISHAW**   
**apply innovation**

## Renishaw applies innovation to provide solutions to your problems

Renishaw is an established world leader in metrology, providing high performance, cost-effective solutions for measurement and increased productivity. A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

Renishaw designs, develops and manufactures products which conform to ISO 9001 standards.

Renishaw provides innovative solutions using the following products:

- Probe systems for inspection on CMMs (co-ordinate measuring machines).
- Systems for job set-up, tool setting and inspection on machine tools.
- Scanning and digitising systems.
- Laser and automated ballbar systems for performance measurement and calibration of machines.
- Encoder systems for high accuracy position feedback.
- Spectroscopy systems for non-destructive material analysis in laboratory and process environments.
- Styli for inspection and tool setting probes.
- Customised solutions for your applications.

## Renishaw offices worldwide

### Australia

**T** +61 3 9521 0922  
**E** australia@renishaw.com

### Brazil

**T** +55 11 4195 2866  
**E** brazil@renishaw.com

### The Peoples' Republic of China

**T** +86 10 8448 5906  
**E** china@renishaw.com

### Czech Republic

**T** +420 5 4821 6553  
**E** czech@renishaw.com

### France

**T** +33 1 64 61 84 84  
**E** france@renishaw.com

### Germany

**T** +49 7127 9810  
**E** germany@renishaw.com

### Hong Kong

**T** +852 2753 0638  
**E** hongkong@renishaw.com

### India

**T** +91 80 5320 144  
**E** india@renishaw.com

### Indonesia

**T** +62 21 428 70153  
**E** indonesia@renishaw.com

### Italy

**T** +39 011 966 10 52  
**E** italy@renishaw.com

### Japan

**T** +81 3 5332 6021  
**E** japan@renishaw.com

### The Netherlands

**T** +31 76 543 11 00  
**E** benelux@renishaw.com

### Poland

**T** +48 22 57 58 000  
**E** poland@renishaw.com

### Russia

**T** +7 095 112 42 44  
**E** russia@renishaw.com

### Singapore

**T** +65 8975466  
**E** singapore@renishaw.com

### Slovenia

**T** +386 1 52 72 100  
**E** mail@rls.si

### South Korea

**T** +82 2 565 6878  
**E** southkorea@renishaw.com

### Spain

**T** +34 93 478 21 31  
**E** spain@renishaw.com

### Switzerland

**T** +41 55 410 50 60  
**E** switzerland@renishaw.com

### Taiwan

**T** +886 4 251 3665  
**E** taiwan@renishaw.com

### UK (Head Office)

**T** +44 1453 524524  
**E** uk@renishaw.com

### USA

**T** +1 847 286 9953  
**E** usa@renishaw.com

### For all other countries

**T** +44 1453 524524  
**E** international@renishaw.com