

XR20-W rotary axis calibrator



Process foundation

Component quality is dependent on machine performance. Without understanding a machine's error profile it is impossible to have confidence that your components will fall within specification during manufacture.

Periodic measurement of a machine's performance and capability is the foundation of process control, providing a known, stable environment in which the process is to be performed. Quantifying process capability reduces costs and improves efficiency.

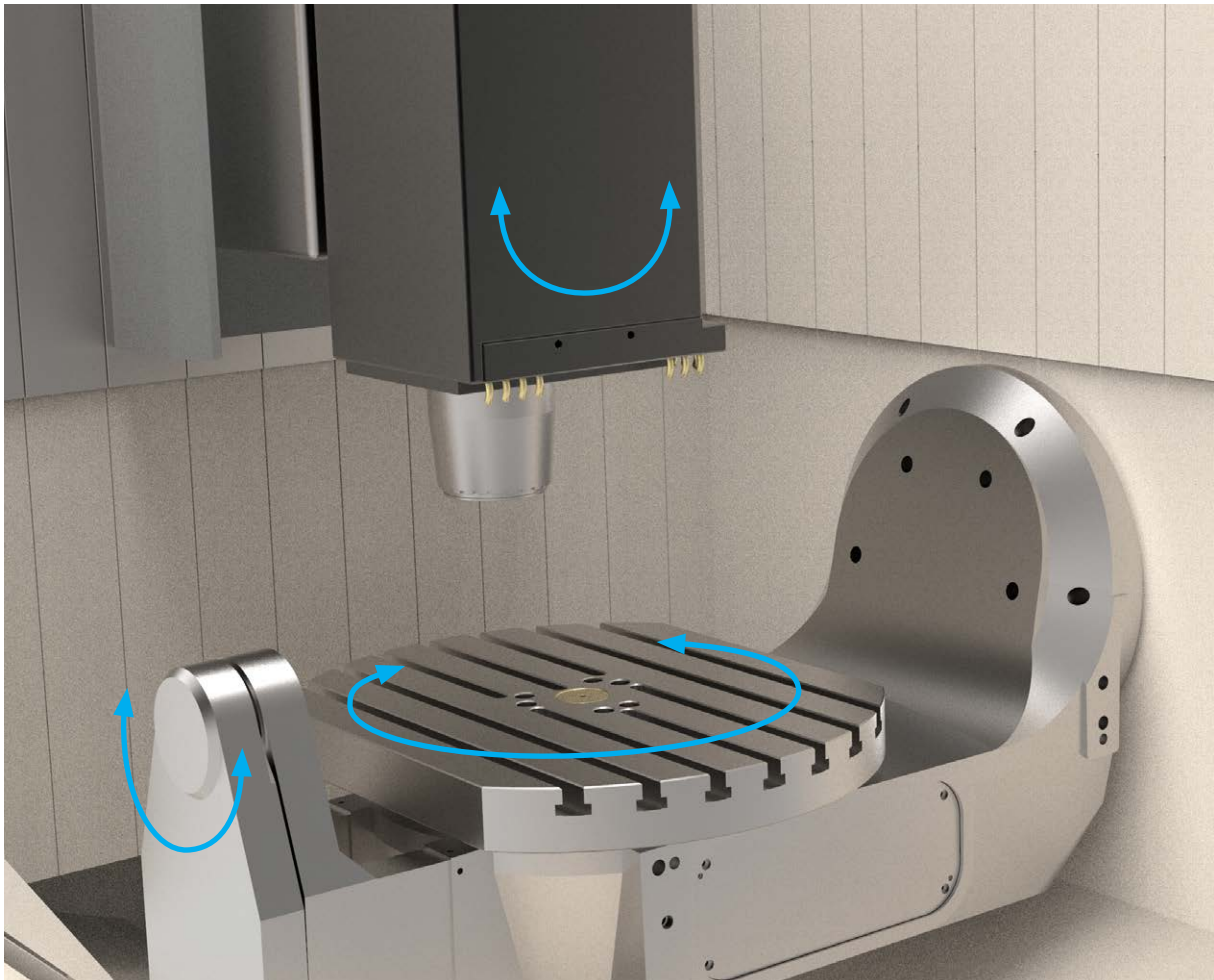


Why do you need an XR20-W rotary axis calibrator?

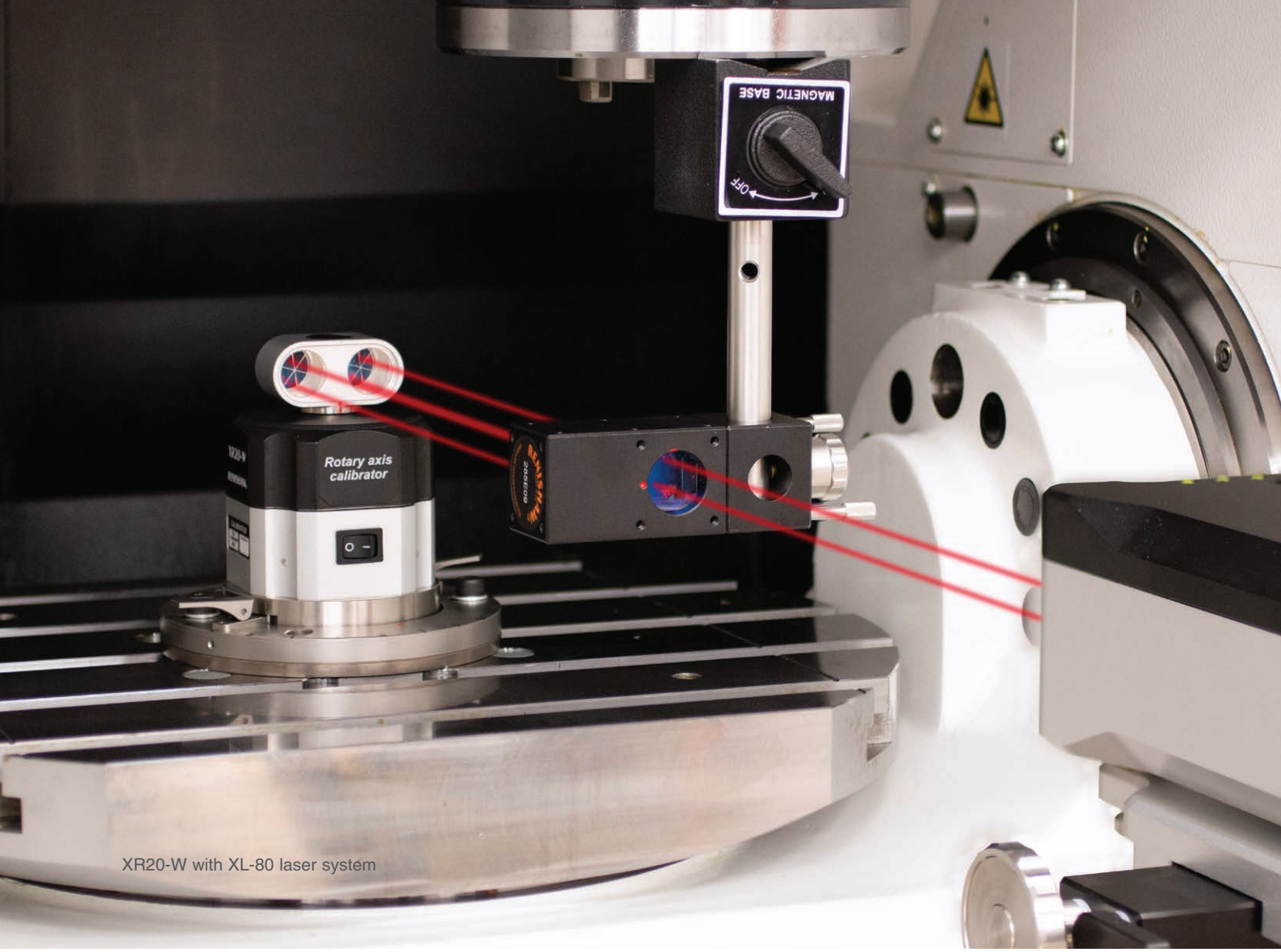
The machine tool industry is developing quickly. Initiatives to improve efficiency, and reduce scrap and production costs have created the need to understand manufacturing processes better than ever before. Knowing the capability of machine tools before metal cutting is the foundation of any machining process.

Historically, machine tool rotary axes were confined to large machines, or small indexing tables. As the introduction of smaller 5-axis machines and mill-turn designs increases, so do the challenges associated with their measurement.

As with linear axes, rotary axes are subject to errors relative to the intended positioning. This can be due to machine installation errors, collisions or general wear in use. Errors in either the angular positioning accuracy or alignment of the axes can produce significant defects in finished parts.



XR20-W calibrates **rotary axes**,
improving the **accuracy**
of **5-axis machining**.



XR20-W with XL-80 laser system



System overview

The XR20-W rotary axis calibrator works in conjunction with Renishaw XL and XM laser systems. The XR20-W consists of an integrated angular retroreflector mounted on a precision servo-controlled axis. The angular position of this axis, and the optics relative to the main body housing, is controlled by a very high accuracy encoder system with the scale directly machined onto the main bearing.

Key features and benefits:

- **Flexible and light weight** – designed for single handed easy fitment to a wide variety of rotary tables, lathes and other rotary axes
- **High accuracy** - down to ± 1 arc second verification of rotary axes in any orientation
- **Rapid testing** - quick test setup and fast data capture
- **Wireless operation** – powered by rechargeable batteries and integrated wireless connection using Bluetooth® communication
- **Built-in alignment targets** – minimises measurement errors during setup
- **Auto calibration** – pre-measurement calibration cycle compensates for angular alignment errors
- **Pre-test cycles** – automatic direction and feedrate detection

Easy to use mounting options

Mounting the XR20-W to rotary axes is simplified using a range of modular mounts to suit different applications.

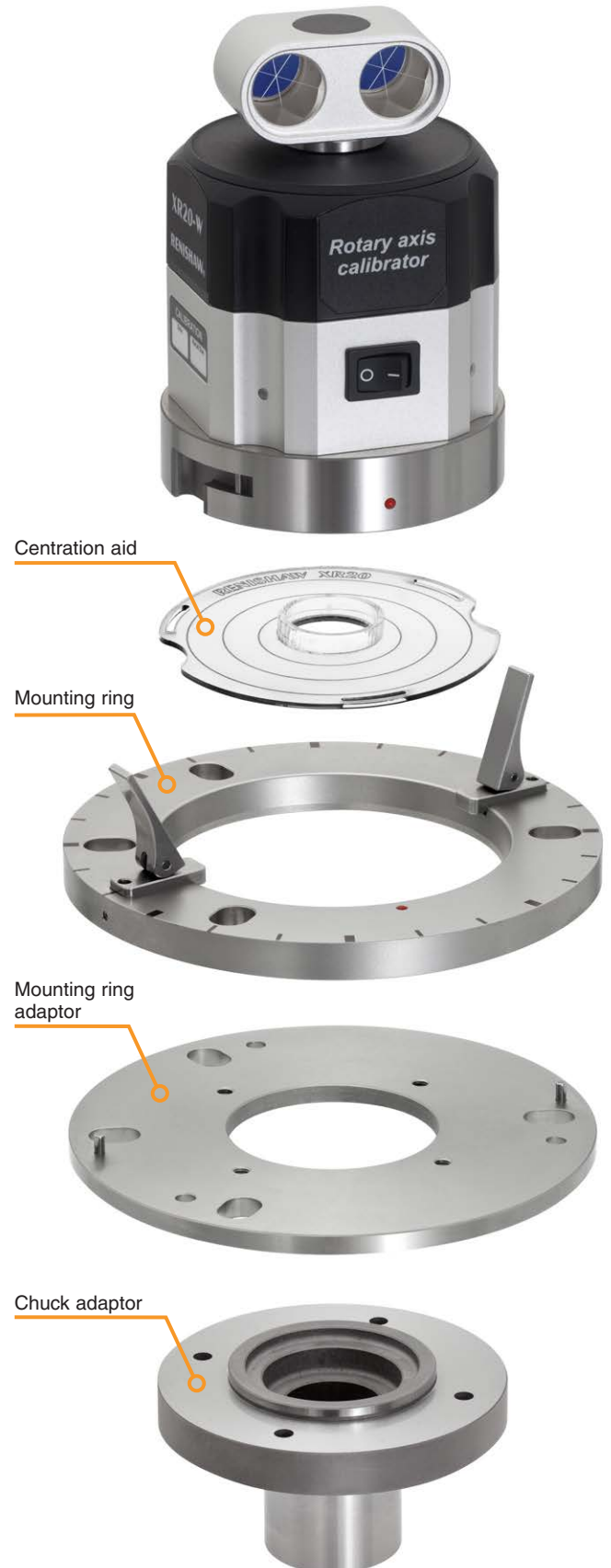
Standard mounting

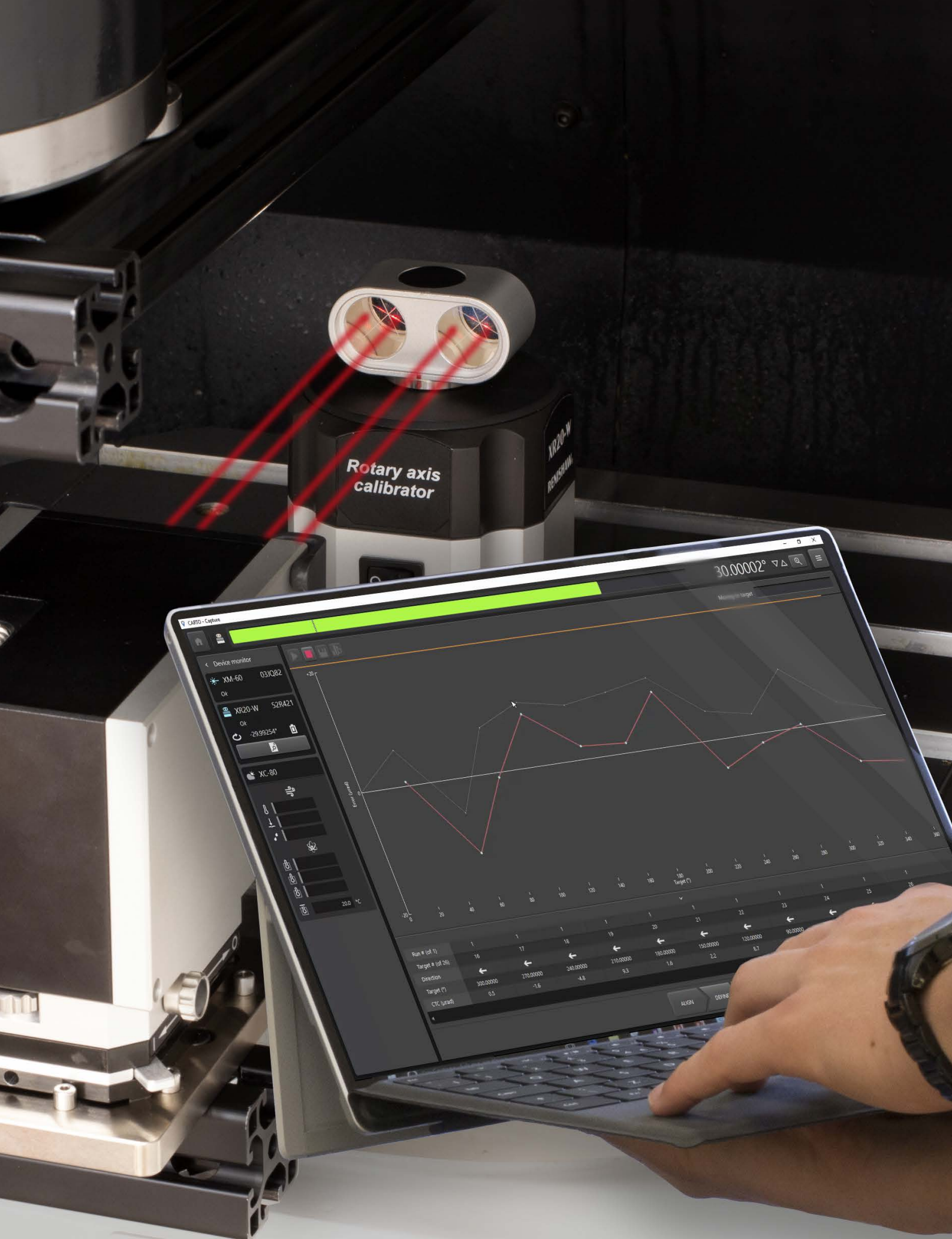
Centration on the axis is typically very simple, using the markings around the circumference of the mounting ring and the centration aid.

Flexible mounting

As well as the standard mounting arrangement, a mounting ring adaptor plate enables the XR20-W to be fitted to rotary tables with unsuitable centre recesses. It can also be used to secure the XR20-W to the chuck (lathe) adaptor and custom mounts.

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CARTO software



The CARTO software suite guides the users through the workflow of the XR20-W measurement process, from setting up a test to analysing the data. Building upon customer feedback and years of calibration experience, the intuitive user interface and the flow of the software matches the easy set-up of XR20-W with XL or XM systems.

The CARTO suite is made up of two applications;

- Capture - to collect laser measurement data.
- Explore - to provide powerful analysis to international standards.

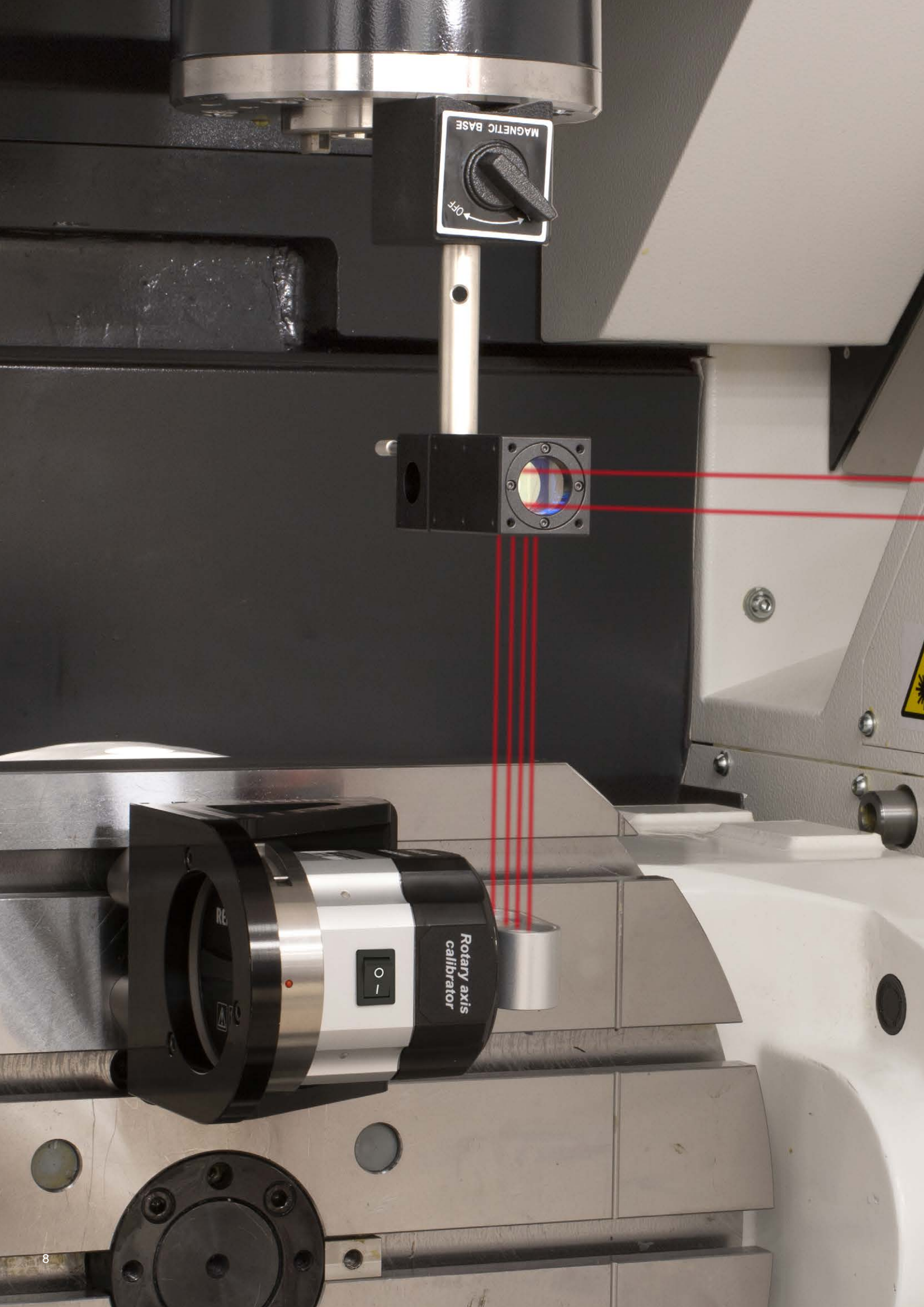
CARTO features a database system which automatically stores and organises data for the user. This simplifies operation and allows users to quickly and easily compare data across multiple machines over time.

The CARTO user interface can easily be configured to suit user preferences, with the ability to change themes and customise displays. It is tablet-friendly and has expandable menu sections for ease of use on compact screens.

Test methods are automatically saved, so users conducting repeat tests can simply recall an earlier test.

For further information visit www.renishaw.com/carto





MAGNETIC BASE
OFF

Rotary axis
calibrator

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Off axis rotary measurement

Traditionally, rotary axis calibration has required that the XR20-W is mounted on the centre of the machine's rotational axis. This can lead to difficulties on machines where access to the centre of rotation is limited, such as trunnion and swivel head machine configurations as shown in Figure A.

A solution to this is to mount the XR20-W 'off axis' (not mounted on the centre of rotation) and perform a test which synchronises linear and rotary moves so that the laser beam alignment is maintained throughout a test as shown in Figure B.

Off axis rotary software

Renishaw's off axis rotary software allows the user to:

- Automatically calculate the offset distance between the centre of rotation of the XR20-W and the centre of rotation of the rotary axis
- Generate a test part program (which synchronises rotary axis and linear axis moves to maintain laser beam alignment)
- Remove any contributory linear axis angular error from the observed rotary axis results, giving 'clean' results for the rotary axis

Off axis mounting hardware

The XR20-W 90° bracket provides a high specification mounting solution for both 'on' and 'off axis' rotary measurements. The bracket can be mounted with the removable high power magnetic feet or using the through holes for direct bolt attachment.

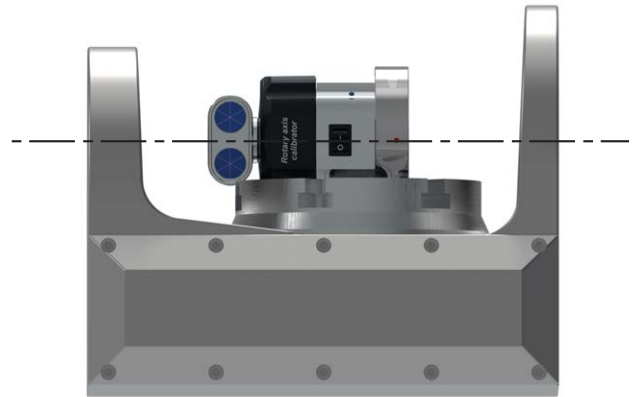


Figure A: On axis mounting

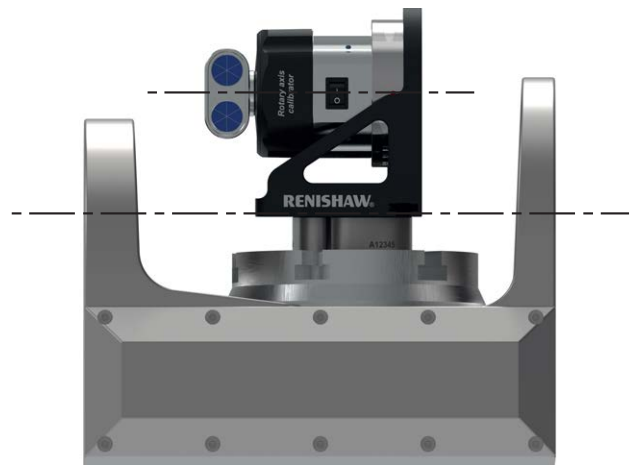


Figure B: Off axis mounting



XR20-W 90° bracket kit



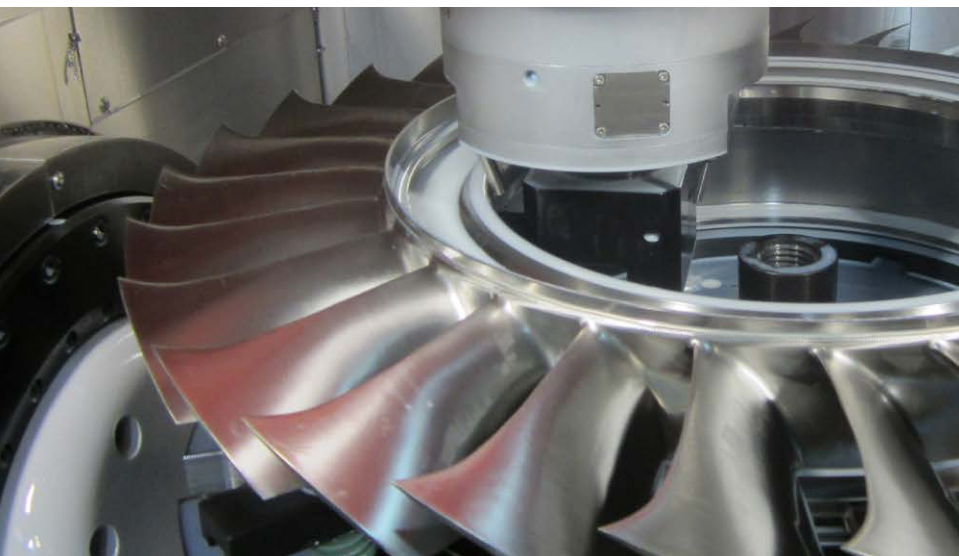
What do our customers think?

Our rotary axis calibrators offer the ultimate in confidence and usability. But don't take our word for it ...



With the features of the XR20-W (easy and flexible set-up due to its size and weight, wireless operation and user-friendly software), we have reduced our test setup time by 40% and test run time by 20%. An added benefit is that Bluetooth® wireless technology has allowed safer testing making supervision a non issue. As a result we do not disrupt shop floor activity, a great attraction to our operations and quality procedures..

Hurco (Taiwan)

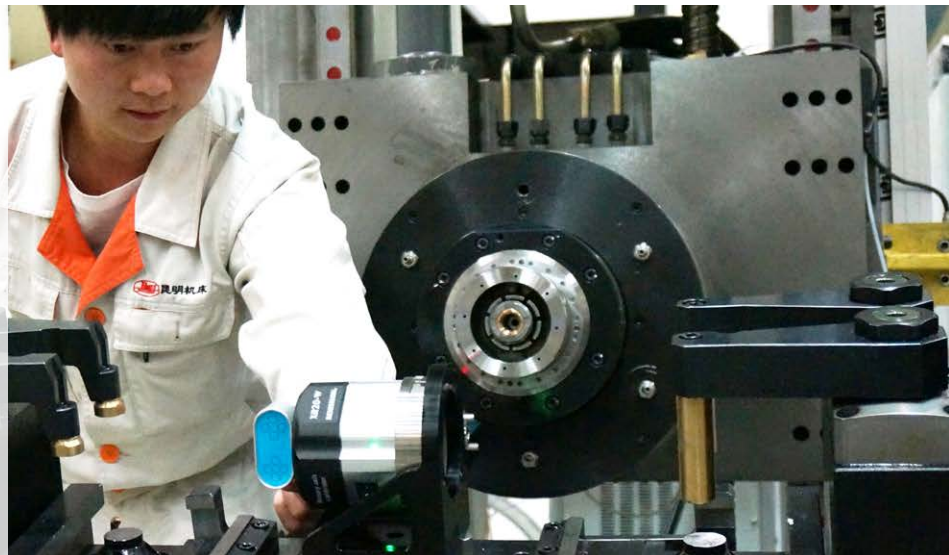


The Renishaw XR20-W rotary axis calibrator is used to check rotary axis errors. The rotary axis test, carried out with Renishaw's XR20-W is much better now because, unlike our previous control methods, Renishaw uses a reliable interferometric approach to make these tests. The assistance, support and technical approach supplied by Renishaw had a major role in helping us to reach our goals..

Breton S.p.A. (Italy)

// The XR20-W features many improvements over its RX10 predecessor, including Bluetooth wireless technology which makes the data capture process more reliable. Renishaw has a strong reputation in metrology so some of our customers specifically request that we use Renishaw's calibration products for commissioning.

Kunming Machine Tool Company Ltd (China)

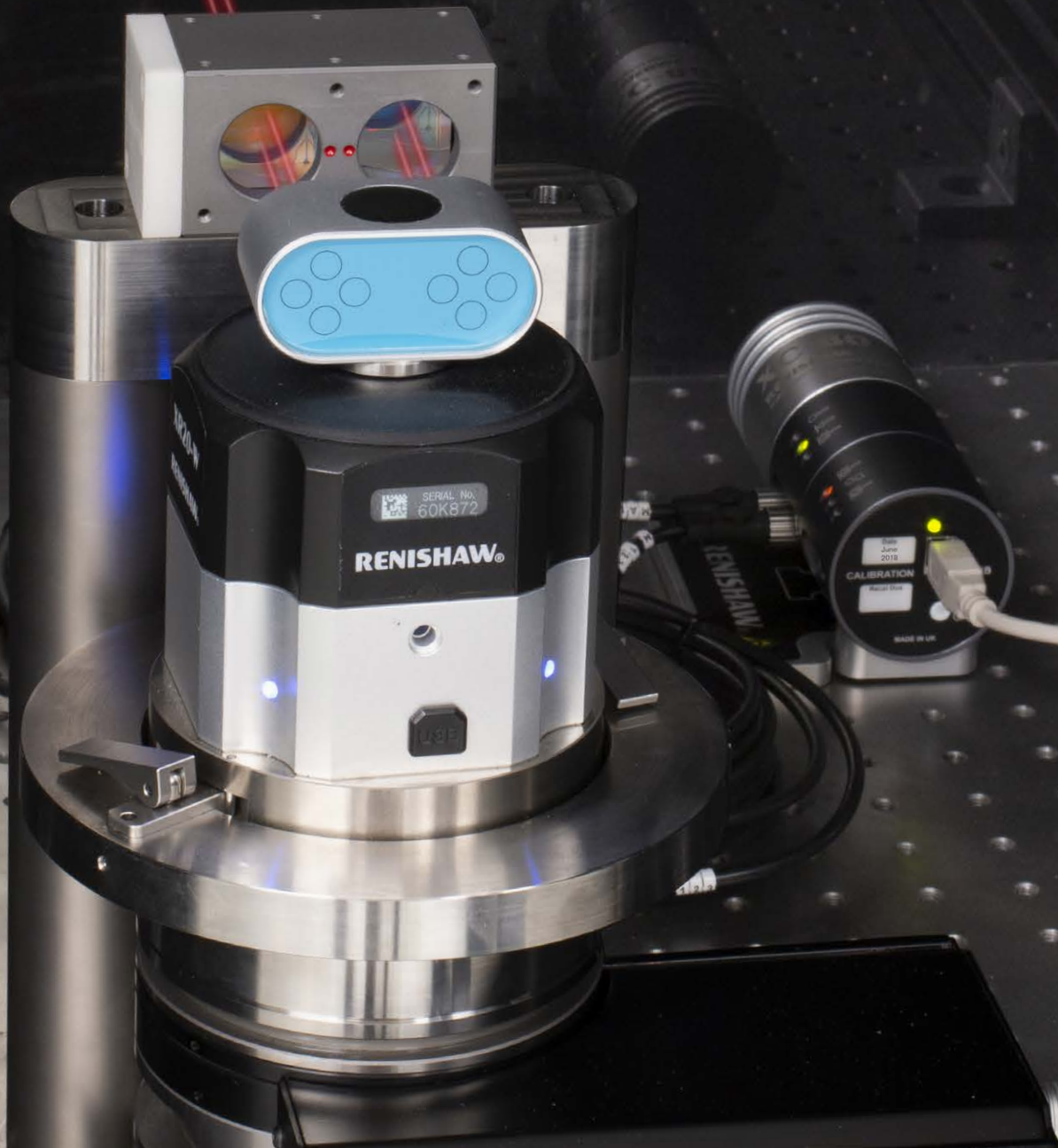
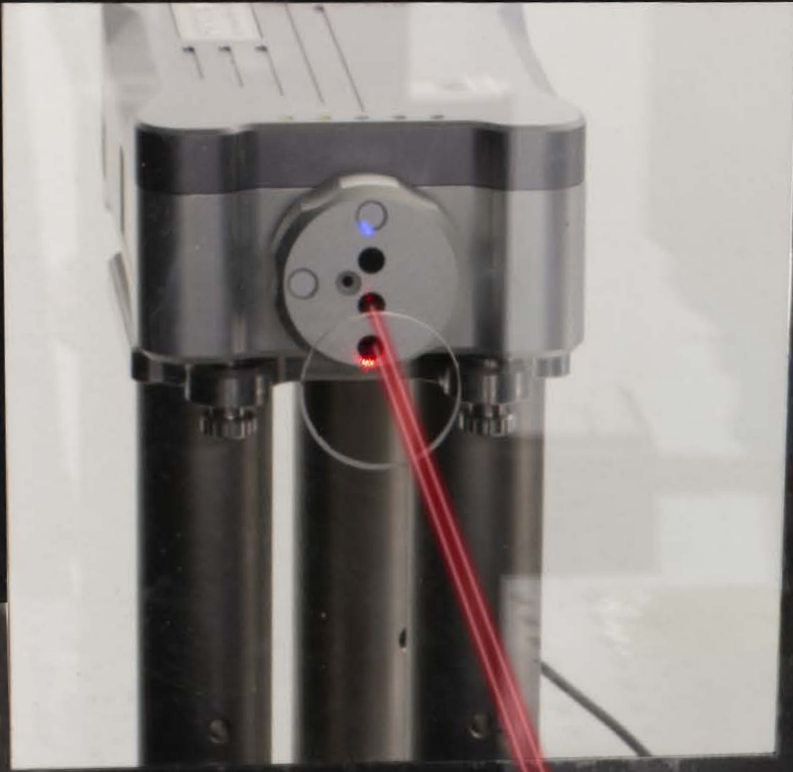


// We currently use Renishaw's XR20-W rotary axis calibrator with XL-80 laser. The XR20-W calibrator features a measurement accuracy of ± 1 arc second. Renishaw's calibration equipment is well respected in the international measurement community and greatly enhances the confidence of our customers.

Solpower (Taiwan)



Calibration facilities worldwide provide local laser calibration traceability.



Service and quality

Our ongoing commitment to service and quality provides our customers with the complete solution



Training

Renishaw offers an established range of comprehensive operator training courses either on-site or at a Renishaw training centre. Our experience in metrology allows us to teach not just about our products, but also underlying scientific principles and methods of best practice.

This enables our customers to get the most out of their manufacturing processes.

Support

Our products enhance quality and productivity, and we strive for total customer satisfaction through superior customer service and expert knowledge of potential product applications. When you purchase a laser or ballbar system from Renishaw, you are buying into a worldwide support network that understands machine metrology and the service of production equipment.

Renishaw calibrations in the UK are traceable to the National Physical Laboratory, a signatory of the CIPM MRA. Calibration facilities worldwide can provide local laser calibration traceability.

Design and build

Not only does Renishaw have comprehensive in-house design capability, its extensive manufacturing capacity allows it to produce nearly all components and assemblies in-house. This gives us the ability to fully understand and control our design and build process.

The performance of Renishaw lasers has been independently verified by the National Physical Laboratory (UK) and the Physikalisch-Technische Bundesanstalt (Germany).

Certification

Renishaw plc is certified and audited regularly to the latest ISO 9001 quality assurance standard. This ensures all aspects of design, manufacture, sales, after sales support, and recalibration remain at the highest standards.

The certificate is issued by BSI Management Systems, an internationally recognised certification body, accredited by UKAS.



Renishaw's innovation has transformed industrial metrology

Renishaw offers a range of calibration solutions for machine tools, CMMs and other applications:

XM multi-axis calibrator system

- Measure six degrees of freedom in any orientation from a single set-up
- Unique technology, optical roll measurement and fibre optic launch



XL-80 laser measurement system

- The ultimate in traceable, versatile motion system analysis
- ± 0.5 ppm certified linear measurement accuracy



XK10 alignment laser system

- Measure and align geometric and rotational axes
- A single digital solution for a range of machine tools



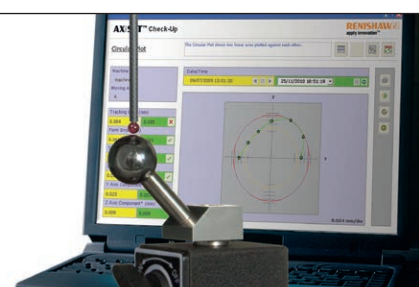
QC20-W ballbar system

- The most widely used system for machine tool performance verification
- Reduces machine down-time, scrap and inspection costs



AxiSet™ Check-Up for machine tools

- Rapid on-machine measurement of rotary axis performance
- Accurate detection and reporting of errors in rotary axis pivot points



For more information visit www.renishaw.com/calibration

XR20-W system information

System specification

XR20-W system	
Max feed rate (> 5° axis rotation)	10 rpm
Max feed rate (< 5° axis rotation)	Unlimited
Height	130 mm
Diameter	Ø100 mm (150 mm on mounting plate)
Weight	1.2 kg (kit 6.5 kg)
Interface	Integral USB comms, no separate interface

Performance specification

Rotary (with XL-80)	
Accuracy	±1 arcsec (at 20 °C)
Resolution	0.1 arcsecs
Range	0° to 360°

Rotary (with XM system)	
Accuracy	±1.2 arcsec (at 20 °C)
Resolution	0.1 arcsecs
Range	0° to 360°

Radio communication

Class 1 wireless communication device	
Communication distance	10 m typical operation

Battery (rechargeable)

Technical data	
Max current	3.7 V DC
Battery life	3 hours typical operation (for new batteries)

Power supply

USB power supply	
Shielded USB2	Full or high speed
For cable length less than 3 m	28AWG/2C (for signals), +24 AWG/2C (for power)

Please contact your local Renishaw office for further details at www.renishaw.com/contact

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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