

# New laser unit provides improved frequency stability

## **RLE interferometer system specification extended to include differential measurement, part per billion laser frequency stability and picometre resolution.**

The introduction of Renishaw's RLE system in 2001 revolutionised interferometer system architecture, reducing a complex scientific instrument to a simple production tool.

Key in this transformation was the use of fibre optics to deliver the laser light directly to the measurement axes, eliminating the requirement for multiple remote beam splitters, benders and adjustable mounts.

Building upon this established technology, Renishaw now introduce the RLE20, an enhanced performance interferometer system with 'front end' performance capability.

The electronics and semiconductor production equipment industries continue to experience a trend whereby OEMs are being pressured to accommodate smaller feature sizes, increase throughput and reliability, whilst simultaneously decreasing equipment footprints and costs. This places increasing demands on the manufacturers of position encoder systems.

The new RLE20 interferometer system and associated components provide users with part per billion-frequency stability, sub-nanometre non-linearity, and a resolution capability of 40 picometres: a specification that enables the advantages provided by fibre optic launch to be enjoyed by precision motion system manufacturers and semiconductor equipment OEMs producing wafer inspection, lithography and other yield enhancement tools.

The RLE20 system benefits from the same system architecture as the established RLE10 with a laser unit being connected to a detector

head by a 3 m fibre optic umbilical. As a direct result of launching the laser light through fibre optics, only two components need to be aligned to form a complete axis positioning system, leading to a dramatic reduction in installation time and an opportunity to reduce equipment footprint.

The increasing range of interferometer solutions from Renishaw now includes multiple laser sources and interferometers for use in linear, X-Y (planar) and differential measurement applications.



All Renishaw RLE laser systems provide positional output signals in differential digital RS422 and / or 1 Vpp sine / cosine formats. Digital output signals provide resolutions of up to 10 nm, whilst analogue signals can be used in conjunction with Renishaw's RGE interpolators or the new RPI20 parallel interface to provide resolutions of 0.39 nanometres and 40 picometres respectively.

As with any laser interferometer system, when using an RLE system in a non-vacuum environment, or an application where it is not possible to reference the system against a known distance, some form of refractive index compensation is required in order to maintain accuracy under fluctuating environmental conditions. (Interferometric measurement is based on the wavelength of laser light. Changes