



## **Manufacturers Of Fine Metrology Equipment**

### **PRESS RELEASE**

**Is this the most accurate long bore measuring machine in the world? Derby-based Eley Metrology have shipped their latest CNC system to a leading aerospace company in the USA.**

**Eley Metrology – designers and manufacturers of high precision measurement systems have shipped their latest CNC, Long Bore Measurement (LBM) to a leading aerospace supplier near Boston in the USA. The LBM is manufactured totally at the Derby factory and certified in Eley’s UKAS approved facility.**

The LBM is unique and offers a solution to an area of Metrology that has always presented a challenge i.e. the precision measurement of features down long deep bores. Applications include aerospace components such as main engine shafts, hydraulically operated under-carriage landing gear, nuclear reactor items, oil industry components, line bored bearing housings and any components where the precision measurement of features inside long deep bores are of interest. Perhaps one of the best examples is highlighted by the critical requirements of a jet engine main shaft.

Such a component will be required to rotate in use possibly at 30000 rpm. The centrifugal forces involved are immense. It is vital that the geometry and size of such a component is in compliance with the engine designers exacting specifications and requirements. Concentricity of inner and outer shaft bearing diameters are critical along with the blend radii of various internal and external diameters. All features must be measured in relationship to the centreline of the shaft. Any out of tolerance will cause serious vibration problems with possible catastrophic consequences if not identified before build of the final engine assembly.

The LBM can measure size, wall thickness, shape and geometry of a component without the need to re-datum. This is extremely important as any need for re-datuming will have an effect upon the ‘‘uncertainties of measurement’’ involved.

With previous ‘‘old’’ measurement procedures where a composite measurement approach is employed using dial indicators and gauging techniques, the budget for uncertainties of measurement alone would often take the component specification way outside the available tolerance band. This is why the LBM was conceived. With greater demands for precision by designers along with the advent of more superior manufacturing machines so the need for more accurate and certain measurement had arrived.

The LBM can access and measure holes as small as twenty millimetres in diameter. It can measure bores up to three metres in length. It resolves to one micron. The latest LBM leaving Eley Metrology has been passed to ISO 10360. It meets a volumetric measurement capacity of better than ten microns at the end of the measuring lance of two metres long.

In keeping with all of Eley's products there is no error mapping involved. How then is this achieved? Jeff Eley chairman and managing director of Eley Metrology explained; "The LBM weighs very nearly fourteen tons and is extremely strong and very stable. It has a main granite guide of slightly more than four and a half metres long. The guide along with all manufactured items are produced entirely at our facility in Derby. The main guide is hand finished by our engineers to give a total specification of four microns over the entire length of the guide. This covers parallelism and straightness. The other two axes are manufactured to comply within two microns of straightness and parallelism. We are in effect producing measurement masters in all four axes; X Y and the two Z's.

The principle guidance system is that of a vee-flat with pre-loaded bearings throughout. This system is not new but is unique to CMM's. Vee-flat systems are employed by nearly all the major machine tool builders for many years". Jeff Eley is convinced that this is the best method of guiding precision co-ordinate movement. Eley cites this system along with their totally unique bridge system.

Here the main bridge guidance members are kinematically mounted on three spheres within a cradle that Eley describes as a shear plate. All of the axial forces are dissipated through this cradle or shear plate thereby allowing a stress-free and stable movement of the bridge and the vertical Z-axis members.

The primary Z-axis is capable of measuring as a conventional CMM with or without the carbon fibre lance in place. No error mapping is employed in either case in order to meet its specification. It does however provoke the question of what would the LBM achieve with error mapping included?

Eley continues; "The lance has two Z-axis vertical members controlling stability and squareness. I believe we are now producing the most accurate CMM's ever made. I know of no other machine that will approach this specification."

As part of a total turn-key system to its USA customer Eley have designed and supplied special universal fixturing that will accept any size and configuration of component within the LBM's volume. Along with this Eley have supplied metrology master's to assist with certification and day-to-day compliances. The analysis software employed on the LBM is Eley's True Measure 4 (TM4) which employs I++ controller protocols to allow alternative software abilities to be used, should the customer prefer.

The production of the LBM represents many years of development by Eley Metrology. Jeff Eley asserts that the solution provided by the LBM with regards to the precision measurement of long bores is unique, and occupies an area of dimensional metrology which is not trivial in its challenge

For further information please contact Jeff Eley, Managing Director on 01332 367475