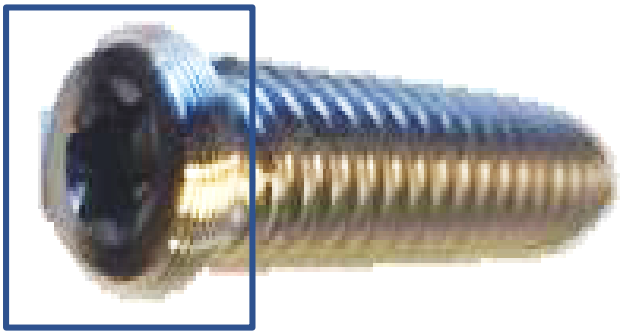
Bruker alicona

Optical Metrology Application Note

Application:

Measurement of components for Orthopaedics and Traumatology



Osteosynthesis screw with a hexa lobe screw head

Bruker Alicona is a leading global supplier of optical metrology solutions based on the principle of Focus Variation.

Focus Variation works on the basis of moving a focal plane over a surface and collecting robust 3D data which can then be used to measure geometric form and surface finish from a single optical sensor.

Measurement processes can be fully automated and provide GD&T measurement capabilities across all industrial & medical sectors.

The systems are in use in Industry, Industrial Research, Universities and production facilities globally.

www.alicona.com

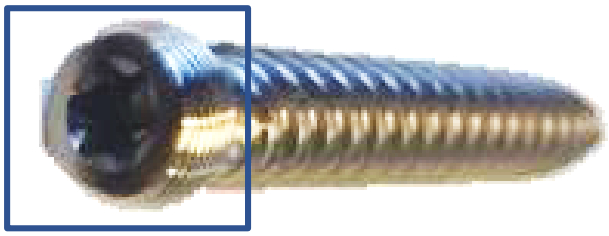
Introduction

In this application note, we describe the use of Focus Variation measurement technique for quality control of Biomedical Parts.

In the very sensitive field of orthopedics and traumatology, damage to the surface of medical devices should be avoided, especially during quality control processes. Optical measurement systems, contactless by definition, represent a solution to prevent damage potentially caused by tactile measurement processes. In addition, optical technologies allow the use of wear-free measuring means, which can be automated even in production and which provide connected and repeatable results.

The measurement of osteosynthesis screw heads is a good example of optical dimensional measurement of microgeometries in the biomedical field. The osteosynthesis screw is a medical aid that is placed in the tissues to ensure a stable connection between bones or bone fragments in cases of complex or large fractures. Osteosynthesis screws are the most common fastening aids and can be used alone or in combination with other components (e.g., plates).

In surgical applications, the dimensional accuracy of the screw head is crucial to ensure an accurate connection between the screwdriver and the screw head. This is necessary, on the one hand, to ensure that the head of the screw is not damaged during insertion and, on the other hand, to prevent the screwdriver from slipping and injuring the patient.



Measurement of the complete shape of the screw head

One of the advantages for this application is the ability to measure the entire screw head with high resolution over 360 °.

This is achieved using the InfiniteFocus G5 system fitted with an advanced real3D rotation unit as illustrated in Figure 1

Figure 1

The component is placed in the rotation holder and rotated to software-controlled positions and individual measurements are made and then automatically merged into a complete 3D dataset. The calibrated and high-accuracy axes of inclination and rotation make it possible to make fully automatic, repeatable and connected measurements throughout the part. Polygon features such as contour, difference, shape, or shape deviations are then visualized and measured. See Figure 2

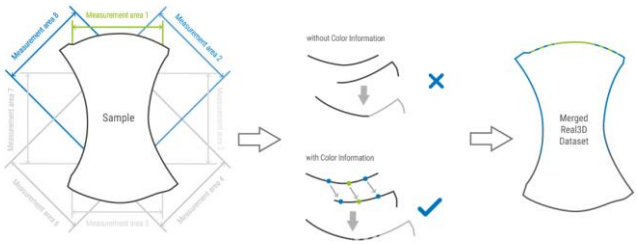


Figure 2 : Real 3D technology for complete measurement of the shape. The component is measured at different angles of rotation and tilt. A complete and precisely merged 3D dataset is created from individual measures that have overlapping areas.

In the case of this osteosynthesis screw, the acquisition system equipped with the Real3D servo-controlled rotary axis, allows the generation of a 3D file of the entire screw head. In a second step, the analysis module, with tolerances, allows to extract a cross-section in the axis of the screw, in order to measure the distances between the top of the screw head and the bottom of the cavity or the bottom of the hexa lobe, but also to check the diameter of the entrance of the cavity which receives the screwdriver. This data can then be directly compared against a CAD model. Shown in Figure 3

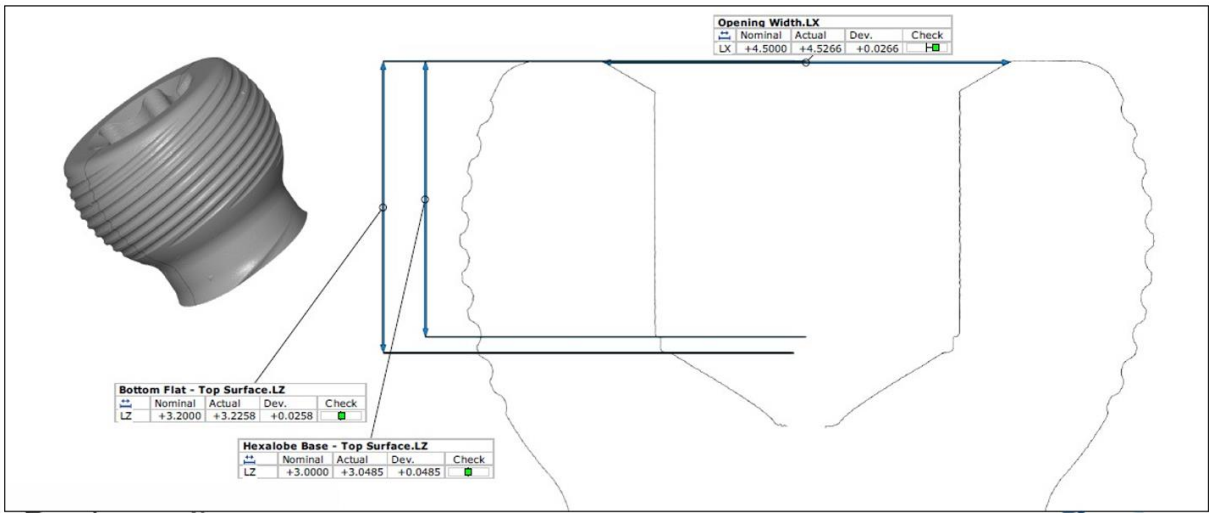


Figure 3 Measurement of heights and width inside the screw head

The Focus Variation Technique also allows measurement of the following parameters: Radii, Distances, Angles and Diameters, on sections perpendicular to the axis of the screw or directly on the 3D shape, shown in Figure 4.

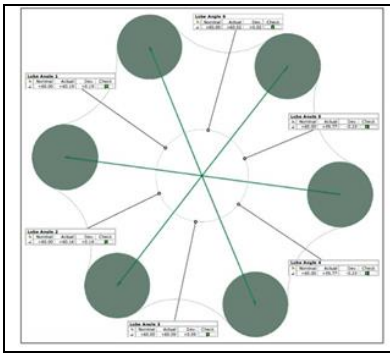
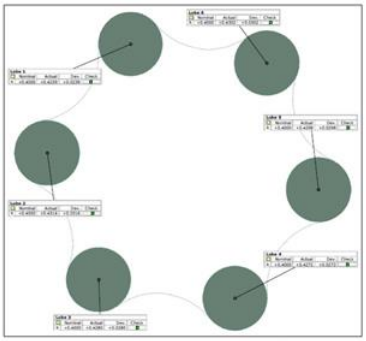
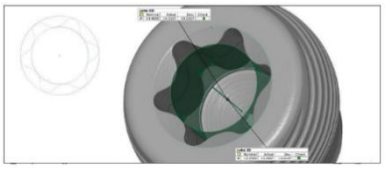
		
Angle of the lobes	*Lobe Radius*	*Internal and outer diameters of the lobes*

Figure 4

Conclusion

In conclusion, Bruker Alicona' s Focus Variation optical measurement solutions provide biomedical device manufacturers with suitable measurement tools to effectively implement quality control in the classic areas of tolerance dimensional quantity metrology, but also surface finish. The measuring systems can be used in a wide variety of different industries and are suitable for all types of manufacturing processes, including additive manufacturing. Users have the possibility to measure dimension, position, shape and roughness with tight tolerances on complex geometries with one sensor, without contact and with high accuracy. All these measurement processes can be automated in production.

InfiniteFocus G5 information at http://bit.ly/2TF9ctH