RENISHAW
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FORTiS™ enclosed absolute encoder systems

Proven
absolute position measurement technology

Ground-breaking
robust non-contact design

Superior
performance in metrology and feedback

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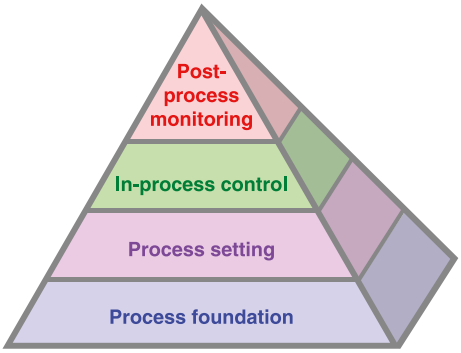
FORTiS™ encoders – improve process control

Reduce process variation at source and reap the rewards

The higher the degree of variation in the manufacturing process, the higher the risk for error. Foundation level process control using Renishaw encoders can help **eliminate the risk**. The FORTiS-S™ and FORTiS-N™ linear encoders can facilitate the following measures that enhance machine tool metrology and improve reliability, leading to **significant operational and commercial benefits**.



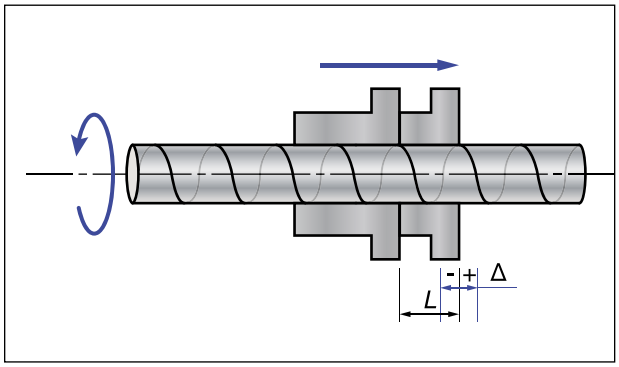
Process foundation

Design in superior machine tool performance

For many machine tool applications, the semi-closed loop system comprising a recirculating ballscrew coupled to a rotary encoder provides adequate performance. However, this arrangement is subject to some mechanical backlash which can result in errors that increase over time through wear.

FORTiS linear encoders measure direct linear motion of the machine's slideways, which:

- eliminates the effects of mechanical errors due to backlash
- builds confidence in machine capability after calibration
- reduces calibration requirements and increase uptime

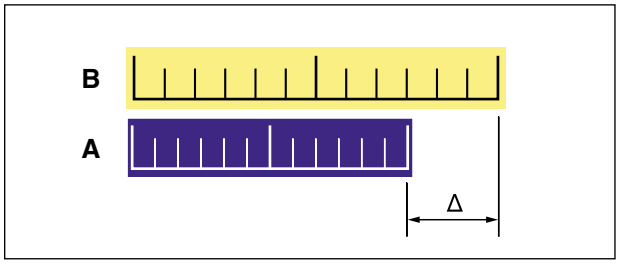


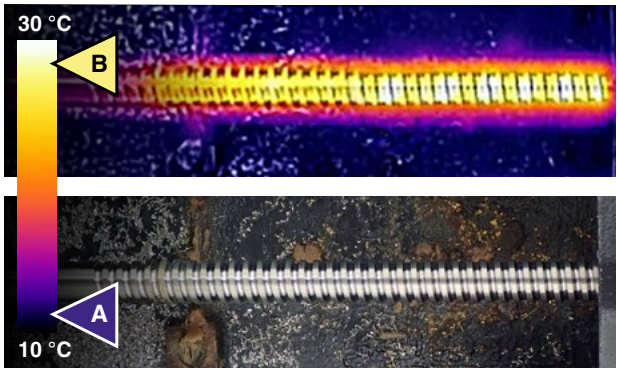
Build in compensation for thermal variation

During machine operation, when ballscrews heat up they grow longer and when cooling they become shorter. This variation in feedback cannot be measured by rotary encoders alone, resulting in positioning errors that can lead to scrap.

FORTiS linear encoders feed back true position directly from the actual position of the machine's slideways, irrespective of variation in ballscrew length, which:

- eliminates positioning errors due to thermal effects on ballscrews
- builds confidence in machine stability and performance
- enables more demanding, higher value work

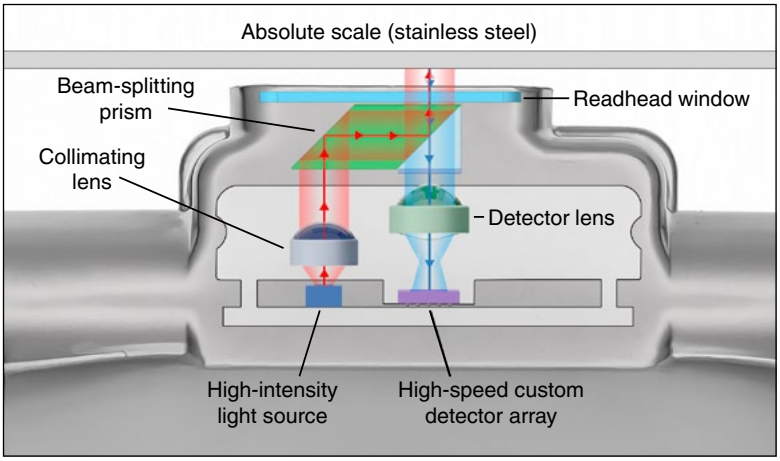




Next generation enclosed encoders for use in the harshest environments

Proven absolute encoder technology

FORTiS™ encoder systems apply Renishaw's proven absolute position measurement technology. A miniature ultra-high speed digital camera, housed in a sealed readhead, reads a single track, fine pitch (30 µm) optical steel scale to deliver superior performance in position feedback, motion control, metrology and contamination resistance.



Robust non-contact design

Having no internal moving parts such as bearings, springs or wheeled carriages eliminates wear, minimises risk of breakage and improves reliability, to deliver longer system lifespan.

FORTiS-S™
Standard width

FORTiS-N™
Narrow width

Tough stainless steel scale...

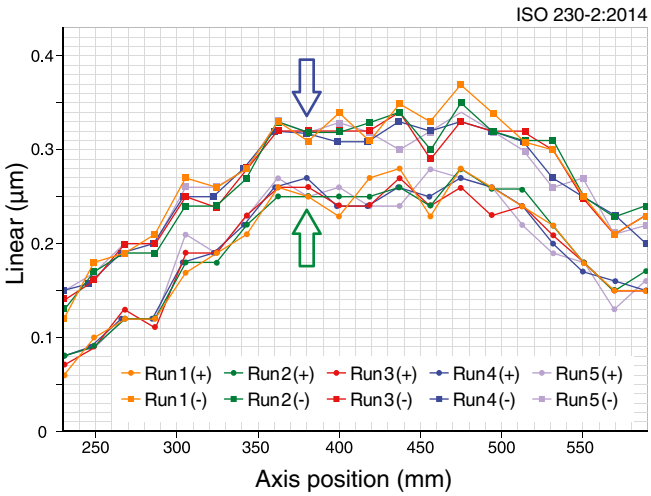
...has an exceptional breakage threshold and a high resistance to contamination even when exposed.

The scale's coefficient of thermal expansion (CTE of 10.1 ±0.2 µm/m/°C) is similar to the base material used in the majority of machines, reducing errors due to thermal effects whilst increasing measurement certainty.

Low noise (jitter below 10 nm RMS) and SDE (Sub-Divisional Error, the error within a scale period) of just ±40 nm enables encoder feedback of superior fidelity, to ensure smoother velocity control and rock-solid positional stability.

Enhanced metrology

Hysteresis and backlash errors associated with mechanical contact designs are reduced, improving workpiece surface finish and form.



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Engineering with acumen

A breakthrough in readhead design

In addition to the benefits of a non-contact optical encoder, our engineers considered other design elements that offer distinct advantages over older conventional designs.

Both readhead models are sealed against ingress of liquid and solid contaminants to IP67, allowing them to remain undamaged and working even after full immersion.

Application of tuned mass damping technology enables class leading vibration resistance. Tested beyond 30 g, both FORTiS-N and FORTiS-S models achieve the same specification and can endure the same harsh conditions.

Installation – simple, intuitive and fast

Unlike traditional installation methods, peripheral diagnostic equipment is not essential. Renishaw's patented set-up LED and carefully designed accessories ensure right-first-time installation that is up to 90% faster than more conventional systems.

When setup is verified using Renishaw's ADTa-100 and ADT view software, installation data can be easily saved as a CSV file in a permanent record.

Convenient form and fit

Both FORTiS models are bolt-hole compatible with alternative brands of enclosed linear encoders, simplifying design change.

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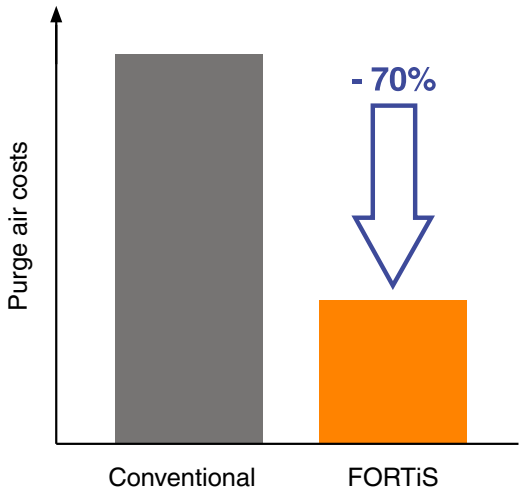
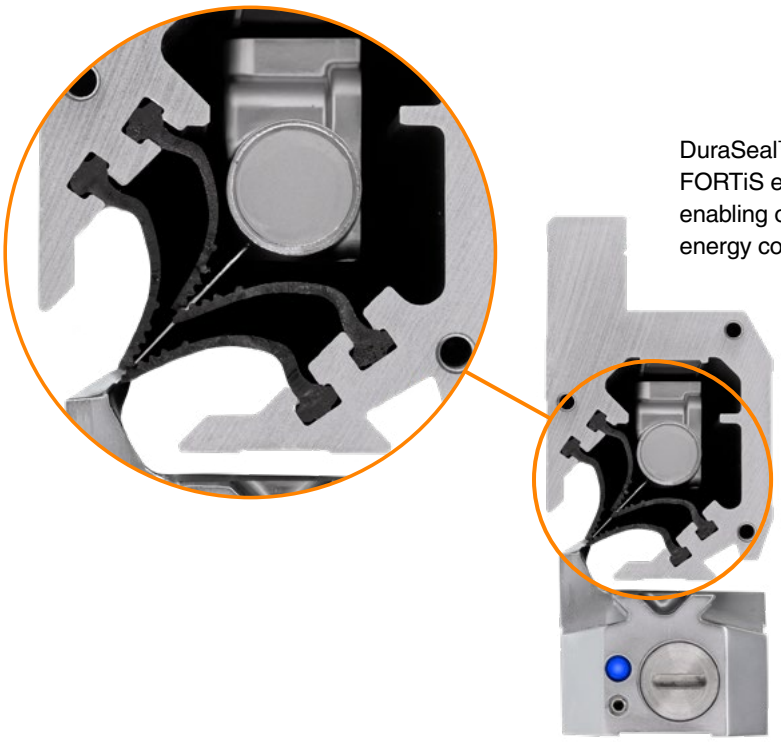
Benefit through evolution

Machine tools that are optimised to cut more metal, more reliably and more accurately, will quickly **maximise productivity, profits and the user's competitive edge**. Furthermore, 21st century design considerations can help reduce energy consumption and costs.





DuraSeal™ lip seals have been specially developed for FORTiS encoders and provide superior sealing properties, enabling operation with lower air consumption, reducing energy costs and carbon footprint.

Technology benefits
Ground-breaking non-contact design improves metrology, feedback and vibration resistance
Advanced high-speed digital technology widens scope of future machine designs
Robust construction delivers outstanding reliability under the harshest conditions
Exceptional sealing properties increase uptime
Unmatched set-up procedure

Commercial benefits
Enhanced system capability and longevity
Differentiating technology for integrators and greater usability for users
Reduces downtime and increases user productivity
Reduces user operation costs and carbon footprint
Saves time, reduces costs and builds confidence in right-first-time installation

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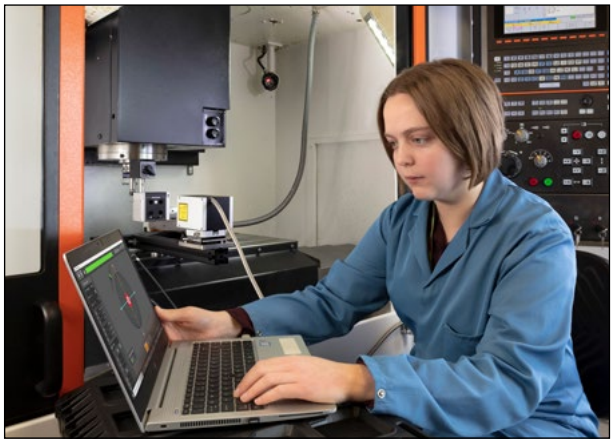
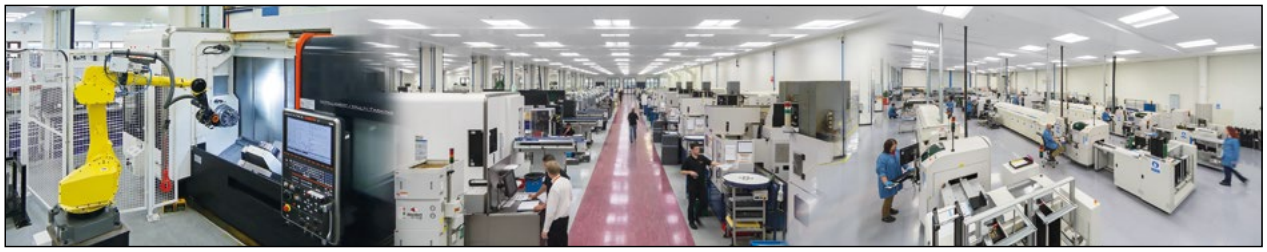
A history of excellence

Our metrology leadership and our reputation for engineering excellence have put us at the forefront of our markets since we launched our first encoders in 1989.

As an industry-leading innovator, Renishaw re-invests each year approximately 14% of turnover into engineering, research and development. The results are ground-breaking new solutions for our customers that demonstrate our commitment to creating unique technologies – pushing encoder performance to new levels.

All our optical encoders have CE approval, RoHS compliance, and are manufactured by Renishaw under strict quality controls that are certified to ISO 9001:2015. They are also backed by a truly responsive global sales and support network.





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+44 (0) 1453 524524 **uk@renishaw.com**

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