



InfiniteFocus G Series Application Note

Full Report available at: <https://bit.ly/3bxTjj4>

Application: Measurement of
Turbine Blades

Bruker alicona

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

Turbine Blade Measurement.

In this measurement report summary, we describe the use of the Bruker Alicona InfiniteFocusG5 to measure turbine blades used in the compressor of air conditioning systems.

To ensure that the blade functions correctly the geometry and surface topography need to be manufactured within a small tolerance band and the surface finish needs to be within a defined range to ensure air friction is not created.

This report shows how, using optical metrology, that it is possible to measure, with high accuracy, the full blade with our measurement technology and optimize the production of the blades.

The full measurement report available at <https://bit.ly/3bxTjj4>

The illustration below shows the sample measured.



Picture of sample

The measurement system used in this report is the InfiniteFocusG5 system fitted with an advanced real3D rotation unit. This allows a full 360° rotation of the blade.



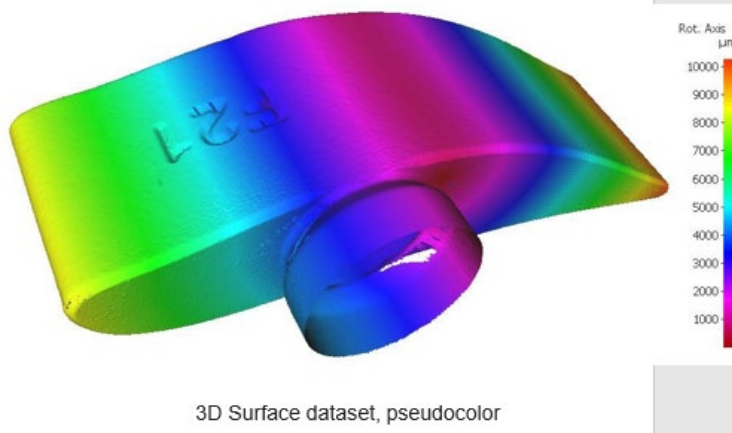
InfiniteFocusG5

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.

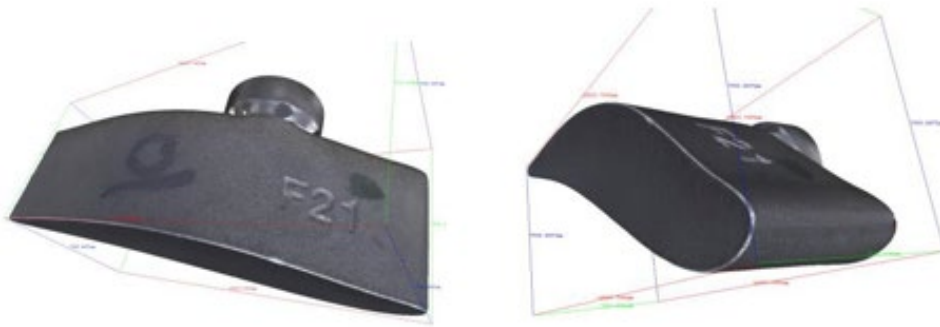
A 3D model of the surface and the blade is created which is then displayed as a 3D model either in true colour or in pseudo colour related to height as shown below. It also can be displayed with overall dimension box.



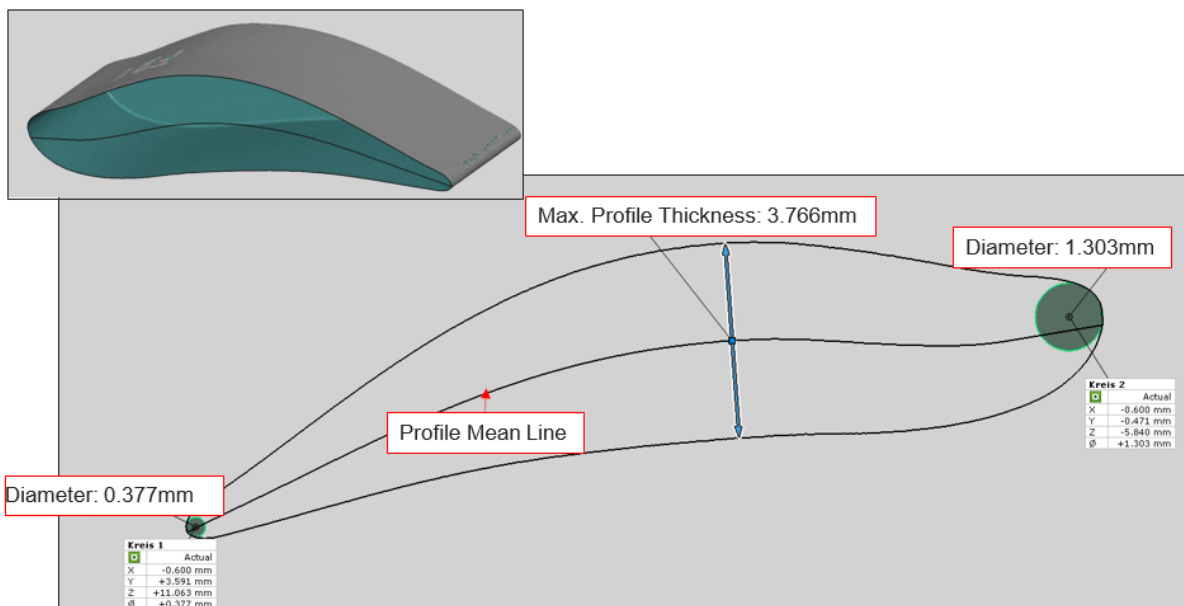
3D Surface dataset, truecolor



3D Surface dataset, pseudocolor

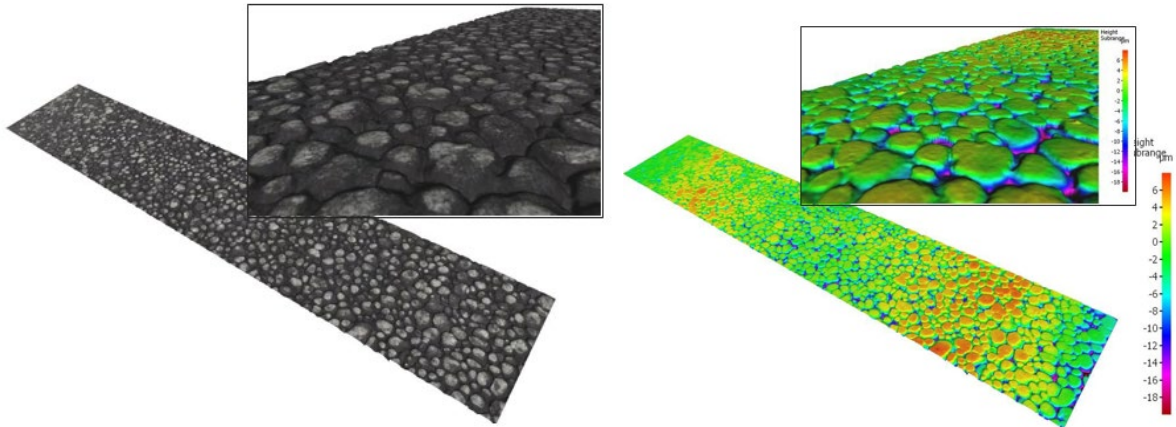
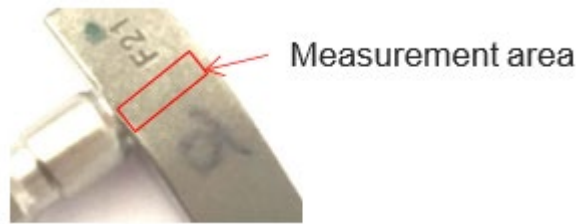


Using the Alicona Inspect Module it is then possible to display and measure the profile geometry as shown below.

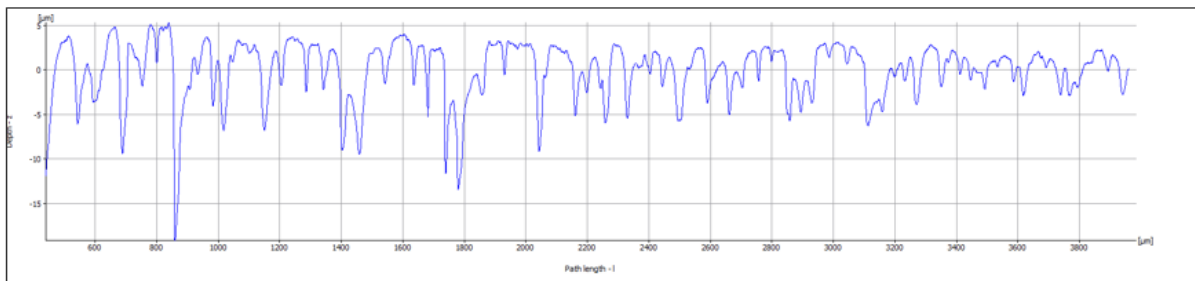
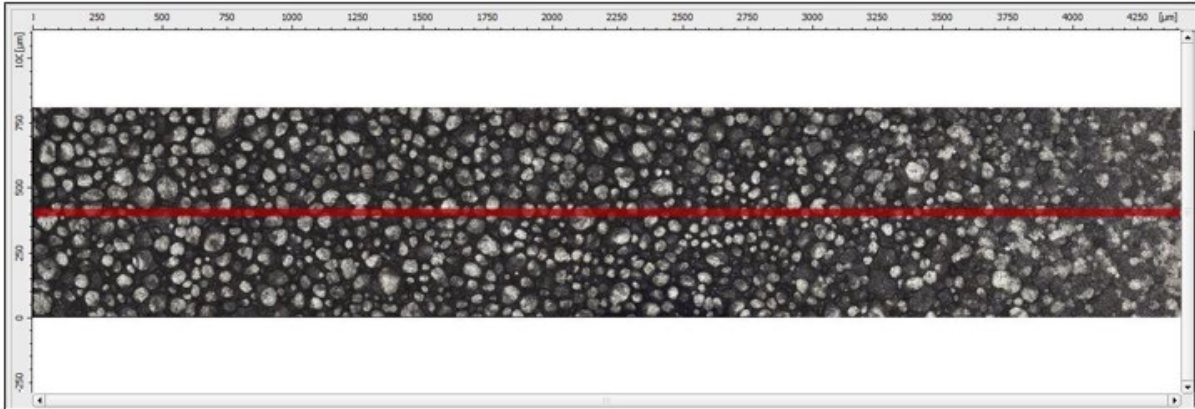


3D dataset with fitted reference plane and geometries

To measure the surface finish in the selected area shown below surface data is collected and displayed as shown below and displayed in true colour and in pseudo colour related to height,



With a profile line extracted across the surface it is now possible to measure surface roughness.



Extracted profile (unequal axis scaling)

And the full measurement results are automatically tabulated.

Name	Value	[u]	Description
Ra	2.36	µm	Average roughness of profile
Rq	3.14	µm	Root-Mean-Square roughness of profile
Rt	24.47	µm	Maximum peak to valley height of roughness profile
Rz	14.08	µm	Mean peak to valley height of roughness profile
Rmax	24.47	µm	Maximum peak to valley height of roughness profile within a sampling length
Rp	5.32	µm	Maximum peak height of roughness profile
Rv	19.15	µm	Maximum valley height of roughness profile
Rc	10.50	µm	Mean height of profile irregularities of roughness profile
Rsm	159.68	µm	Mean spacing of profile irregularities of roughness profile
Rsk	-1.61		Skewness of roughness profile
Rku	7.24		Kurtosis of roughness profile
Rdq	0.36		Root-Mean-Square slope of roughness profile
Rt/Rz	1.74		Extreme Scratch/Peak value of roughness profile, (≥ 1), higher values represent larger scratches/peaks
l	4399.74	µm	Profile Length
Lc	800.00	µm	LambdaC: cut off wavelength

Summary

It can be seen that using optical metrology allows a simple and easy to use method of measuring complex geometry and surface finish with a single measurement solution.

This report is intended to show that various measurement tasks can be solved with an InfiniteFocusG5. The system can be used in R&D, failure analysis and in production.