



InfiniteFocus G Series Application Note:

Application: Gold Stub Bump
measurement.

Bruker alicona

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

Focus Variation works based on 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.

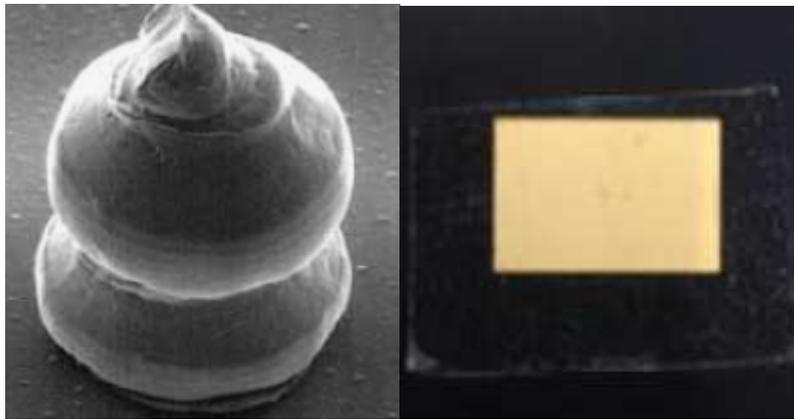
The systems are in use in Industry, Industrial Research, Universities and production facilities globally.

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Gold Stud Bumping

In this measurement report, we describe the use of the Bruker Alicona InfiniteFocusG5 system to accurately measure the height of Gold Stud Bumps on microcircuits without the need of a SEM (scanning electron microscopes) which have been traditionally used. Optical metrology does not require a vacuum allowing the process to be completed much faster, also, optical metrology systems do not require a specialist operator allowing the measurement to be made in situ in manufacturing.

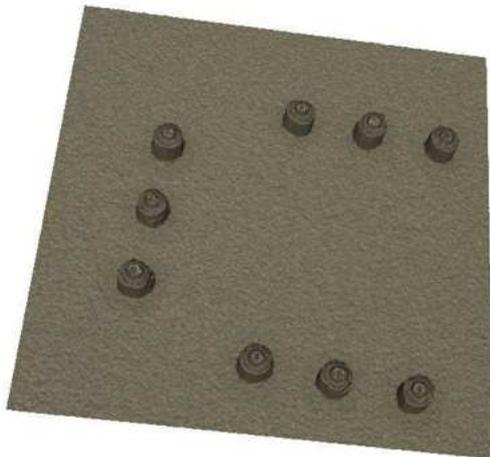
The vertical resolution that can be achieved with Optical Metrology is $<10\text{nm}$ (0.0000010cm), these measurements are traceable to international standards, the sample to be measured is a training circuit with gold stud bumps.



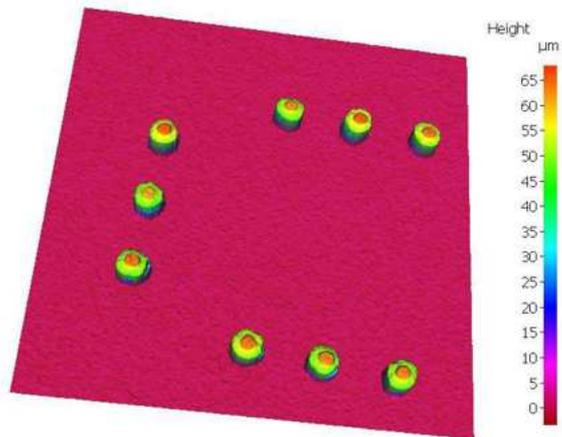
The measurement system used in this report is the InfiniteFocusG5, the measurements can also be made using the smaller InfiniteFocus SL system.

InfiniteFocus is a highly accurate and flexible optical 3D measurement system based on the Focus Variation technology. Using only one sensor, users verify dimensional accuracy surface finish of their components. By means of Vertical Focus Probing, an extension of Focus Variation vertical surfaces can be probed laterally. Components in high accuracy, with a high vertical resolution and in high repeatability. The robust measurement principle of Focus Variation in combination with a vibration-isolating hardware allows the systems to be used in a manufacturing environment. With an automation interface, InfiniteFocus can also be used for fully automatic measurements in production.

The samples to be measured are simply placed on the stage of the G5 instrument. A 3D model is created which is then displayed either in true colour or in pseudo colour related to height as shown below.

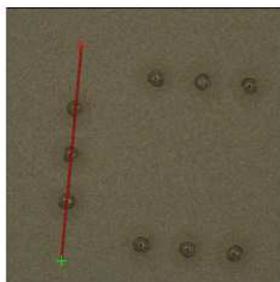


3D surface dataset, true color



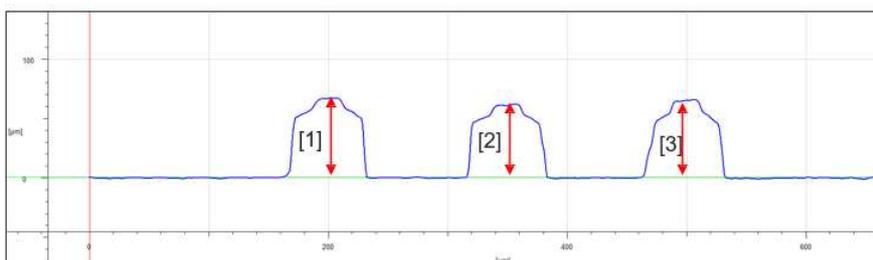
3D surface dataset, pseudo color

The data set are then used in the profile form measurement module and a line is extracted across the surface and the height values displayed as shown below.



Surface dataset, profile path, true color, profile width: 10µm

Name	Value	[u]
[1] height step 1	0.067	mm
[2] height step 2	0.061	mm
[3] height step 3	0.065	mm



Extracted profile (unequal axis scaling)

Summary

Using optical metrology allows a simple and easy to use method measuring heights with strict vertical tolerances. The technique is easy to use and provides a visual model of the surfaces measured. The measurement data can be compared against a master “golden” product or against CAD data to ensure maximum productivity in the factory.

This guarantees a robust and repeatable quality control in addition to an optimization of manufacturing processes. The Bruker Alicona measurement system also allows the measurement of profile and area-based roughness conforming to ISO 4287, 4288 and ISO 25178. User-friendly handling and easy automation using the measurement Inspect measurement module.