Improved medical implant quality through precision measurement
Established in 1886, Taylor Hobson is the world leader in surface and form metrology and developed the first roundness and surface finish measuring instruments.

We provide contact and non-contact measurement solutions for the most demanding applications on a global basis, with a worldwide infrastructure to support our clients; we are a truly global ultra precision metrology company.

We are pioneers continually developing our products to meet the ever-increasing demands of next generation technologies, particularly in medical, precision optics, automotive, bearings, aerospace and renewable energy technologies.

This forward thinking philosophy is captured perfectly in our diverse range of product solutions. Recent developments include measurement systems for intraocular lenses and moulds, femoral heads, stems and sockets.

Taylor Hobson is part of the Ultra Precision Technologies Division of AMETEK, Inc. which is a leading global manufacturer of electronic instruments and electromechanical devices with 2014 sales of $4 billion. AMETEK has over 15,000 colleagues at more than 120 manufacturing locations around the world. Supporting those operations are more than 100 sales and service locations across the United States and in 30 other countries around the world.
Medical implants require exceptional levels of quality, durability, precision and reliability in order to meet patients’ expectations. Recent developments by Taylor Hobson deliver an in depth understanding of implant characteristics such as wear and provide vital feedback for design improvements. This improves both the implant and the quality of life for patients.

**Applications**
- Ophthalmology
- Orthopaedic Implants
- Spinal Implants
- Heart valves
- Dentistry

**Typical benefits**
- Improvements in the performance of ophthalmics by the analysis of characteristics such as form error, radius, surface finish and astigmatism.
- Improvements in the quality and safety of implants by analysis of the wear and damage found on explanted components.

**Critical analysis types**
- 3D Topography
- Surface finish
- Form and contour
- Radius
- Dimensions and features
- Tool tip radius and offset
- Angles
- Diffractive
- Aspheric
- Astigmatism
- Volumetric wear
- Roundness
- Straightness
- Flatness

Knee implant
Form Talysurf PGI measuring the implant
Taylor Hobson provides non-contact and contact solutions for measuring IOLs and IOL moulds, reducing the variation in lens power and providing greater control during manufacture.

**IOLs – Measurement for clearer vision**

Measure critical dimensions to predict lens power early in production

IOLs provide good, natural vision rapidly after cataract surgery. They last for the remainder of the patient’s life and are now able to correct for either near or far vision or a combination of both. Astigmatism can also be corrected with IOLs.

Taylor Hobson provides non-contact and contact solutions for measuring IOLs and IOL moulds, reducing the variation in lens power and providing greater control during manufacture.
Use Taylor Hobson’s TalyMap and Asphero-diffractive analysis software to:

- Predict errors in the power of the final lens – by radius measurement
- Improve lens performance – by analysis of aspheric form error and roughness
- Improve diffractive lens efficiency – by analysis of step height and surface finish

Product solutions

- Form Talysurf PGI
- CCI
- TalyMap software
- AAU software
Hips – extending implant life

Taylor Hobson provides solutions for sample development, control of the manufacturing process and analysis of defects and scratches.

**Surface finish and form**

Orthopaedic implants, like femoral heads, stems and sockets, are manufactured with a very low form error and a high degree of smoothness so as to function as low wear bearings. During in vivo use, the surfaces are subject to both wear and damage.

Articulating surfaces naturally wear in normal use. 3D mapping techniques utilised on Taylor Hobson instruments enable you to calculate the volume of the component and the volume of material that has been worn away. This is an essential part of improving the quality and safety of implants by analysis of the wear and damage found on explanted components.
Taylor Hobson's Talyrond systems measure form and topography simultaneously, identifying areas of wear or corrosion, providing precise dimensions for calculating the volume of material loss.

This is achieved by use of a high resolution gauge (0.3 nm), a frictionless air-bearing spindle and precision axial and radial datums for measurement of roundness, straightness and cylindricity. The system also incorporates a patented gauge calibration technique for the measurement of radius, angle, height, length and distance.

TalyMap is Taylor Hobson’s 3D analysis software, providing:
- Radius and form error analysis
- Accurate calculation of wear volumes
- In depth understanding of material loss patterns
- Control of surface quality for improved durability
- Control of taper angle and form to reduce wear

**Product solutions**
- Form Talysurf i-Series
- Form Talysurf PGI
- Talyrond
- CCI
- LuphoScan
- TalyMap software
Wear on joint prostheses is the main cause of premature failure leading to revision surgery. Increasing the prosthetic component’s life is a challenge to the industry. Furthermore, maintaining quality control during the manufacturing process is key to improving the performance of prosthetic pieces. Taylor Hobson’s combined equipment like the Form Talysurf, Talyrond and CCI have enabled a clearer understanding of these points.

André Luis Lima de Oliveira PhD in Biotribology, São Paulo University – USP /Brasil

### Quality control checks throughout the manufacturing process

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### Orthopeadic articulating surfaces – knee implant

Knee replacement surgery was first performed in 1968. Since then, improvements in manufacture, materials and design have significantly increased its effectiveness. Manufacturing process control, combined with the detailed measurement and analysis of surface texture, form and wear have made total knee replacements one of the most successful of medical procedures.

### Product solutions

- Form Talysurf i-Series
- Form Talysurf PGI
- CCI
Knees – improving prosthetic piece performance

Volumetric wear software

Compare performance of materials and lubricants using 2D and 3D analysis techniques through wear scar analysis

Contact and non-contact measurement techniques are available for analysing the wear of components using both 2D and 3D analysis techniques to calculate the amount of material that has been worn away.

Cylinder mapping of 3D components for analysis of volume and material loss

This type of measurement is particularly important in implants where the material lost has to be dealt with by the body and where the void left behind can host infections and other foreign bodies.
Further applications

A whole solution
Form, surface finish, contour and wear analysis can all be delivered in a single 2D or 3D measurement using both contact and non-contact instruments.

- Tooth implants
- Heart valves
- Pump valves
- Spinal implants
- Pill punches
- Intra-ocular lenses (IOLs)
- Articulating surfaces (hip/knee joints)
- Effects of toothpastes and brushing
- Reduce wastage
- Provide quality assurance
- Research equipment
- Defect detection
- Volumetric wear analysis
- Manufacturing process feedback

"Extending implant life through detailed analysis"
The metrology experts

Taylor Hobson is world renowned as a manufacturer of precision measuring instruments used for inspection in research and production facilities. Our equipment performs at nanometric levels of resolution and accuracy.

To complement our precision manufacturing capability we also offer a host of metrology support services to provide our customers with complete solutions to their measuring needs and total confidence in their results.

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- Metrology training – practical, hands-on training courses for roundness and surface finish conducted by experienced metrologists
- Operator training – on-site instruction will lead to greater proficiency and higher productivity
- UKAS calibration and testing – certification for artifacts or instruments in our laboratory or at customer’s site